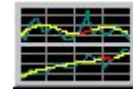




7 PRECONDITION



This module enables interactive or automatic despiking, filtering, interpolation, editing and rejection of observation data.

Two options are available:

Interactive, whereby the user has full control over editing and processing data with all observation time series plots in view.

Non-interactive, whereby the observations are automatically processed using the parameters which have been previously defined and saved from a previous line, or the internal default parameters if none have been previously saved.



7.1 Non-interactive Precondition

Select *Execute | Auto Precondition* from the main menu and select the line from the line list which then appears. Multiple lines may be selected.

The default parameters will be applied to all observations. This process runs in the foreground with the progress displayed at the bottom of the main panel. No further interaction is required.

This option should be used if changes have been made in the database to observation parameters or geodetic parameters and interactive viewing of the observation time series plots is not required.

This option is also used in *Automatic Processing*.

7.2 Interactive Precondition

Select *Execute | Interactive Precondition* from the main menu or click on the *Precondition* button and select the line from the line list which then appears.

7.3 Parameters

To force re-processing of all observations set the line status as appears in the project panel to *Input Complete* by selecting *Project | Edit* from the main menu. This may be desired, for example, if a modified set of parameters is arrived at after appraising data from a subsequent line, and it is wished to apply the modified parameters to a line that has already been preconditioned.

7.4 Groups

When the *Interactive Precondition* module is started the *Group* dialog first appears as shown in Figure 7-1.

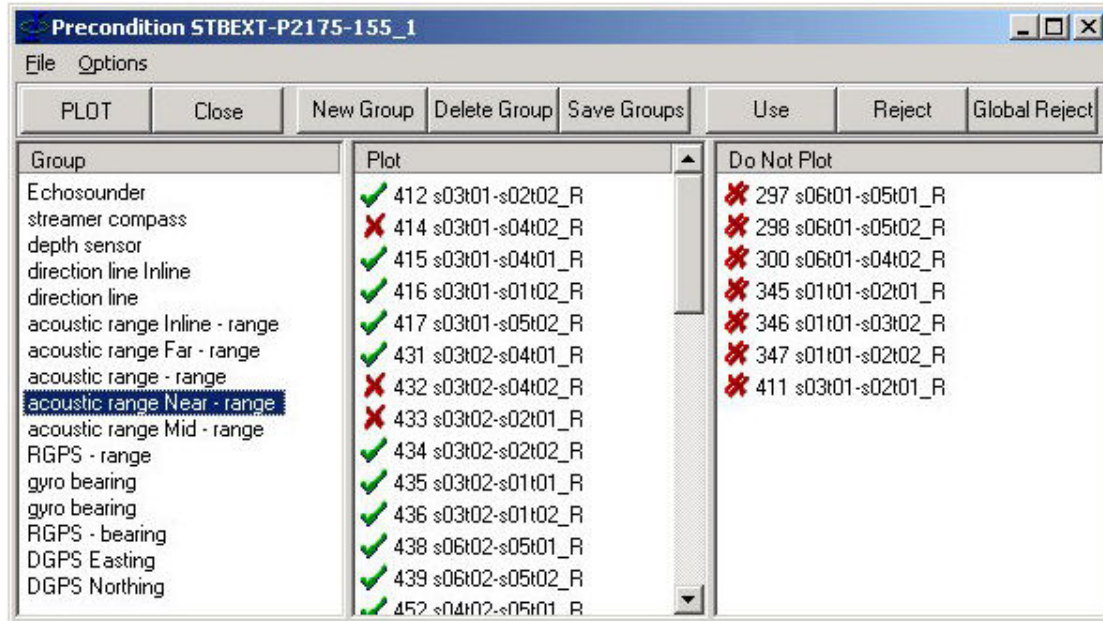


Figure 7-1

Groups are used to facilitate the application of processing parameters to observations, and to select which observations are to be plotted when using *Interactive Precondition*.

Note: Only the observations which are selected to be plotted will be preconditioned.

Each observation is allocated a group number during input of the P2, which is made up from the Positioning System Identifier as defined in the H52 records, the observation type and location along the streamer.

Observation groups are created the first time *Interactive Precondition* is started in the project.

It is possible to create, delete and rename groups, and to move observations between groups.

It is also possible from the *Group* dialog to select which observations will be plotted.

7.4.1 Renaming, Creating and Deleting groups

To rename a group highlight the group, then either click again on the group label or press the <F2> key, edit the name and press <Enter>.

To create a new group click on the *New Group* button, type the name of the group, and press <Enter>.

To delete groups, select the groups to be deleted and press the *Delete Group* button. Groups which contain observations will not be deleted.

Click the *Save Groups* button to save all changes.



7.4.2 Moving Observations Between Groups

To move observations from one group to another

1. Select the group(s) containing the observations to be moved. The observations will appear in one or both of the right hand lists.
2. Select the observations to be moved.
3. Using the mouse, drag the selected observations and drop them on the group in the *Group* list to which they are to be moved.

7.4.3 Setting Observation Plot Status

Observations can be selected for plotting or not plotting by moving them into the appropriate *Plot* list or *Do Not Plot* list respectively.

To move individual or multiple observations from one list to another first select the group(s) to which the observations belong. Select the observations and drag them into the desired list.

To move entire groups from one list to another select the groups and then drag them into the required list.

To save the observations' plot status for subsequent instances of *Interactive Precondition* click the *Save Groups* button.

Note: Observations in the *Do Not Plot* list will not be preconditioned.

7.5 Rejecting Observations

Setting an observation's "reject" status will determine if that observation is to be used in the network adjustment. The three status flags are:

- Use:* The observation will be used in the network adjustment for each shotpoint a good value is available.
- Reject:* The observation is not used in the network adjustment.
- Global Reject:* The observation is not used in the network adjustment. When the *Observation* table in the *Database* is saved as the default, subsequent lines for which the *Default Observations* are used will retain the *Global Reject* status. Refer to [Database](#) for more information.

To set the status select the observations to which it is to apply then click on the *Use*, *Reject* or *Global Reject* button. The observation's icon will appear as a green tick, red cross or red double cross respectively.

Observation status is automatically saved.



7.6 Auto-Rejection

7.6.1 Number of Observations

Observations with few data can be rejected by specifying the minimum number of data as a percentage of the number of shotpoints in the line.

From the menu choose *Options | Auto-rejection*.

Enter the minimum required percentage of data below which an observation will be rejected.

The default value is 10.

7.6.2 Delta SD

The standard deviation of the point-to-point differences (delta) of the *processed* (i.e. edited, gated, interpolated and filtered) data can be used to automatically reject an observation.

From the menu choose *Options | Auto-rejection*.

Check the *Maximum SD* checkbox and enter the threshold. If an observation's delta SD exceeds this value it will be rejected.

The default is on, value 5.

7.7 OBC Acoustic Parameters

When processing data recorded by the Gator system it is sometimes convenient to include in the project several datasets which do not share the same cable definitions and number of acoustic devices. For this reason saving of default precondition parameters from within the Multiplot window is disallowed. However, default parameters can be specified by selecting from the menu *Options | Default OBC Acoustic Parameters*. This option is only available when the project acquisition system is set to GATOR RECEIVER.

7.8 Plots

7.8.1 Plotting order

By default the plots appear in order of observation number.

To plot the data ordered by observation group, from the menu choose *Options | Plot by Group*.

To plot the data ordered by the nodes to which the observation is connected, from the menu choose *Options | Plot by Node*. This option is useful, for example, to plot consecutively two-way and one-way observations between the same two nodes.



Click on the *PLOT* button to start the Precondition.

If the line status as appears in the project panel is *Input Complete*, the default parameters will be applied to all observations. This process runs in the foreground with the progress displayed at the bottom of the main panel. The process may take up to around one minute depending on the CPU speed.

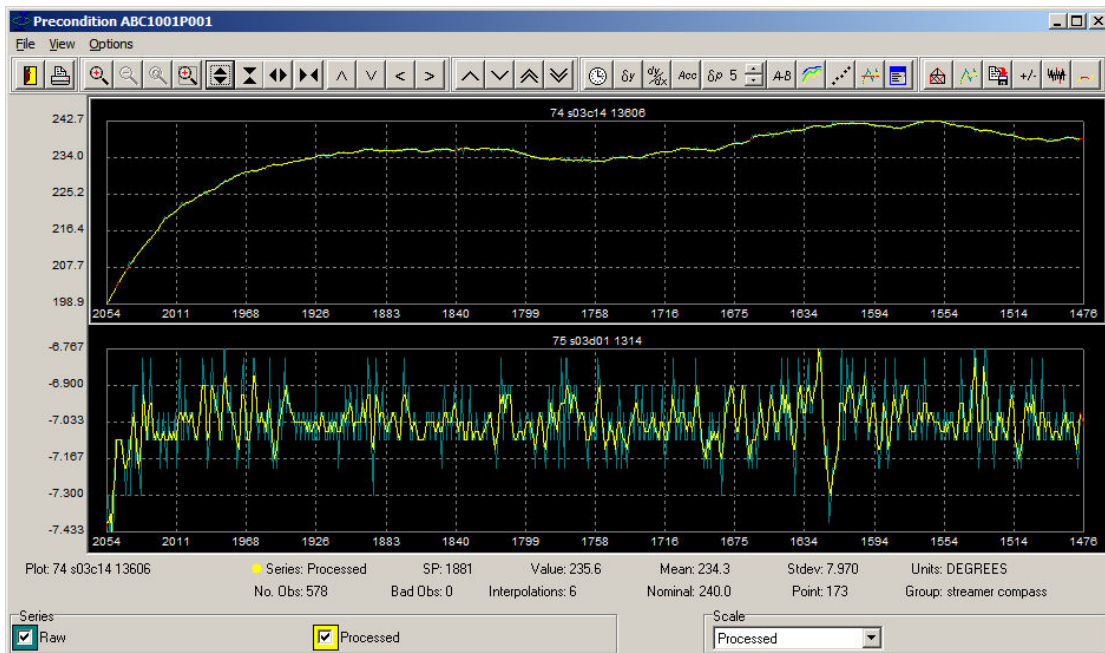


Figure 7-2

Once the precondition parameters have been applied the Multiplot panel appears as shown in Figure 7-2. Time series plots of data from the first few observations are displayed according to the default display parameters.

Note: Depth data are inverted before plotting i.e. the sign is changed.

In the following descriptions, the plot referred to as the *Selected Plot* is that highlighted. In Figure 7-2 the *Selected Plot* is the top plot.



7.9 Menu

The basic Multiplot menu functions are described in [section 15. Multiplot](#). The following functions are specific to the Precondition module:

Options:

Hotkeys: Set the Hotkeys for:
deleting data using the edit line
toggling the use/reject status of an observation
Ctrl and Alt key combinations are not supported.

View:

Network: Display the network (see Network Display).
Time as Metres: Display in metres observations of type RANGE which have been recorded in time units e.g. acoustic ranges recorded in milliseconds.
Note: processing parameters must still be specified in the observations original units.

7.10 Toolbar

The basic Multiplot toolbar functions are described in [section 15. Multiplot](#). The following functions are specific to the Precondition module:



Displays the Network Diagram.



Invokes the processing parameter dialogue box with values pertaining to the *Selected Plot*.



Saves the current processing parameters for all observations as the default parameters. Only layers which span the full SP range are saved.



Invokes a dialogue box allowing negative values for the *Selected Plot* or all plots to be rectified. This option is used specifically for Digicourse one way ranges which are flagged by being recorded as negative.



Display raw minus processed data.



When depressed enables the left mouse button to be used to edit existing data or create new data by dragging inside the plot area. Data points are created at 5 second intervals. The direction of creation is set by the initial mouse movement.



7.11 Series

In the Precondition module, for each observation, two series are defined:

- Raw:* Raw time-based data as recorded in the P2 file. This data can be edited. Original data is restored using the *Undo All Edits* option from the popup menu. Default colour is blue.
- Processed:* Raw time-based data with the most recent processing parameters and edits applied. Default colour is yellow.

By default both of these series are visible and the *Active Series* is the processed series.



7.12 Popup Menu

The basic Multiplot popup menu functions are described in [section 15. Multiplot](#). The following functions are specific to the Precondition module:

- Delete above:* Delete all processed data on the *Selected Plot* above the *Edit Line*.
- Delete below:* Delete all processed data on the *Selected Plot* below the *Edit Line*.
- Delete between:* Delete all processed data on the *Selected Plot* above and below the *Edit Line*.
- Block shift:* On selecting a sub-menu item a dialog will appear prompting for the correction which will be added to the data. This correction will be applied to both raw and processed data.
- Above:* Add the correction to points on the *Selected Plot* for which the processed data lies directly above the *Edit Line*.
- Below:* Add the correction to points on the *Selected Plot* for which the processed data lies directly below the *Edit Line*.
- Between:* Add the correction to points on the *Selected Plot* for which the processed data lies directly above or below the *Edit Line*.
- Undo all edits:* Undo all deletions, corrections, creations and external imports for the *Selected Plot*.
- Undo last edit:* Undo the last deletion only performed on the *Selected Plot*. This function is only available as long as the plot remains in view.
- Use obs:* Toggle on/off use of *Selected Plot* for the network adjustment.
- Global reject:* Toggle on/off use of *Selected Plot* for the network adjustment. When globally rejected, an observation will remain rejected when defaults are loaded for a subsequent line.
- Network:* Display the network diagram for the shotpoint at the cursor position, highlighting the observation in the *Selected Plot*.
-



7.13 Plot Statistics

The basic Multiplot statistics are described in [section 15. Multiplot](#). The following statistics are specific to the Precondition module:

- Nominal value, calculated from node positions.
- Number of bad observations.
- Number of interpolated points.

7.14 Processing Data

For the first line input in the current project, an internally generated set of parameters will be applied. For subsequent lines the *Default* parameters will be applied.

Click on the *Parameters* button to invoke the Precondition Parameters dialogue box as shown in Figure 7-3 below. For each of the three processing categories, click on *Apply* to apply these parameters to the *Active Plot*; click on *Apply to Group* to apply these parameters to the group of observations to which the *Active Plot* belongs.

To save the *Default* parameters for subsequent lines click on the *Save* button. The layer 1 parameters for each observation by number will be saved and automatically applied to subsequent lines when they are initially preconditioned.

Warning: If the P2 header changes with respect to the order of observations input then the default parameters will not be correctly applied. To prevent this delete the file *Procparm.0* in the database folder before invoking the Precondition module. In this case the internal set of default parameters will be applied. However, should there be any significant header changes then it is strongly recommended that a new project be created, specifying a new database folder.

7.14.1 Processing Categories

Three categories of processing parameters are applied to each observation: Interpolation/extrapolation, Gate and Filter. These are described in detail in the following sections.

7.14.2 Layers

For each of the parameter categories up to 10 layers of parameters may be applied. The manner in which these layers are applied depends on the parameter category and is described in the following sections.

Each layer is associated with a set of parameters and a shotpoint range over which these parameters are applied. For layer 1 this is the entire shotpoint range and cannot be changed.

To add a layer for the whole shotpoint range, click on the observation plot to select the observation, then in the parameters window right click on the layer dropdown list



to invoke a popup menu and select *Add New Layer*. Enter the desired parameters.

The new layer will be added when the *Apply* or *Apply to Group* button is clicked.

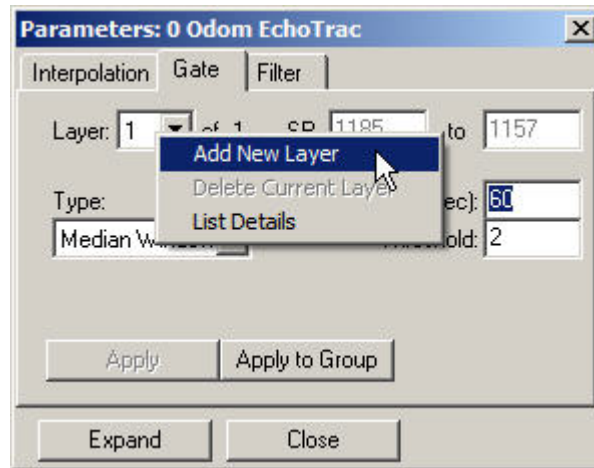


Figure 7-3

To add a new layer for a partial shotpoint range first use the left mouse button to draw a line on the plot over the desired shotpoint range, then add the layer as described above. In Figure 7-3, a new filter layer will be added for shotpoint range 10081 – 10116.

To delete a layer first select the layer from the layer dropdown list then select *Delete Current Layer* from the layer popup menu.

With focus on the layer drop-down list, the *Insert* and *Delete* keys may be used instead of the popup menu to add and delete layers.

Note 1: layer 1 cannot be deleted.

Note 2: when applying to group, all layers will be applied to all observations in the group, and existing layers will be removed.

7.14.3 Interpolation/extrapolation

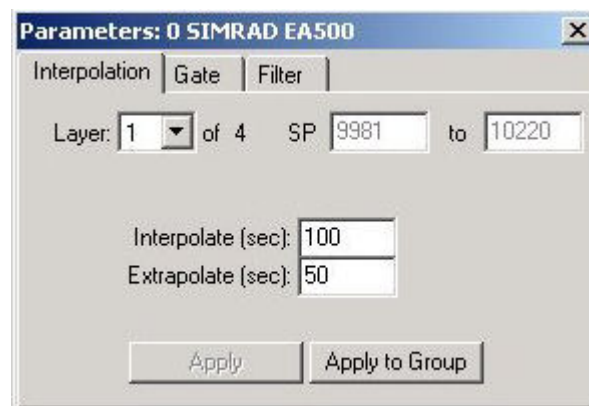


Figure 7-4



Interpolation and extrapolation applies to edited, gated and missing data.

“Missing” data is an arbitrary term which depends upon the sample interval. E.g. if the interpolation threshold is set to 10sec then shot events which fall between any consecutive samples which are more than 10sec apart will not be interpolated. The interpolation threshold should therefore be set to at least the interval between most consecutive samples.

To apply interpolation and/or extrapolation enter the thresholds in seconds and click on *Apply* or *Apply to Group*. Gaps or missing data up to the specified threshold will be interpolated. To remove interpolation or extrapolation set the threshold to 0sec.

Subsequent layers will **replace** existing layers over the selected shotpoint range e.g. to disable interpolation over a sub-range add a new layer for that shotpoint range, set the threshold to 0sec, and apply.

7.14.4 Gate

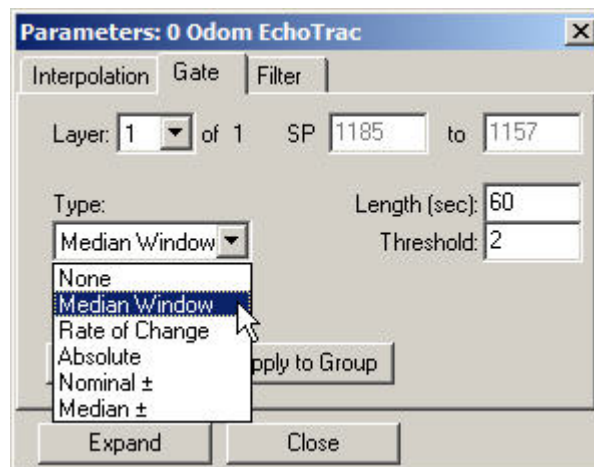


Figure 7-5

To turn off gating click on *None* and click on *Apply* or *Apply to Group*.

The following methods are supported:

Median Window Gate:

Enter the window length in seconds and the threshold in the units of the observation. Click on *Apply* or *Apply to Group*.

A data point will be gated if the absolute difference between its value and the median value of all samples in the window centred on that point exceeds the specified threshold.

Rate of Change Gate:

Enter the window length in seconds and the threshold in the units of the plot. Click on *Apply* or *Apply to Group*.



A data point will be gated if the absolute value of the difference between its rate of change and the median value of the rate of change of all points within the window exceed the specified threshold.

Absolute Gate:

Enter the upper and lower thresholds in the units of the observation. Click on *Apply* or *Apply to Group*.

A data point will be gated if its value falls outside of the specified thresholds.

Nominal Gate:

Enter the absolute value of the threshold in the units of the observation. Click on *Apply* or *Apply to Group*.

A data point will be gated if its value falls outside of its nominal value \pm the specified threshold.

Median Gate:

Enter the absolute value of the threshold in the units of the observation. Click on *Apply* or *Apply to Group*.

A data point will be gated if its value falls outside of the median value of the entire dataset \pm the specified threshold.

Subsequent layers will **augment** existing layers e.g. the first layer may specify a median gate of large length and high threshold to gate large unwanted excursions in the data, and a subsequent layer may specify a smaller threshold and length to eliminate higher frequency smaller outliers.

7.14.4.1 Group Gating

When applying parameters to the group the following will not be applied to the group:

Nominal Threshold
Median Threshold

This is because the thresholds for these gate types are correlated with the magnitude of the observation.



7.14.5 Filter

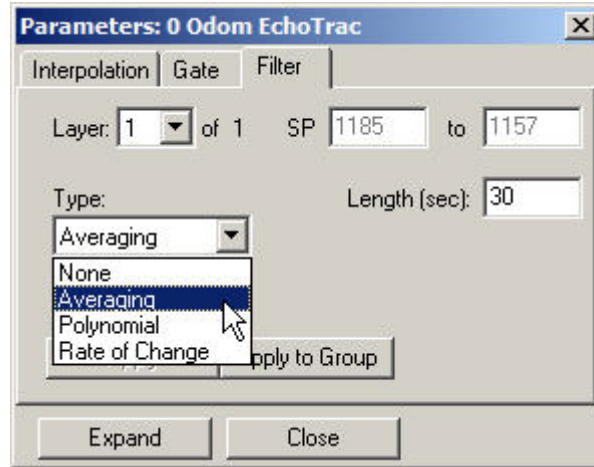


Figure 7-6

To turn off filtering click on *None* and click on *Apply* or *Apply to Group*.

The following methods are supported:

Averaging:

Enter the window length in seconds. Click on *Apply* or *Apply to Group*.

The value of each data point will be replaced with the mean value of all points falling within the specified window.

Polynomial:

Enter the length in samples and the order of polynomial. Click on *Apply* or *Apply to Group*.

The value of each data point will be replaced with the value of the best fit polynomial of the specified order and range of samples centred on that data point. If the order exceeds the sample range it will be automatically replaced with the sample range.

Rate of Change:

Enter the window length in seconds. Click on *Apply* or *Apply to Group*.

The value of each point will be replaced such that its mean rate of change equals the mean rate of change of all points within the window.

Subsequent layers will **replace** existing layers e.g. to remove all filtering from a sub-range of data select that range, add a new layer, select *None*, and apply.

7.14.6 Editing Data

With the *Fixed Zoom* button up, draw a line on the plot using the left mouse button. Use the appropriate Hotkey, or right click and select from the popup menu one of the following:



- Delete Above:* Data points falling above the line will be deleted.
Delete Below: Data points falling below the line will be deleted.
Delete Between: Data points falling above and below the line will be deleted.

These actions may be repeated as many times as required to delete data from different areas of the plot. After editing, deleted data will be immediately interpolated and filtered if applicable.

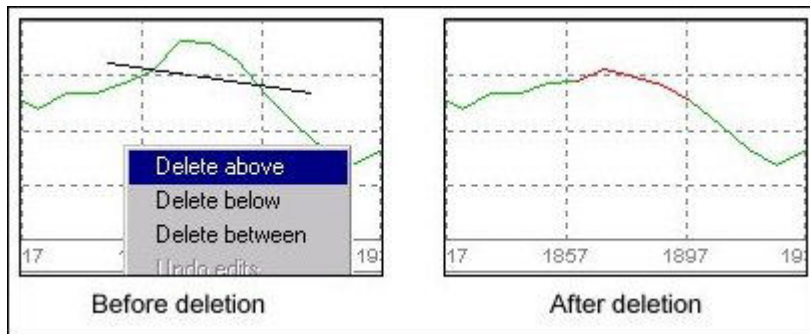


Figure 7-7

Figure 7-7 shows the effects of deletion, interpolation and filtering.

To undo all deletions on a plot, click the right mouse button on the plot and select *Undo Edits*.

To undo the last deletion on a plot, click the right mouse button on the plot and select *Undo Last Edit*. This option is only available as long as the plot remains in view.

7.14.7 Correcting Data

Erroneous data for which the error is known may be corrected rather than deleted.

In the case of an addition or subtraction operation, for example to correct data from swapped laser targets, the *Block Shift* function should be used. In the case of a scale operation, for example to correct multiple echosounder returns, the *Block Scale* function should be used.

With the *Fixed Zoom* button up, draw a line on the plot using the left mouse button. Right click and select from the popup menu one of the following:

- Block shift/scale | Above:* Data points falling above the line will be corrected.
Block shift/scale | Below: Data points falling below the line will be corrected.
Block shift/scale | Between: Data points falling between above and below the line will be corrected.

These actions may be repeated as many times as required to apply corrections to data in different areas of the plot. After correction, corrected data will be immediately interpolated and filtered if applicable.



Note: both the raw and processed data series are corrected. Original raw data is backed up so that the operation may be undone.

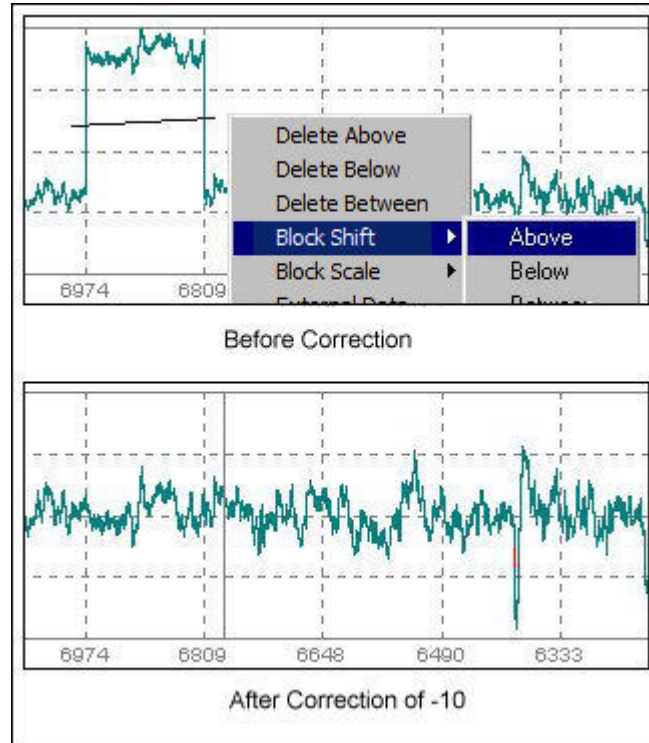


Figure 7-8

Figure 7-8 shows the effects of correcting, interpolation and filtering. In this example all data above the *Edit Line* has been shifted by -10.

To undo all corrections on a plot, click the right mouse button on the plot and select *Undo Edits*.

To redo the last undo click the right mouse button on the plot and select *Redo Last Undo*. That this option is only available for edits performed by deleting data.

Data can also be edited from the data table (see below).

7.14.8 Creating Data

To create data to replace the existing raw data series depress the *Create Data* button, then use the left mouse button to draw the new data. When the mouse button is released existing raw data is replaced with the new data where coincident, and the gating and filtering parameters are applied. This action can be repeated as many times as necessary. New data points are created at 5 second intervals.

To undo all creations on a plot, click the right mouse button on the plot and select *Undo All Edits*.



7.14.9 Importing External Data

Data recorded in an external file may be imported to replace existing data or missing data. Once imported, this data is treated in exactly the same way as original data from the P2 dataset.

The external data must conform to the following:

- The file must be in ASCII.
- Data, and either hours, minutes and seconds or shotpoint fields must be present.
- Fields must be either of consistent fixed width or delimited with a character or string of less than 256 characters.
- Each record must end in a carriage return/ line feed.
- The data must be in the units specified in the observation definition.
- At least some of the times must fall within the period defined by the edit line prior to importing.

To import external data perform the following steps:

1. Using the left mouse button draw an edit line across the area of the plot which is to be replaced with external data.
2. Right click on the plot and from the popup menu select *External Data* to invoke the External Data Dialog (see Figure 7-9).
3. Enter the file name containing the data.
4. Enter the format string, format type and the field delimiter if applicable. The contents of the data file are displayed for reference. See Format Strings below.
5. Click on the *OK* button.

To revert back to the original dataset select *Undo All Edits* from the popup menu.

7.14.9.1 Timing

The time stamps of the external data are defined by the year, day, hour, minute and second fields. These are used to compute the time of each data point since the first shotpoint of the line. If any of these are not present then the corresponding attribute (year, day etc.) of the first shotpoint in the line will be substituted.

Only data with times which fall within the period defined by the edit line will be imported. All existing data within this period will be replaced.

Warning: It is the responsibility of the user to ensure that the time data used is valid. If, for example, the line started shortly before midnight on day 100 and the external data was from after midnight. i.e. day 101, and no Julian day was present in the records, then the external data will be incorrectly assumed to have been recorded on day 100, i.e. the day of the first shot, and not day 101.



7.14.9.2 Large Datasets

SeisPos imposes limitations on the number of data points in a series in order to conserve memory use. The situation may arise when the number of external data points exceeds this limit, in which case the user will be notified. If this does occur then it will be necessary to exit and re-start Precondition upon which the memory allocation for that observation will be automatically increased, and to re-import the external data. For very large external datasets it may be necessary to do this several times.

7.14.9.3 Format Strings

The format string allows the following format specifiers:

y = year
d = Julian day
h = hour
m = minute
s = second
p = shotpoint
x = data value
Any other character = do not import

Delimited:

Each data field, regardless of length, is represented by a single format specifier. Refer to Figure 7-9 below for an example. In this example year and Julian Day are not present in the records.

The field delimiter used to separate the data fields must be specified.

To suppress import of a field use any character not listed above e.g.:

```
DATA RECORD:      100,2001,49,12,02,20.9,$XYZ,1234.56
FORMAT STRING:    #ydhms#x
```

In this example the 1st and 7th fields, 100 and \$XYZ, will be ignored.

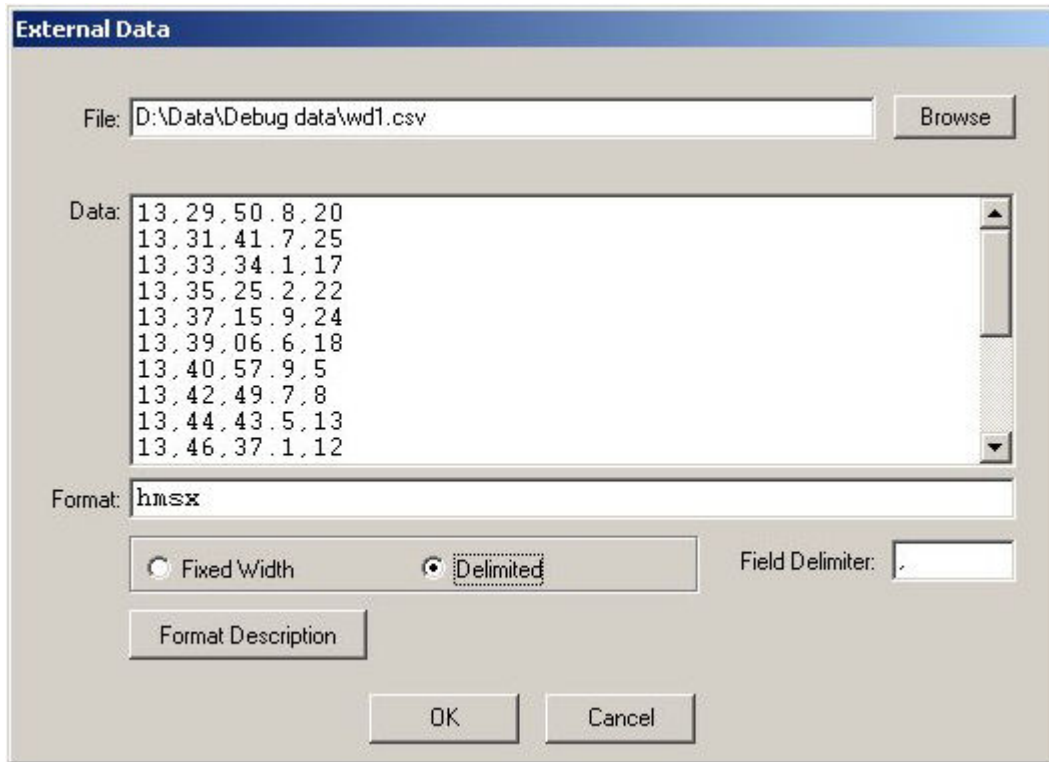


Figure 7-9

Fixed Width:

Each data field is represented by a group of the same format specifiers representing the exact position and width of the field. The field delimiter is not used. Refer to Figure 7-10 below for an example. In this example space characters have been used to indicate the positions in the data records to be ignored.

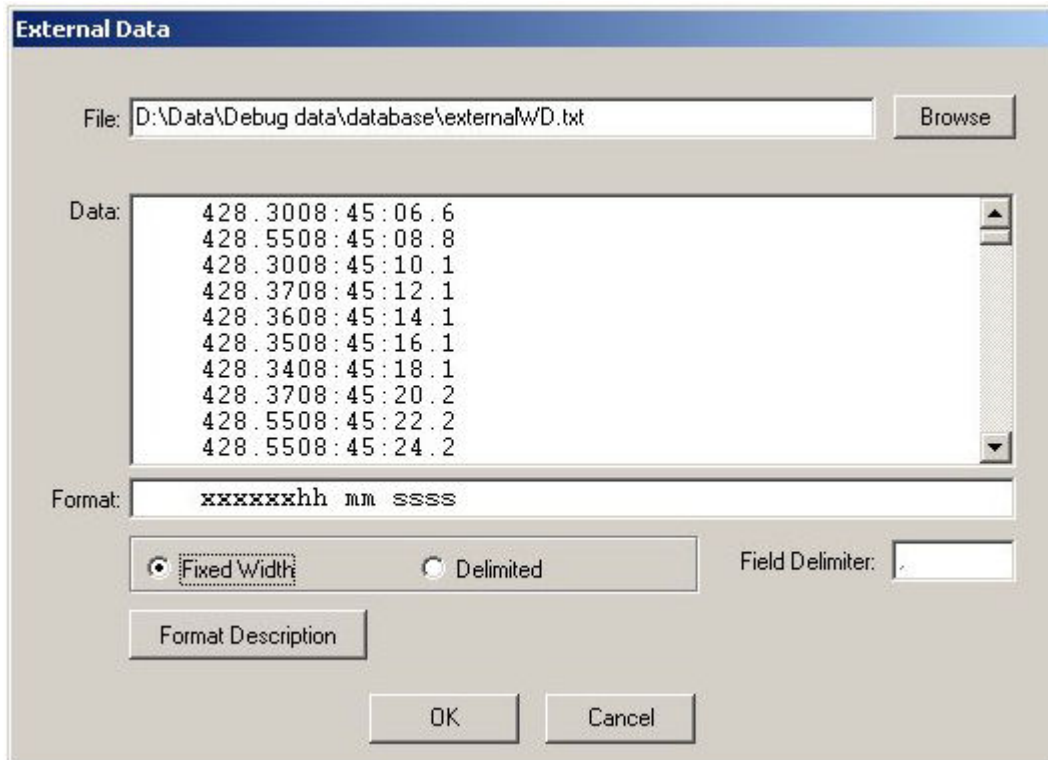


Figure 7-10

7.14.10 Missing Data

If data has been gated, edited or is missing for a period greater than the interpolation threshold, a red line will be drawn along the bottom border over the area of affected data. This line is extended by 5 pixels either side of the affected data so that even single affected data points will be highlighted thus.

7.15 Network Display

Click on the *Network* button to display the network diagram. To display the network diagram for a particular shotpoint, position the cursor at the desired shotpoint within one of the plots, click the right mouse button and select *Network* from the popup menu.

Refer to section 6. Network Diagram for a description of the common functions available. Functions unique to the Precondition module are described as follows.

7.15.1 Toolbar



Click or hold down the arrow keys to scroll through the shots, the observations displayed are updated accordingly.



Toggle on/off display of good observations.



Toggle on/off display of bad observations.



Toggle on/off display of interpolated observations.



Link observation: when this button is down, click on an observation in the network diagram to display its time series plot. Repeated clicks will scroll through co-located observations.

7.15.2 Display

When the *Obs* buttons are toggled on, the appropriate colour for the observations are overlaid on top of the other colours. E.g. to display bad observations for the given shotpoint toggle off and back on so that they are not obscured by other observations between the same nodes which may be good or interpolated.

Rejected observations are not displayed.

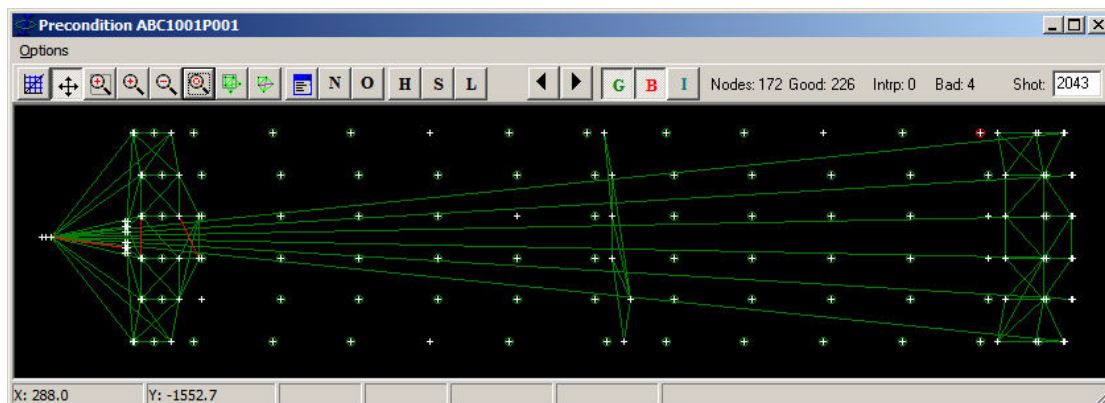


Figure 7-11

The default observation colours are:

Good: green

Bad: red

Interpolated: cyan

The information on the toolbar displays the number of nodes, good observations, bad observations and interpolated observations for which nodes are currently visible in the diagram. This will be therefore changed by zooming in.

The shotpoint for which the display is shown can be changed by typing in a new shotpoint number and pressing the *Enter* key.

When the mouse is clicked on a plot in the main Precondition window the observation is highlighted on the network diagram.



7.16 Summary Report

Each time the Precondition module is exited, or Auto-Precondition is executed, a Precondition Summary Report is generated. The latest report can be viewed by selecting *View | Reports | Precondition Summary* from the main SeisPos menu.

The precondition summary report gives the following information for each observation:

Observation number

Observation name

Number of observations: the total number of data points regardless of status flag.

Number of bad observations: the number of data points flagged as GATED or EDITED.

Maximum bad block: the size, in data points, of the largest contiguous block of data points flagged as GATED or EDITED.

Mean: the mean of all good or interpolated data points.

Nominal: this has no significance for depth data or DGPS data.

Difference: the mean minus the nominal

Maximum delta: the maximum difference between any two consecutive good or interpolated data points.