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408UL Data Analysis

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Summary

There are ten 408UL Telemetry Data Acquisition Systems working in three sectors of ONGC for acquiring high-resolution seismic data. These systems supplied by Sercel, France record data on NAS (Network Attached Storage) in SEGD-8058 32-bit IEEE format. SQC-Pro displays the Data on LCD Monitor with selected Processing parameters for real-time QC. Due to limited available time for Acquisition a detailed QC Analysis cannot be under-taken in the Instrument Cabin. FPU (Field Processing Unit) facilitates Processing of Data after it is read using a SCSI Drive. Hence, it is mandatory to write Data on Cartridge before it can be processed. Air-conditioned dust free environment with high power UPS should be provided for the FPU and SCSI Drive. The services of well trained/experienced Geophysicist needed for effective use of FPU. If detailed Analysis and basic QC of Data can be done for the SEGD Disk Files using the most commonly available Windows PC, the field crew would certainly benefit from it. Keeping this in view a set of Software Utilities have been developed for which no specialized training or expertise required.

Introduction

The 408UL systems are equipped with SQC-Pro for real-time analysis of acquired data. Real-time QC analysis is required for the Observer to change Acquisition parameters like charge, depth etc. Zoomed and expanded plots are required to check for reverse or sluggish channels for immediate rectification in the field. SQC-Pro has its limitations in reporting of noisy traces and Spectrum generation. For the old data stored in NAS, only paper plots can be generated on the Thermal Plotter and no on-screen plots possible. The data has to be transcribed on Cartridge and read into FPU for generating plots. Keeping these limitations in view a set of Utilities have been developed in Visual Basic which work on Windows-Xp based PC. A Laptop or a PC can be used to import the NAS data using **FTP** Program. The Utilities mentioned in the following discussion can serve to enhance the capabilities of the Observer and the field crew. An effort was made to interface the results of the Analysis with the existing FPU to reduce the manual Trace Editing which accounts for major time of the Processing. As These Utilities were developed in-house, no license is required for using on any number of Workstations. Simultaneous Analysis of SEGD Data on multiple Workstations can be done.

Theory

The most commonly used network cable in a Local Area Network (LAN) is Unshielded Twisted Pair (UTP). The two most common configurations used for connecting computers are *straight thru* and *crossover*.

The straight-thru network cable can be used for connecting the PC and NAS directly or through the Hub/Switch. The crossover cable can be used for connecting the PC to PC directly.

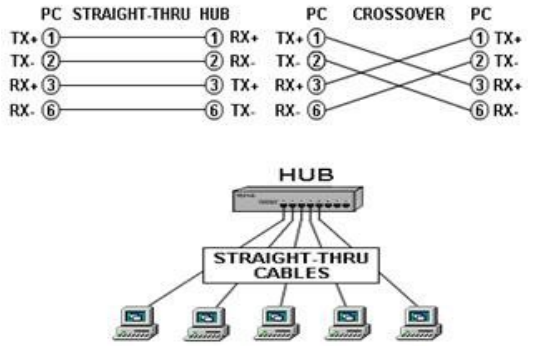

Figure 1: Connecting Windows Workstations to the Hub Inside the 408UL Recording Cabin

Data Transfer :

File Transfer Protocol utility is run in the 'Command Prompt' window to create a TCP/IP link with NAS. Using this either a single file or multiple files can be transferred to the Windows Xp based PC. The data can be transferred even while the Acquisition System is continuously monitoring the Line in Seismonitor mode or Recording Data on NAS. The data can be transferred to the PC using Windows Xp Operating System immediately after the shot or any time later.

The 'Internet Explorer' application can also be used for easier Data Transfer from NAS to Windows PC. IP Address of the NAS has to be entered in the Address Bar. UserID and Password are to be provided for authentication.

Data Utilities :

After the Data is transferred to a PC, it is possible for some analysis on this data using Utility Programs *408ULDataPlot, 408ULTraceSpectrum and 408ULDataTraces* developed by the Author using Visual Basic. Using these programs, SEGD Files can be read directly and plots can be generated with AGC & Fixed Gains. Analysis such as First Breaks, Ambient, Signal, Dead & Noisy Traces and Spectrum generation can be done. The Utility Programs are self-explanatory and can be used by any Observer for Plotting and Analysis without any expertise or help documentation. The methodology for the Analysis is shown in the figure.

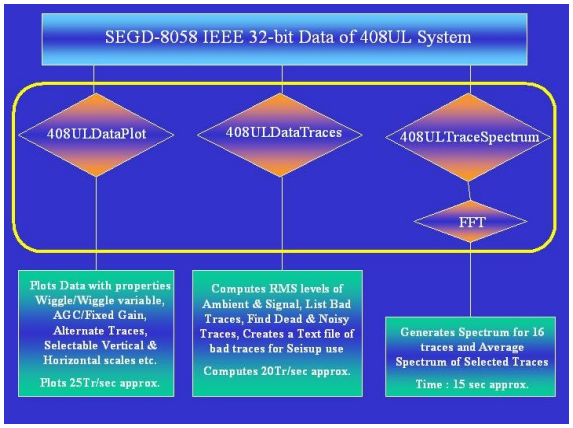

Figure 2: Flowchart showing the input and output for the Utilities.

408ULDataPlot :

The program generates plot with AGC/Fixed Gains in wiggle/wiggle-variable area with both vertical and horizontal scale selections. Samples are taken at 4ms to generate quicker plots. Now, with the availability of PCs with latest AMD/Intel Processors, clock speeds exceeding 3 GHz and RAM more than 512MB, it has been observed that the program plots 240 traces in less than 8 seconds. One seismic record normally contains maximum of 1800 traces and all can be plotted in about a minute. Screen captures of the plotted data can be saved in JPEG files, which can be printed using Laser/Inkjet Printer.

Some screen captures are shown for better idea. First Breaks can be clearly observed by selecting proper horizontal and vertical scales. Alternate traces can be plotted for increasing the plot range. The program gives all required important information reading the header of the record. *AGC Plots of FF #848 recorded on NAS by GP-11 (FS 2005-06) are shown in Figs. 3 & 4.*

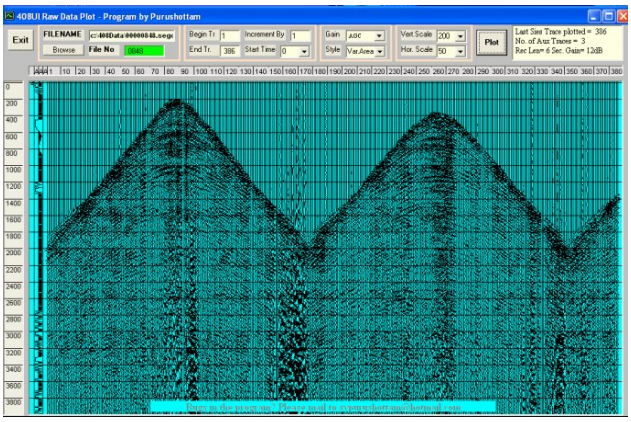

Figure 3: Variable/Wiggle AGC Plot with Horizontal Compression

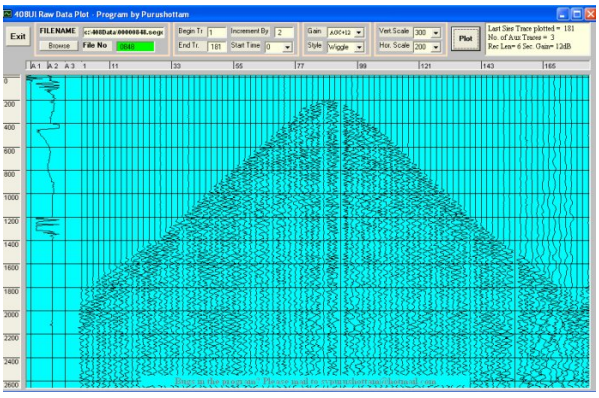

Figure 4: Wiggle AGC Plot with Horizontal Expansion

408ULTraceSpectrum :

408ULTraceSpectrum also displays Data for the selected time window, computes FFT for 1024 sample values of maximum 48 traces and generates Trace Spectra. Presence of noisy traces in the selected window causes the summary to be displayed in red colour. If all the selected traces have no errors then the summary of traces is displayed in blue colour. Individual Trace Spectrum

and as well as Average Spectrum of all the selected traces can be displayed. Screen captures of the Spectra can be used for Presentations.

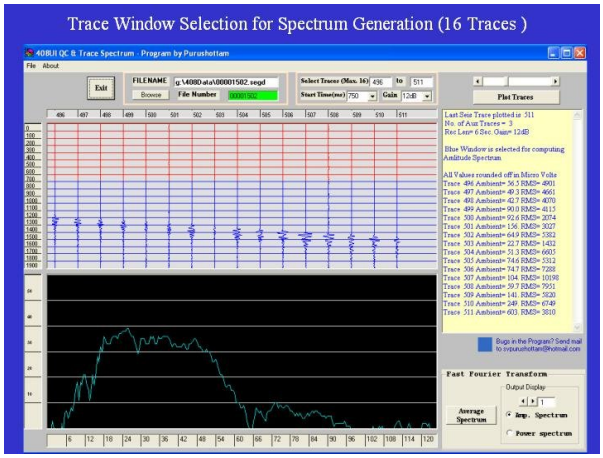

Figure 5: Average Spectrum of the 16 Traces is displayed for the Selected Time Window

The *408ULTraceSpectrum* Program can also be used for Visual Trace Analysis. The selected time window for analysis is shown in blue colour. AGC and Fixed Gain can be applied for required display. Scroll Bars enable quick selection of Traces. Summary is displayed in Blue if all the Selected Traces are good and in Red if any one Trace is bad. Fig. 5 shows the plot of 16 Traces and their Average Spectrum. Selection of Time Window and listing of Trace Summary is shown.

Fig. 6 shows the plot of 48 Traces and their Average Spectrum. Screen Capture of the Average Spectrum is shown in Fig. 7 which can be used in the QC reports.

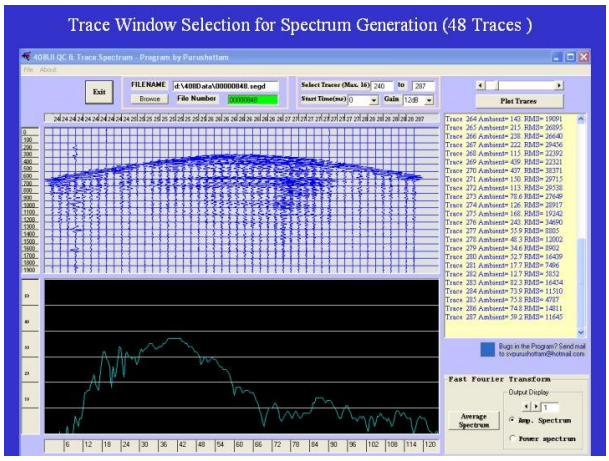

Figure 6: Average Spectrum of the 48 Traces is displayed for the Selected Time Window

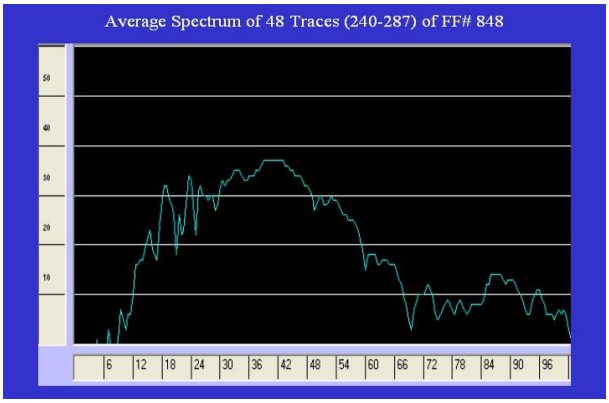

Figure 7: Screen Capture of Average Spectrum

408ULDataTraces :

The Program computes Ambient and Signal levels in the selected window of 1000 samples at 2ms Sampling Interval. Dead and Noisy Traces are reported separately for each SEGD file and are listed out in a file which can be viewed by Notepad Application. Numerical and Graphic Summary provides quick conclusion about the quality of the Acquired Data. The Program can be used for detailed Trace Analysis. The logic behind reporting as "Noisy" for a maximum of 100 files at one go is proprietary and can be modified or improved upon. More PCs can be employed for faster Analysis for different sets of Data.

ASCII files are generated which can be viewed by Notepad Application and help create a database of bad traces. File "BadMatrix.txt" lists all the bad traces with computed RMS level other attributes like Noisy, Dead, Offset & Dead etc. ASCII File "BadMatrix" generates file-wise list of bad traces in a format which can be directly interfaced with SEISUP System during trace-editing. ASCII Files can be generated for using with GEOCLUSTER & FOCUS Systems also, which can be used by RCC for faster Processing of Data.

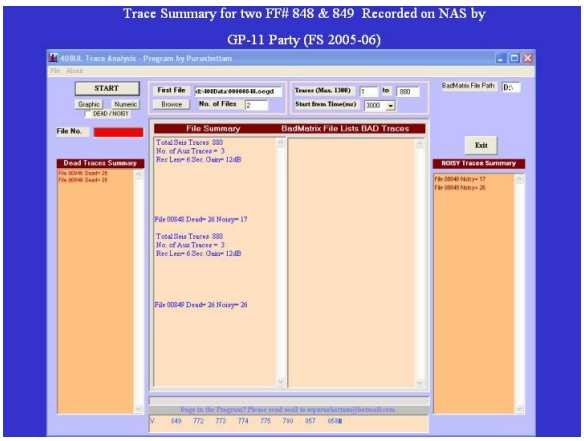

Figure 8: Numerical Trace Summary

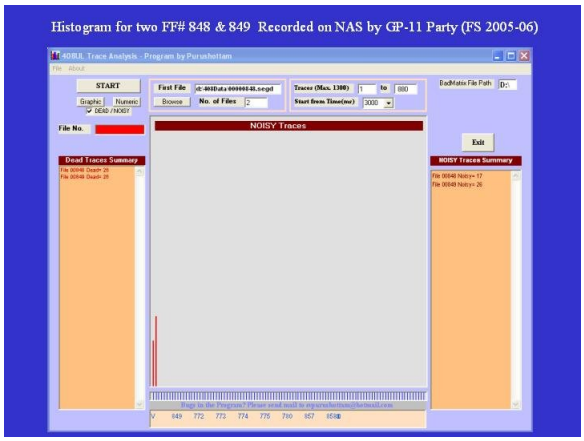

Figure 9: Graphical view of Trace Summary

The ASCII files generated by the Program are shown in Figs. 10 & 11. Figure 10 lists out the Bad Traces with computed RMS level. The Fig. 11 shows two files, one generated by Manual Trace picks on SEISUP and the other generated by the *408ULDataTraces* Program automatically.

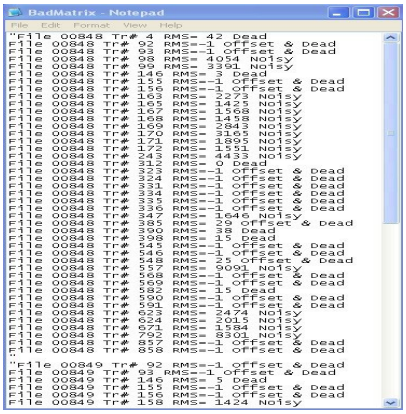

Figure 10: Listing of Bad Traces

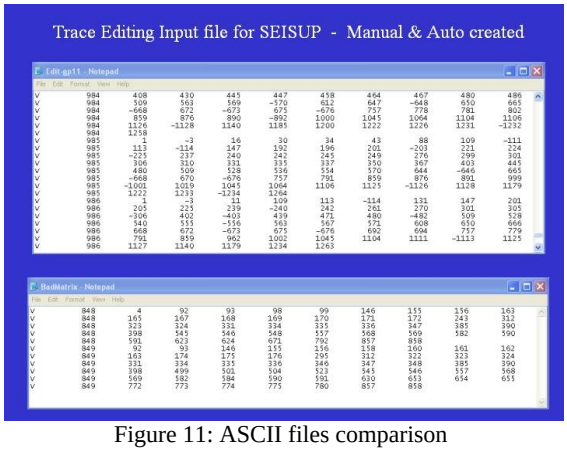

Figure 11: ASCII files comparison

Conclusions

The Utilities for **408UL Data Analysis** can be implemented by 408UL crews and can be used along with **SQC-Pro** inside the Recording Cabin for better analysis of Field Data. All the Utilities can also be used on a Standalone PC in base camp with FTP backed up data of 408UL System for trace analysis and generating reports. The Observer can have greater control on the Data Quality by eliminating the bad or sluggish geophone groups by using the *408ULTraceSpectrum* Program. *408ULDataTraces* Program can be used to create a database of Dead and Noisy Traces for trace editing on FPU and at RCC. *408ULDataPlot* Program can be used to overcome the limitation of generating plots of the previously recorded data. The QC Teams may find these utilities useful when they visit Field. The Programs can be upgraded to add more features.

References

408UL CMXL V 8.1 User's Manual Vol. 2 – Chapter 2 for information on SEGD Format.