User's Manual for BASELINE

Input and Output files

The program BASELINE is a predominately user interactive program. However, the program does require two files to run. The first file is the acceleration time history for baseline correction. This time history can be in a number of different file formats as specified in the User's Manual for the program. The second file is the input parameter file. The description of the input parameter file is provided in the User's Manual for the program.

The BASELINE program will generate three output files. The names of two of the three output files are specified in the input parameter file. The first output file contains the baseline corrected acceleration time history. The second file contains the baseline corrected acceleration, velocity, and displacement time histories along with the uncorrected displacement time history and the baseline correction function. The third output file which is generated by the program is a parameter log file which lists all of the parameters for each pass at the baseline correction. This file is given a filename which is identical to the filename of the input acceleration time history with the three letter extension replaced with the letters, 'par.' As an example, if the input acceleration time history filename was 'test.acc' the corresponding output parameter filename would be 'test.par.'

A fourth output file can be generated by the BASELINE program if the user selects this option. The fourth file is an encapsulated postscript file of the baseline corrected acceleration, velocity, and displacement time histories. If requested, the user will be prompted by the program for the output file name as well as a title string for the plot. The maximum and minimum axis limits are determined within the program.

Program theory

The program BASELINE will perform a least squares inversion between the input displacement time history and a user specified polynomial of degree n, where is less than or equal to 10. The user can also specify a set number of points to skip and or add. The combined total number of points in the time history and the number of points to add must be less than the maximum number of points that the program is compiled for (see Section 3). The starting point of the input time history for the baseline correction is also specified by the user. The program will allow for multiple iterations to improve the baseline correction of the original time history.

The program will initially read in the user specified parameters and the initial uncorrected acceleration time history. The uncorrected displacement time history will be computed by integrating in the time domain. Next a standard least squares fit will be computed between the uncorrected displacement time history and the polynomial of degree n. The minimum least squares solution (red line) will be graphically presented on

the screen along with the uncorrected displacement time history (green line). At this point the user can accept the baseline correction or continue with additional iterations.

Once the final baseline correction function is accepted by the user, the baseline function is differentiated twice to obtain an acceleration baseline function. This acceleration baseline function is then subtracted from the original uncorrected acceleration time history to produce the baseline corrected acceleration time history (green line). This baseline corrected acceleration time history is then integrated twice in the time domain to obtain the baseline corrected velocity and displacement time histories. The baseline corrected displacement time history (green line) is plotted on the screen along with a zero line (grey line) for a final check and acceptance by the user.

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The program BASELINE requires one input file to run. The input acceleration time history must have the following format:

Line1:	Title Line
Line 2:	Npts, Dt
Line 3:	Acc Time History in Free Format

The output baseline corrected time history will have the same format. The input file needs three filenames which correspond to the following files:

Line 1:	Input filename for acceleration time history.
Line 2:	Output filename for baseline corrected acceleration, velocity, and displacement time histories.
Line 3:	Output filename for baseline corrected acceleration time history.

The user will be asked to input a suite of input parameters when the program is started. The following input parameters and their descriptions are listed below.

nskip	=	Number of points to skip in the initial time history. These skipped points are not fit in the process and the output baseline corrected file will not contain these points. For most cases nskip=0.
nAdd	=	nAdd is the number of points to add on the to end of the input time history to improve the baseline function fit. These extra points will not be included in the final output time history. nAdd is usually taken as 10% of the total number of points in the input time history. These additional point can improve the baseline fit for the later portion of the time history.

nParam	=	Order of polynomial for baseline correction.
te	=	Percent taper to apply to the end of the time history (usually taken as 5%). This value is entered as a percentage (i.e., 5).
starttime	=	Start time in seconds for the least squares baseline fit to be applied to the input record. If starttime is greater than 0.0 the baseline function will be equal to zero for all time less than starttime.
tstop1	=	Start time in seconds for skipping over in the baseline fit procedure. If tstop1 is greater than 0.0 then tstop2 must also be greater than 0.0 with tstop2 greater than tstop1. Using the tstop1 and tstop2 values, a baseline correction function will be estimated for the windowed input acceleration time history that does not include the data points between tstop1 and tstop2. The output baseline corrected time history, however, will contained the entire time window of the input acceleration time history.
tstop2	=	End time in seconds for skipping over in the baseline fit procedure.
file1	=	Filename of input parameters (see above).

After the initial parameters values are entered by the user, the uncorrected displacement time history (green) and corresponding baseline correction function (red) will be plotted to the screen. The user must hit the enter key twice to obtain the next set of options from the program. Four options are presented to the user:

0 = Next iteration

This option allows for another pass of the baseline correction. The only parameter that changes for this option is the nParam value. The user will be prompted for the next iteration value of nParam and the corresponding displacement (green) and baseline function (red) will be plotted. All other parameter values are held fixed at the initial values.

1 = Save this output

This option will perform the baseline correction based on the current parameter values. The baseline corrected displacement history (green) will be plotted along with a zero line (gray) for reference. This option must be selected to advance to the next section of the program.

2 = Rerun Original record

This option will begin the baseline correction procedure from the initial input acceleration time history record.

When this option is selected, all of the interactive input parameters values must be re-entered by the user.

3 = Disregard last iteration

This option will disregard the last iteration. When this option is selected the previous displacement time history (green) and baseline function (red) will be plotted to the screen.

Once the user has an acceptable baseline corrected time history (i.e., option 1 above) and the baseline corrected displacement time history is plotted to the screen, the user is presented with two options:

0 = Start over

This option will initialize the entire baseline correction procedure starting from the original input time history.

1 = Save solution

This option will save the last baseline correction iteration and write the two output files as specified in the input parameter file. The program will crash if the output files specified in the input parameter file are present in the working directory. This feature is used to prevent the over-writing of previously created output files.

The final option of the program BASELINE is the request for the generation of an encapsulated postscript file of the baseline corrected acceleration, velocity, and displacement time histories. If the user selects the yes option (i.e., “1”) the program will prompt the user for a filename for the encapsulated postscript file. Next a title string for the plot will be asked for by the program. After writing out the encapsulated postscript file, the program will finish. This encapsulated postscript file can be imported into a word processing or graphics program or be downloaded directly to a postscript printer. The axis limits are determined by the program based on the maximum and minimum values of the corresponding time histories. If an encapsulated postscript file is not requested (i.e., “0”) the program will end.

The output file “param.out” lists the different iterations of baseline correction program. All of the input parameters values are listed including the values when a iteration is disregarded. The program will open this file as a new file and hence, the program will not run the file is already present in the working directory.