Raw data processing software.

This software will only be executable on a PC with the LabVIEW run time engine installed. It will run on the LiDAR PC.
The appropriate run time engine can be downloaded from this location:
http://joule.ni.com/nidu/cds/view/p/id/1383/lang/en

Summary of operation.
This software will read RAW data files, and will output them in processed data format. This software allows some of the data parameters, which made up the original processed data files to be changed, allowing for re-processing of the original data.

Parameters that can be reprocessed:

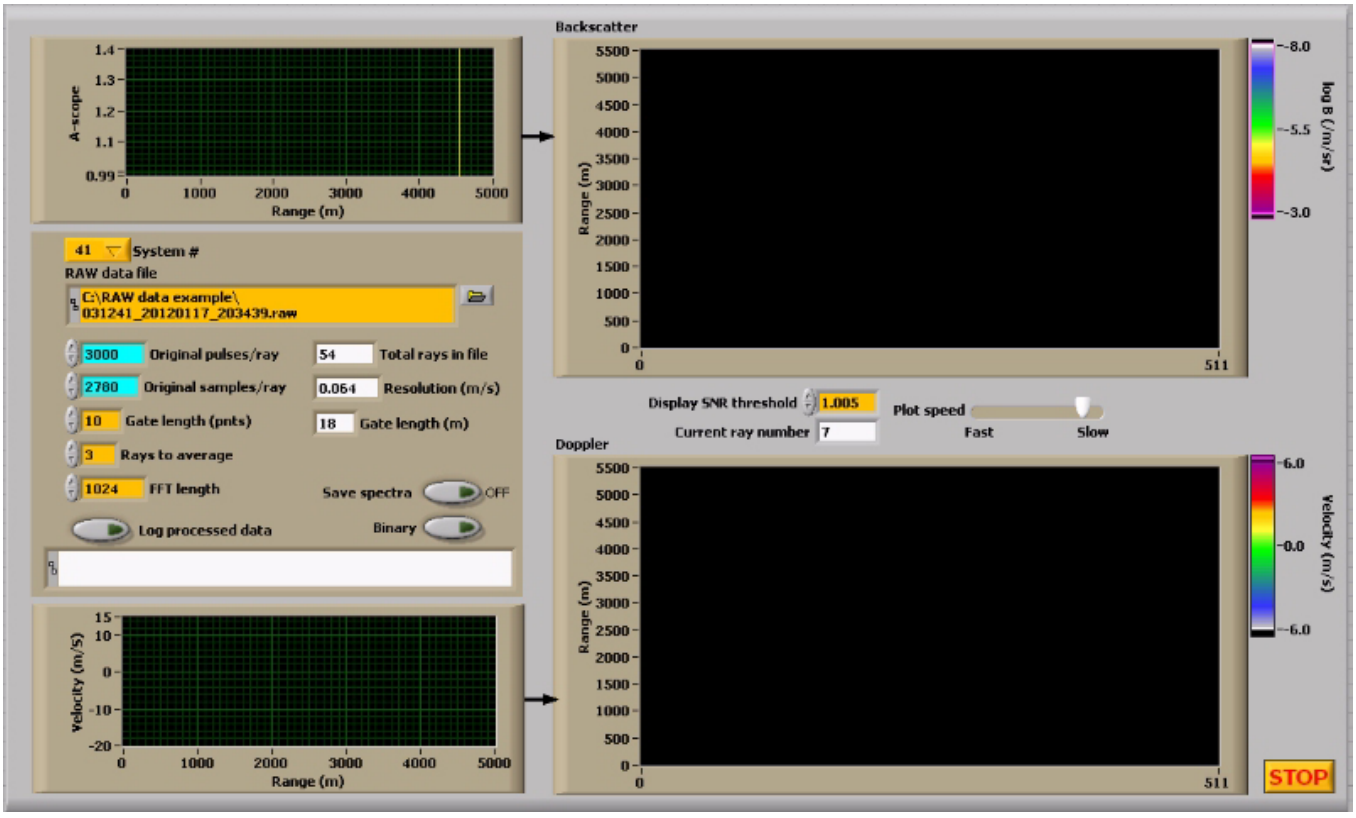
- Gate length
- FFT length
- Number of rays to average*

* The original number of pulses per ray cannot be reduced. For example, if 15000 pulses were averaged when the original data were collected, then this is the minimum amount of averaging that can be chosen by selecting 1 in the 'Rays to average' parameter. Choosing 2 will mean that 30000 rays will be averaged during re-processing.

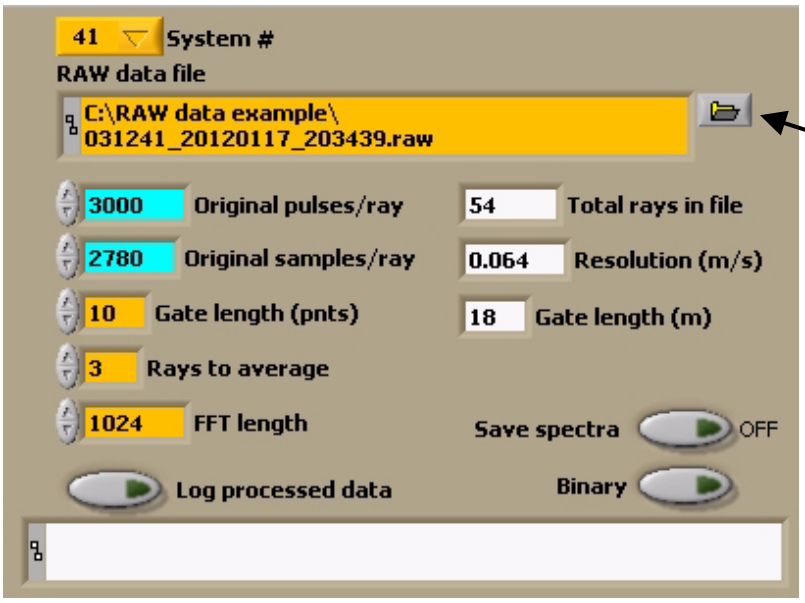
On startup, the software will require certain settings to be entered:

- RAW data input file
- System serial number
- Original pulses per ray
- Original samples per ray
- Gate length (in points)
- Rays to average
- FFT length
- Option to log the processed data

The blue input fields need to match the original data collection settings. The values can be found on the corresponding processed data file header. The other fields having a yellow background are selectable, and can be changed for each run of this software.



For this example, the input fields have been populated with appropriate values. The display fields have a white background, and are updated when the software is running.



Press the browse button to select the RAW data file to be re-processed.

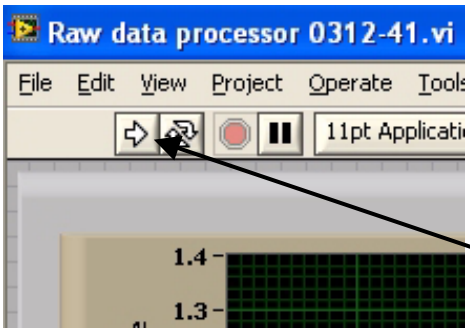
The header section from the original processed data file gives the native 'Pulses/ray' – this is what a '1' entered into 'Rays to average' will correspond to in this software.

The 'Original samples per ray' number can be calculated by multiplying the 'Number of gates' by 'Gate length (pts)'. In the example, 139 x 20 = **2780**, which is the number entered in the re-processing software.

If the processed data is to be saved, then the '**Log processed data**' button can be pressed to show a green light. It is in the off position as shown above.

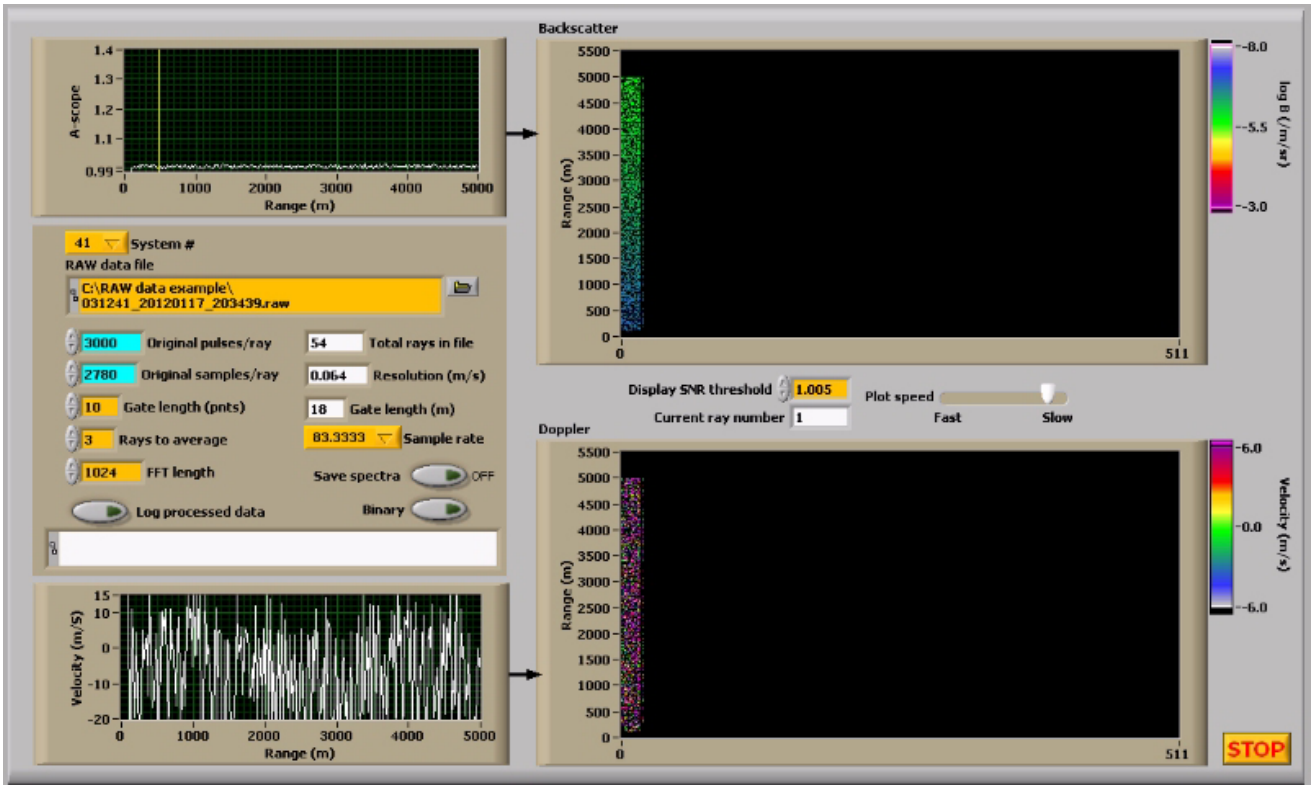
The header as taken from the corresponding original processed data file.

```
Filename:   C:\Lidar\Data\CSM\2012\201201\20120117\41_20120117_203439.csm
System ID:  41
Number of gates:  139
Range gate length (m):  36.0
Gate length (pts):      20
Pulses/ray: 3000
No. of rays in file:    0
Scan type:  ScanFile
Focus range:      0
Start time: 20120117 20:34:39.98
Resolution (m/s): 0.0637
Altitude of measurement (center of gate) = (range gate + 0.5) * Gate length
Data line 1: Decimal time (hours)  Azimuth (degrees)  Elevation (degrees) Pitch
(degrees) Roll (Degrees)
f9.6,1x,f6.2,1x,f6.2,f6.2,f6.2
Data line 2: Range Gate  Doppler (m/s)  Intensity (SNR + 1)  Beta (m-1 sr-1)
i3,1x,f6.4,1x,f8.6,1x,e12.6 - repeat for no. gates
****
```



Press the right facing arrow to start the processing

After the run button is pressed, the data file will be accessed and re-processed using the input parameters. The plotting update rate can be adjusted by moving the 'Plot speed' slider. The display threshold can also be changed – it will not affect the logged data.



The processed data filename will be displayed if the logging button is pressed. The software will begin processing as soon as it is started, so ensure that the Log button is pressed prior to running if the complete data file is to be logged.

The re-processed data file name will be made up from the original raw data file name, and will be appended with 'reprocessed' along with the date and time that it was re-processed. It will be saved by default to C:\LiDAR_Reprocessed_Data – the directory will be created if it doesn't exist.

The data file will have the same format as the processed data as saved using the regular LiDAR software. The start time in the header will reflect the re-processing date/time, as will the decimal time for each ray. No Az / El scanner information will be available either as scanner data is not saved to RAW data files. Refer to the original processed data file for azimuth and elevation positions.

An example header from a re-processed data file.

```
Filename:     C:\LiDAR_Reprocessed_Data\031241_20120117_203439_reprocessed_170912_132857.hpl
System ID:    41
Number of gates:     278
Range gate length (m):      18.0
Gate length (pts):  10
Pulses/ray:   9000
No. of rays in file:        54
Scan type:    Stare
Focus range:  0
Start time:   20120917 13:28:57.93
Resolution (m/s):    0.0637
Altitude of measurement (center of gate) = (range gate + 0.5) * Gate length
Data line 1: Decimal time (hours)  Azimuth (degrees)  Elevation (degrees)
f9.6,1x,f6.2,1x,f6.2
Data line 2: Range Gate  Doppler (m/s)  Intensity (SNR + 1)  Beta (m-1 sr-1)
i3,1x,f6.4,1x,f8.6,1x,e12.6 - repeat for no. gates
****
13.482758    0.00    0.00
  0 30.1762 0.105186 -1.582013E-5
```

Spectra output.

If the ‘Save spectra’ button is pressed, then each ray’s spectra data will be saved in either ASCII or binary format to a directory C:\LiDAR_Spectra_Data. The directory will be created if it does not exist.

Note: The data format can’t be changed once the software is running, and the Save spectra button has been pressed – it will be disabled and greyed out. It can be changed once the software is in a stopped state, even if it is greyed out still.

A sub directory will be created using the time that the software was run in the format ‘YYMMDD_HHMMSS’ and then each ray’s spectra will be saved within that using the following nomenclature: Ray_0 then either .txt or .bin., Ray_1 etc. etc.

Each ray’s file consists of [Number of gates x FFT length] of I32 type. Each number and each gate in a binary file follows on from the last with no space. The ASCII data has a [CR] after every number, which results in a column of numbers.

Software updates:

Build date	Type	Details
07/12/12	Update	New systems added to the list.
14/12/12	Bug fix.	Spectra output files varied in size depending on how fast the software ran. Files are now identical in size.