

**COMPUTER PROGRAM MANUAL
(SURVEY DATA REDUCTION MANUAL)**

DAT61W

Version 1.10

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1. Introduction

This Windows based program, replacing the DOS version of DAT61 software, operates under Windows 95, 98, NT(4.0), 2000 and XP. While both versions, DOS and Windows, perform essentially the same functions, the Windows version (DAT61W) provides many useful improvements: a simplified user interface; better on-screen information; the ability to support and process an increased amount of data (limited only by the memory capacity of the computer hard drive); more control and faster completion of most routines; and accessibility to any printer or plotter supported by Windows. The DAT61W supports transfer of data collected in field computers Allegro and Pro4000.

1.1 About DAT61W

The DAT61W program is designed to process data collected by a Polycorder operating under the corresponding EM61 program, or data acquired directly in a computer through the RS232 interface. The program provides for the transfer of data files from the Polycorder to a Personal Computer (PC). Therefore, it can be used to display, edit, print and plot data files. Data can be plotted on the computer screen and on any printer supported by Windows. There is an option to create files that can be used as input for the GEOSOFT or SURFER contouring packages, or any other contour software if a three to six column [X, Y, data1, data2, data3, data4] format is suitable.

This Windows based version of DAT61 provides a much easier interface and improved on-screen information; the amount of data is limited only by the capacity of a computer hard drive; it supports any printer and plotter that is supported by Windows; and offers more control and faster completion of most tasks. The latter can be especially appreciated by users employing the Auto mode with fiducial markers during survey; the positioning of markers and aligning of survey line ends, even in the case of large survey layouts, is much faster and easier as compared to the DOS based program.

Additional improvement was also introduced to the data downloading. The program lists the Polycorder data files and their sizes, and the user may simply select files to be downloaded without the need to review the Polycorder directory.

Overall, processing of the EM61 data with the DAT61W software will result in much greater productivity. File formats are compatible with older DOS based versions of the DAT61 program. However, to download data from a Polycorder 600 a new version of Polycorder program EM61 (for Polycorder 600) must be installed in the logger. This new Polycorder program is compatible with both the DOS and Windows versions of the DAT61 software; data files, therefore, can be downloaded to either version of the program.

EM61 readings are arranged in profile lines. Every profile line can consist of an unlimited number of segments. Each profile line for standard EM61 can contain up to four separate traces: Channel T, Channel B, Channel N, and Channel D. For EM61-HH (Hand Held) data, each profile line can contain up to three separate traces: Channel E, Channel L, and Channel A.

One sample data file, DEMO.G61 is included on the program disk. It allows the user to become familiar with running the DAT61W program.

1.2 Contents of DAT61W Distribution Disk

Program DAT61W V1.10 or later is supplied on one CD disk. Disk contains following files and directories:

- SETUP61.EXE - setup program for DAT61W.
- UploadFiles - directory with two files (FORM61 and EM61) for Polycorder 600, these two files are also placed by Setup61 program in subdirectory UploadFiles of the DAT61W program directory.
- DAT61DOS - directory containing DAT61, DOS based program and associated files
- Documentation - directory containing all related manuals available in PDF format
- DAT61Wdisks - directory containing two subdirectories (Disk1 and Disk2) for users that require floppy disks to run Setup61

If EM61 software is supplied with EM61alg or EM61pro program for Allegro or Pro4000 following additional files and directory are included on the CD distribution disk:

- EM61alg.EXE - data acquisition program for Allegro
- EM61pro.EXE - data acquisition program for Pro4000
- Pro4000disks - directory containing contents of three floppy disks with a Pro4000 system files and Juniper System communication program Lynx

1.3 DAT61W Software Installation

DAT61W uses setup program to load files on your computer. The following section describes the installation process.

To install DAT61W:

- Insert the DAT61W CD disk into computer disk drive.
- Exit all Windows applications before installing the program.

From the Windows File Manager, select **Run** from the **File** menu. The Run dialog box opens (Figure 1.1).

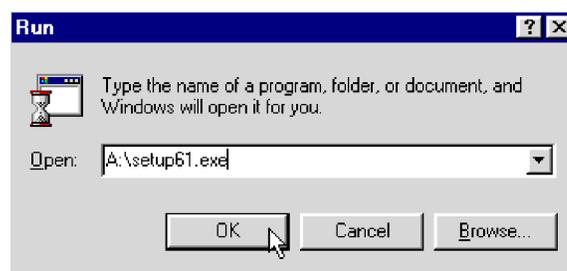


Figure 1.1: Run Dialog window

Browse for the file SETUP61.EXE in the directory of the diskette. Click **OK** to launch the Setup program. Once the Setup determines your computer configuration the Welcome window opens (Figure 1.2).

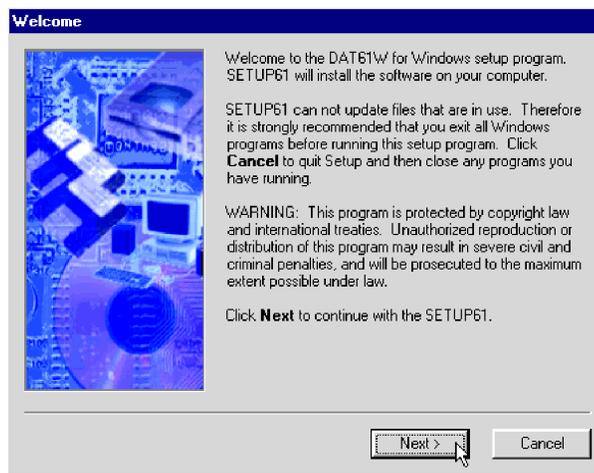


Figure 1.2: Welcome window

Read the text and click the **Next** button. After the **Next** button is pressed the Serial Number window will be displayed (Figure 1.3).

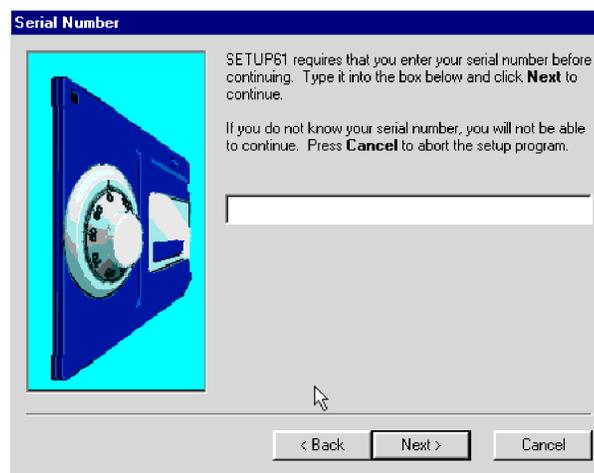


Figure 1.3: Serial Number window

Type the Serial Number into provided box and press the **Next** button. (If you do not know the Serial Number, you will not be able to continue.) The Installation Directory window opens (Figure 1.4).

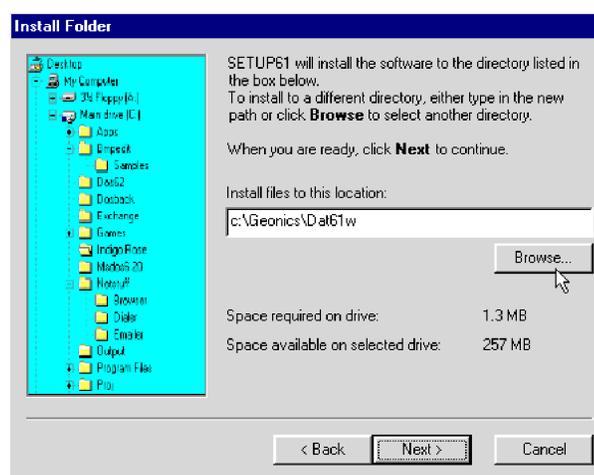


Figure 1.4: Installation Directory window

The default directory is c:\Geonics\DAT61W. Click the **Next** button to install the program to this directory. If you wish to install DAT61W to another directory, click the **Browse** button and the Select Installation Directory window will open (Figure 1.5).

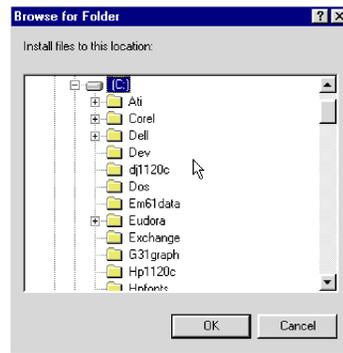


Figure 1.5: Select Installation Directory window

Select a target directory and click **OK**. The Select Installation Directory window closes, and the Installation Directory window opens with the selected directory listed. Click the **Next** button. The Select Short cut Folder window opens (Figure 1.6).



Figure 1.6: Select Shortcut Folder window

The setup program will create a DAT61W menu item in the Program menu accessible by clicking **Start**. If you do not want to use the proposed folder, you can either enter a new name, or select an existing folder from the list. Click **Next** and Ready to Install window will follow.

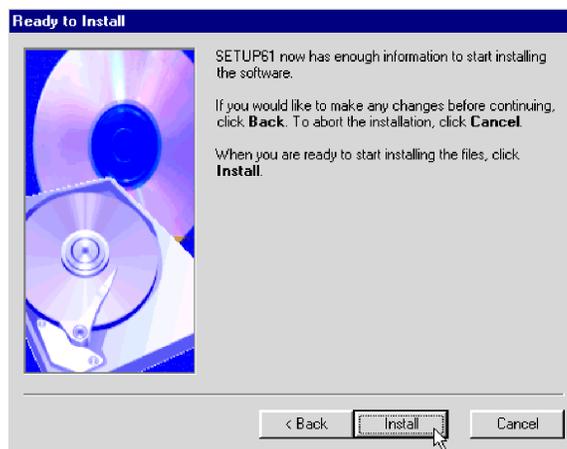


Figure 1.7: Ready to Install window

In case you would like to make any changes before installation, click **Back**. To abort installation click **Cancel**. If you are ready to start installation, click **Install**. The installation progress bar will appear (Figure 1.8).

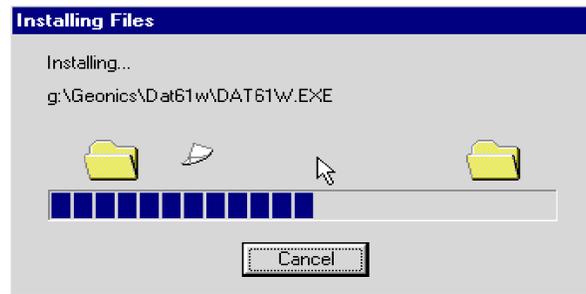


Figure 1.8: Installing Files progress bar

The Installing Files window with a progress bar displays the percentage of the installation completed. When finished, the End of Installation window will appear (Figure 1.9).



Figure 1.9: Finished window

Click **Finish** to end installation. SETUP61 creates a DAT61W program group and places **DAT61W** and **Uninstall** icons into it. The setup program creates also a **DAT61W** menu item in the Program menu accessible by clicking **Start**.

The destination directory that was chosen earlier contains program files, sample files, and the subdirectory UploadFiles that includes files necessary for uploading the Polycorder.

1.4 Program Overview

Start the DAT61W by double clicking the DAT61W icon in the **Start | Programs** menu, in Windows Explorer, or on the desktop if a shortcut was created. At the start, DAT61W occupies the entire screen (Figure 1.10):

The DAT61W defaults to a maximized screen and clicking the minimize button allows access to other applications behind DAT31W. At this point, the user can:

- upload program to the Polycorder,
- download data from the Polycorder,
- merge EM61 and GPS files,

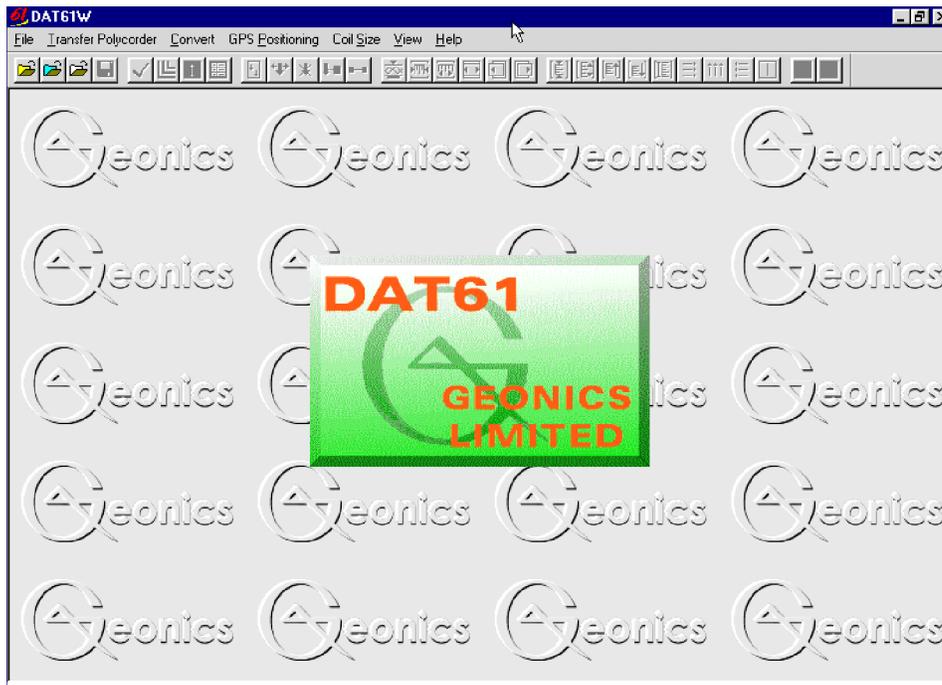


Figure 1.10: DAT61W Initial Screen

- convert raw Polycorder files to DAT61 format (.G61) files,
- load data files: DAT61 profile files (.G61 files). XYZ files, and small (up to 64K) text files,
- select display (tool bar and status bar).

After DAT61 profile file is loaded tool bar becomes active and the screen has following shape (Figure 1.11):

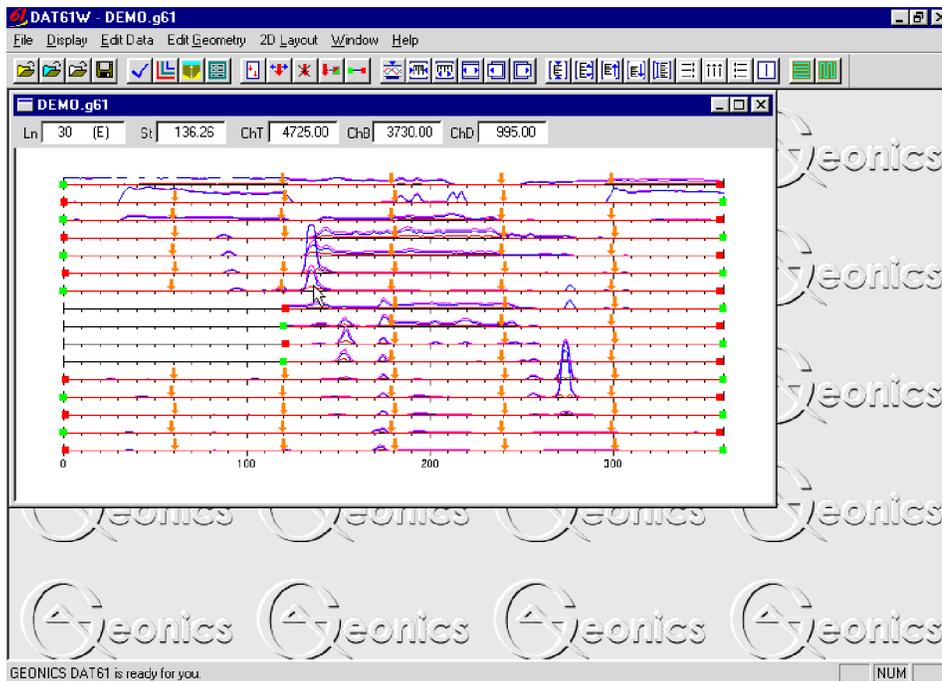


Figure 1.11: DAT61W Screen after profile file is loaded

A stacked profile display can be enlarged to occupy the entire screen by clicking the maximize button. The tool bar (if selected in View menu) is displayed across the top of the screen. The following quick access tools (Figure 1.12) are described below, starting from the left side of the bar:



Figure 1.12: DAT61W Tool Bar

-  **Load EM61 profile file** (data file in DAT61 format with extension name .G61).
-  **Load XYZ file** two dimensional file (DAT61W allows user view layout of survey lines and stations).
-  **Load text file** (this function is similar to Notepad in Windows and allows user to edit small, up to 64K in size, text files).
-  **Save As** allows user to save data under different file names at any time during data processing.
-  **Select Lines** allows user to select survey lines to be displayed. This function also allows you to delete and rename survey lines.
-  **Select Channels** allows user to select EM61 channels to be displayed as profiles and/or as values shown in windows below the tool bar.
-  **Depth** allows user to display the Apparent Depth window.
-  **Set Display Parameters** allows user to set the range of display as well as define axes tics.
-  **Position Markers** allows user to display the Position Markers window.
-  **Adjust Marker** allows the quick adjustment of a marker position.
-  **Remove Marker** allows erasing of a chosen marker.
-  **Adjust survey line between end of the line and a marker** allows user to adjust end of the line without moving neighboring marker.
-  **Adjust Survey Line** allows user to adjust ends of survey lines. The procedure allows moving start of the line (green square) without changing its length and moving end of the line (red square) without repositioning of the start point of the line.
-  **Compressed Amplitude** tool allows user to display data in compressed or linear amplitude scale.
-  **Modify Horizontal Scale** (group of five buttons) allows user to:
 -  compress (squeeze) scale,
 -  expand scale,
 -  return to default range,
 -  shift plot left
 -  shift plot right,

Increments are the same increment of minor tic of horizontal axis.

Modify Vertical Scale (group of five buttons) allows user to:
compress (squeeze) scale,



expand scale,

shift plot up,

shift plot down,

return to default range.

Increments are the same increment of minor tic of vertical (conductivity) axis.



Show Horizontal Grid for Left Axis displays grey grid lines at major tics of the left axis (if only EM61 response is displayed these grid lines apply to both, left and right axes).



Show Vertical Grid displays grey grid lines at major tics of the bottom (stations) axis.



Show Horizontal Grid for Right Axis displays grey grid lines at major tics of the right axis. This tool is available only if Apparent Time Constant profiles are displayed for EM61 Hand Held.



Show Moving Bar displays a vertical bar (line) which can be moved along horizontal axis. This bar may allow to compare alignment of anomalies located at various survey lines.



View XYZ/Create XYZ File allows user to display two dimensional layout of the survey oriented in **W-E** direction and to display Create XYZ File menu.



View XYZ/Create XYZ File allows user to display two dimensional layout of the survey oriented in **S-N** direction and to display Create XYZ File menu.

A detailed description of the functionality of each tool is provided in relevant sections of the manual.

2. Quick Start

This chapter is intended for the user who wishes to quickly start downloading and editing an EM61 survey. Detailed information about all functions and capabilities of the program is given in later sections. It is assumed that the Polycorder was loaded with files necessary to collect field data. If not, please refer to the section 3.2 (Upload Program Files to Polycorder).

2.1 Downloading Data

Select **Data Transfer** in the program menu and then select the **Download Polycorder Files** or **Download Allegro or Pro4000 Files** item (Figure 2.1).

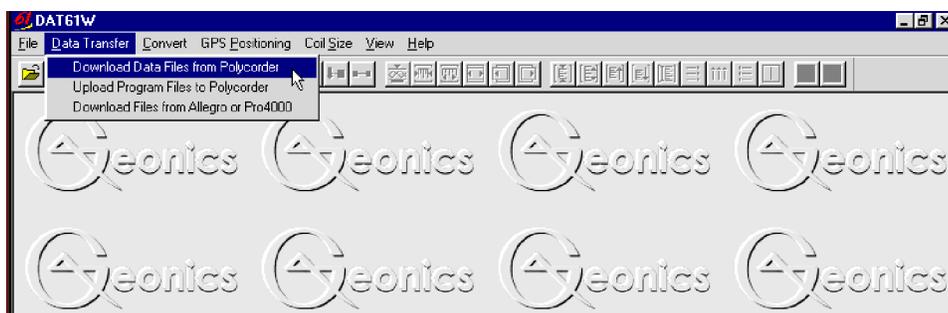


Figure 2.1: DAT61W Data Transfer menu

After clicking the **Download Polycorder Files** item shown in Figure 2.1, the Download data from Polycorde window will appear (Figure 2.2). Similar window will appear if **Download Allegro Files** item was selected (please refer to Chapter 3).

The basic procedure for downloading files is as follows:

- connect the Polycorder and computer via the dumping cable.
- check the configuration of the computer serial port by clicking port number. Other default parameters should be OK in most cases.
- Run Polycorder program **DUMP61W** for Polycorder. Do not mistake this file with the DUMP61 file, which is included in the logger for DOS based programs only. (To run program in the Polycorder: enter MODE 0, select program name and press ENTER.)
- click **List Logger Files** to get data file names contained in the logger.
- select files to be downloaded from the logger.
- click **Download** button. At this point a progress bar should indicate percentage of downloading for each file. Transferred files will be displayed in the center list box.
- after transfer is completed files are automatically converted from raw Polycorder format to DAT61 format, with the extension name G61.

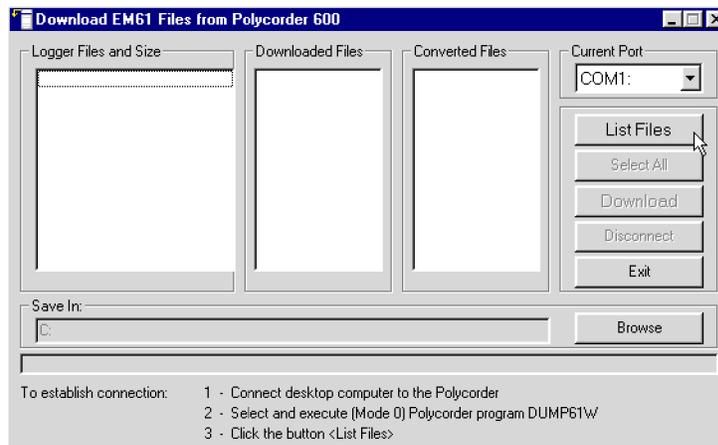


Figure 2.2: Download EM61 Files from Polycorder window

Please refer to the section 3 (Transfer Data) for a detailed description of downloading a data file.

2.2 Specifying EM61 Coil Size

The program will automatically recognize and differentiate data collected with the Standard and Hand Held versions of the instrument; it can not determine, however, the size of the antenna used with the standard unit. Specification of the size of the antenna is necessary to provide correct calculations for the Channel N and D, as well as for Apparent Depth calculations. To specify the size of the coil, select **Coil Size** from the main menu. The Set Coil Size window will be displayed (Figure 2.3).

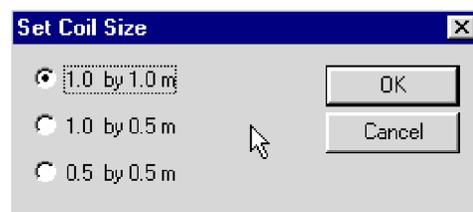


Figure 2.3: Set Coil Size window

Select appropriate radio button and click the **OK** button. The program default setting is 1x 1 m antenna.

The size of the standard unit antenna must be specified prior to data file entry.

2.3 Displaying Data as Profiles

Loading Data Files

To display data select **File|Open Profile** in the menu or click the left mouse button on the  toolbar button (load EM61 Profile File). The Open EM61 File window will be displayed (Figure 2.4).

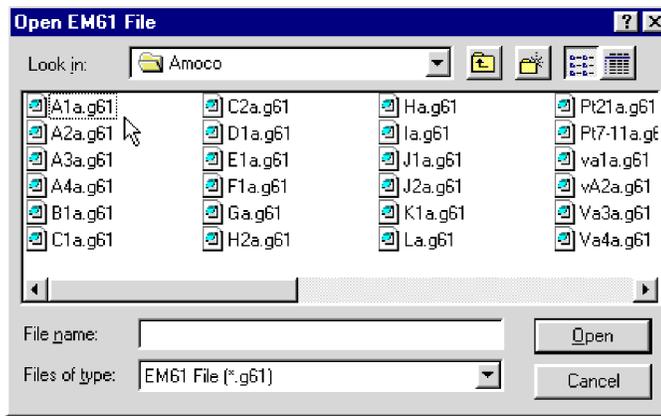


Figure 2.4: Open EM61 File window

Select directory and file name and then click **Open** button (you can also simply double click the left mouse button or press **Alt_O** on the keyboard).

After the file is loaded, data is displayed in a stacked profile format, as shown in Figure 2.5. Survey lines are organized in panels, which contain recorded data. In general, each survey line belongs to a separate panel, although, in the case where two or more survey lines have the same line name they will be placed in the same panel. In order to display such lines in separate panels the line names have to be changed.

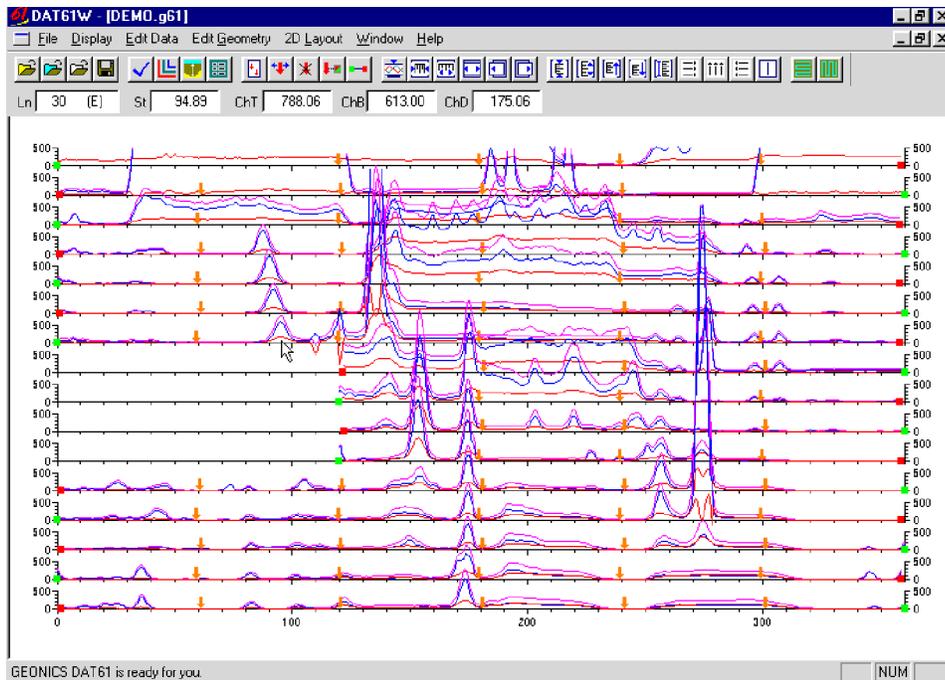


Figure 2.5: DAT61W screen with stacked profiles

The stacked profile window will contain one or more channels as specified in the Select Channels window. This window can be accessed from the main menu by selecting **Display | Select Channels** or by clicking the  (Select Channels) button located on the tool bar. By default channels B and D are displayed. The left vertical axis, relates to the EM61 response and it is labeled in millivolts (mV). The right vertical axis, is the same with the exception when Apparent Time Constant is displayed for the EM61 Hand Held instrument. In this case the right axis relates to Channel A and it is labeled in microseconds (us).

Selecting Survey Lines

When a data file is loaded, all survey lines are displayed. To display a selection of survey lines select **Display | Select Lines** in the menu or click the left mouse button on the  toolbar button (Select Lines). The Select Lines window is shown in Figure 2.6.

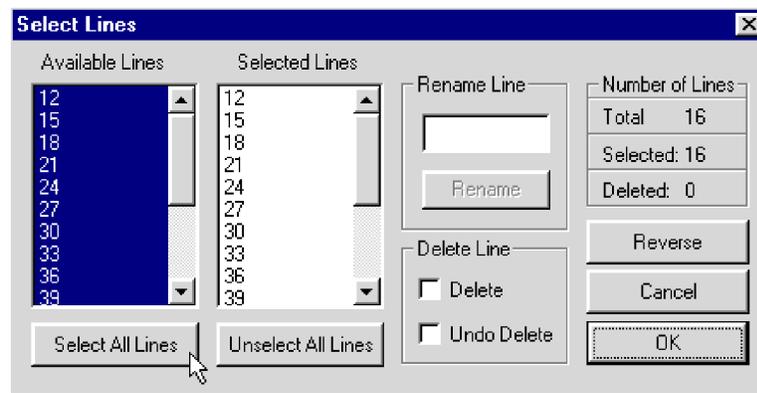


Figure 2.6: Select Lines window

Select and deselect lines to be displayed, by clicking on the line names in list boxes. Buttons **Select All** and **Unselect All** are also available. All highlighted line names will be displayed on the screen after clicking **OK** button.

Deleting and Renaming Survey Lines

The most common initial task in data processing is deleting and renaming survey lines. Both tasks can be accomplished in the Select Lines window (Figure 2.6).

To delete a survey line from the loaded set of data click on the check box next to the Delete Line label. When a check mark is visible, click on the appropriate line name in the line name list box. The letter **D** will be displayed next to the line name. These lines will not be displayed nor written to the output file during **Save** or **Save As** tasks.

Renaming of survey lines can be accomplished in the Select Lines window as well. To rename a line, click on the name in the line names list. The highlighted line name will appear in the edit box located at the Rename Line label. Edit the name in the Edit Box and click the **Rename Line** button. The updated name will now be displayed in the line names list.

Please refer to section 4 (Data Display) for a detailed description of type of formats for data presentation.

Please note that Deleted and Renamed lines will be valid as long as the program is running. In order to save changes permanently use Save As or Save option to create a new data file which can be used later by the program. It is recommended that you use the option Save As since it is worthwhile keeping the original data in an unedited form.

Changing Display Parameters

To adjust the range of displayed parameters select **Display | Set Display Parameters** in the menu or click the left mouse button on the appropriate toolbar button (**Set Display Parameters**). The Set display Parameters window is shown in Figure 2.7.

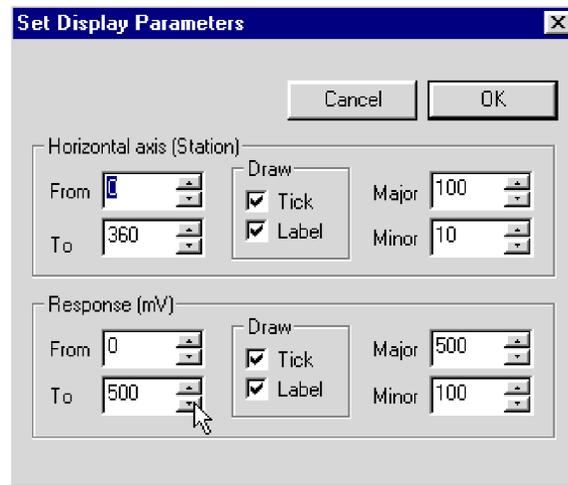


Figure 2.7: Set Display Parameters window

If channel A (Apparent Time) for Hand Held unit is displayed the Set Display Parameters window will have an additional module as shown in Figure 2.8.

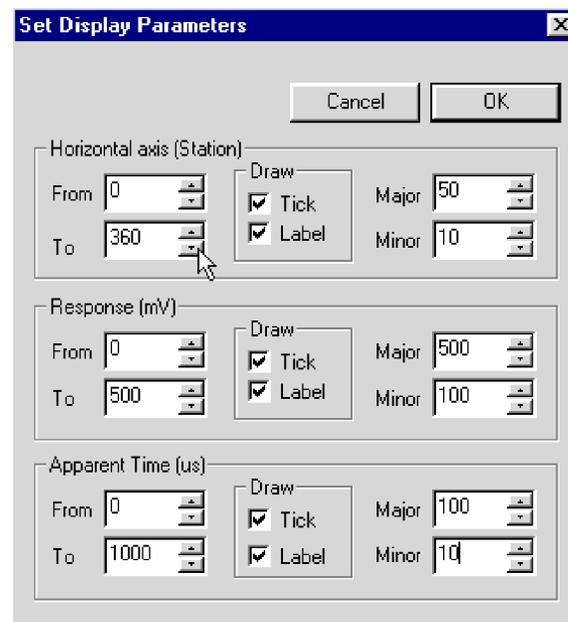


Figure 2.8: Set Display Parameters window

2.4 Editing Survey Geometry

The program allows adjustment of the profiles geometry: changing the placement of start and end stations. It also allows you to reposition points that were marked with the fiducial switch in AUTO and WHEEL modes.

Survey Conducted in Manual Mode

A survey that was carried out in the Manual mode (readings triggered manually at each station) will generally not require any editing of data position. Corrections of common field errors, such as an incorrect start station or line direction, can be made using the **Set Line Limits** or **Shift Survey Lines** option in the Edit Geometry menu shown in Figure 2.9.

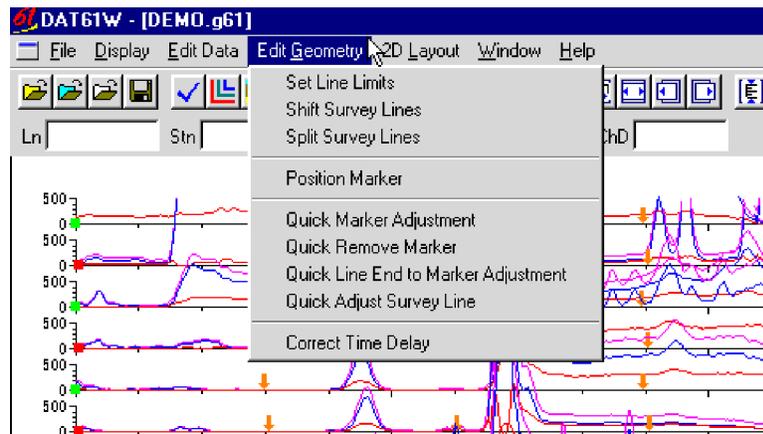


Figure 2.9: Edit Geometry window

Please note that ends of survey lines can also be easily adjusted by the Position Markers tool even if the survey was conducted in the manual mode and fiducial markers were not used. The Start and end stations of each survey line can be edited in the same way as stations tagged by fiducial markers.

Survey Conducted in Auto or Wheel Modes

If data was recorded in Auto or Wheel modes, and fiducial markers were used, the following two step procedure is recommended:

1. Adjust the ends of the survey lines using either the **Adjust Survey Line** or **Set Line Limits** option.
2. Position the ends of the lines and fiducial markers using the **Position Markers** tool.

Step 1

Press the **Adjust Survey Line** button and drag the end points, the start and final stations, to the approximately correct locations. (Positions will be set more precisely in Step 2). This task will involve repositioning of the final station only, provided that the start station was entered in the data logger during data collection to reflect position on the survey grid. (If start stations were not correctly labeled, it is likely that the horizontal axis will need to be re-scaled to accommodate the full length of the survey grid before repositioning the end points.)

When using the **Adjust Survey Line** tool the following rules apply:

- repositioning of the start station shifts the entire line, while the spacing between stations (increment) remains unchanged. The final station is shifted accordingly.
- repositioning of the final station results in shortening or stretching of the line. The start station remains in the same position, and the increment is adjusted accordingly to the final station change.

If a survey's layout is relatively square or rectangular, then adjusting the survey lines can be made easier by using the Set Line Limits window (select **Edit Geometry | Set Line Limits**).

After the end points of all lines have been adjusted to their approximately correct positions, the fiducial markers (assuming that they were regularly spaced in the field) should be roughly aligned across the stacked profiles.

Step 2

Press the **Position Markers** button on the tool bar or select **Edit Geometry | Position Markers**. The Position Markers window will appear on the screen (Figure 2.10). This option can be applied to selected markers or to a group of markers. Since all markers could be relatively close to their true locations (following Step 1), using the Group mode can be a fast method to reposition several markers at once to a selected location.

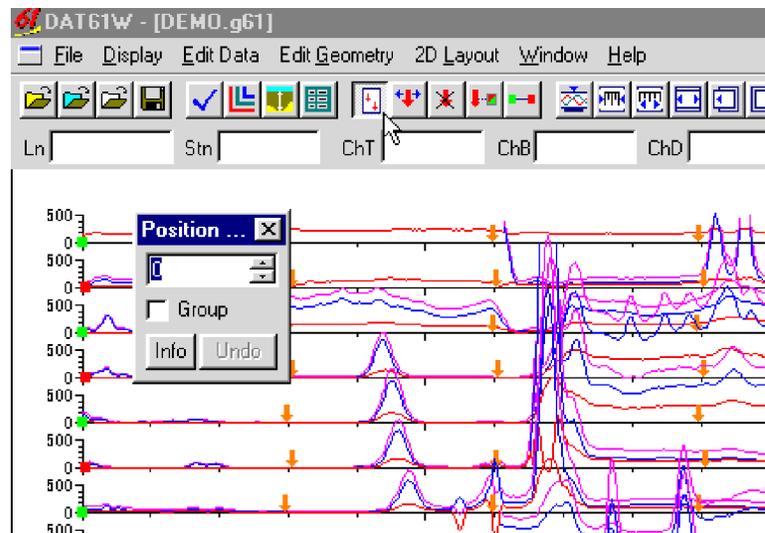


Figure 2.10: Position Markers window

To accomplish group positioning of markers:

- check the Group check box in the Position Marker window.
- use a mouse to drag a rectangle around the group of markers to be repositioned.
- using speed buttons or keyboard, specify station in edit box.
- place cursor inside the rectangle and click the left mouse button.

All selected markers will be moved to the specified station. The same procedure can be applied to the start and final stations of survey lines.

The positioning of markers and end stations is described in detail in Section 5, where the procedure is illustrated by an example.

2.5 Create XYZ File

This option creates a file containing three or more columns: X, Y, Z1, Z2, etc. (where Z1 corresponds to e.g. Channel T or E [mV] depending on the Create XYZ File settings) in ASCII format. This file can be used as an input file for the GEOSOFT or SURFER contour packages (or any other, if a four column format is suitable). All data must be entered in the **Load EM61 File** or **Add** menus prior to running this option.

Data can be converted directly to an XYZ file format by selecting the **2D Layout | Create XYZ File** menu option. Alternatively, the layout of the survey can first be examined by selecting the **2D Layout | View XYZ** menu, or clicking the **View XYZ (W-E)** or **View XYZ (N-S)** button on the tool bar. The view XYZ option shows a two dimensional layout of stations and survey lines oriented either in the W-E or N-S directions. Each station is represented by a dot on the screen. At this point the configuration of the layout can be examined visually and corrected if required.

After the **2D Layout | Create XYZ File** from the profile menu, or the **File | Create XYZ File** from the View XYZ menu options are selected, the Create XYZ File window is displayed (Figure 2.11).

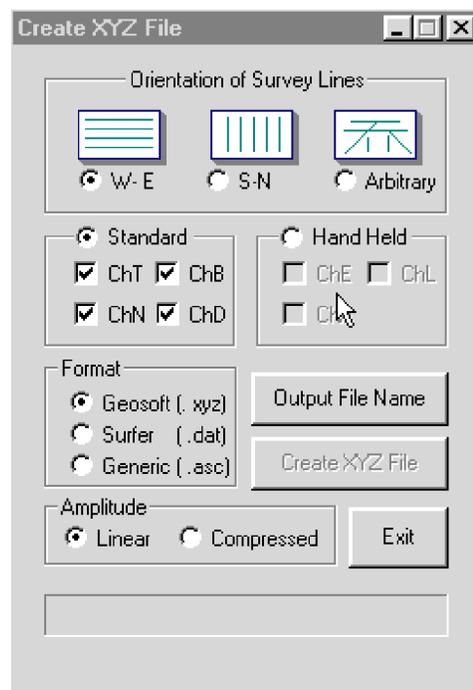


Figure 2.11: Create XYZ File window

Before creating the XYZ file the following parameters must to be specified:

Orientation of Survey Lines

Choose **W-E**, **S-N**, or **Arbitrary** orientation of survey lines. The W-E orientation corresponds to the layout where lines are parallel and oriented in the X direction (assuming that the North and Y coordinate point to the top, and that the East and X coordinate point to the right edge of a page). The S-N orientation corresponds to the perpendicular layout, with survey lines oriented in the Y direction. The Arbitrary option is designed for layouts where survey lines are not parallel.

If the W-E orientation is selected, it is assumed that the line name is the Y (S-N) coordinate and stations are aligned along the X (W-E) axis. If survey lines are parallel and oriented in W-E direction, but line names do not correspond to the Y coordinate, then rename the lines in the Select Lines window. It should be noted that if the line name starts with a number and ends with a letter, e.g. 10N, only the number will be recognized as a Y coordinate.

If the S-N orientation is selected, the line name corresponds to the X (W-E) coordinate and stations are aligned along the Y (S-N) axis. Again, if survey lines are parallel and oriented in S-N direction, but line names do not correspond to the X coordinate, then rename the lines in the Select Lines window. It should be noted that if the line name starts with a number and ends with a letter, e.g. 10E, only the number will be recognized as an X coordinate.

The Arbitrary option is used only in the case where lines are not parallel. When this option is selected the Create XYZ File window expands and the Arbitrary Orientation portion becomes active (Figure 2.12).

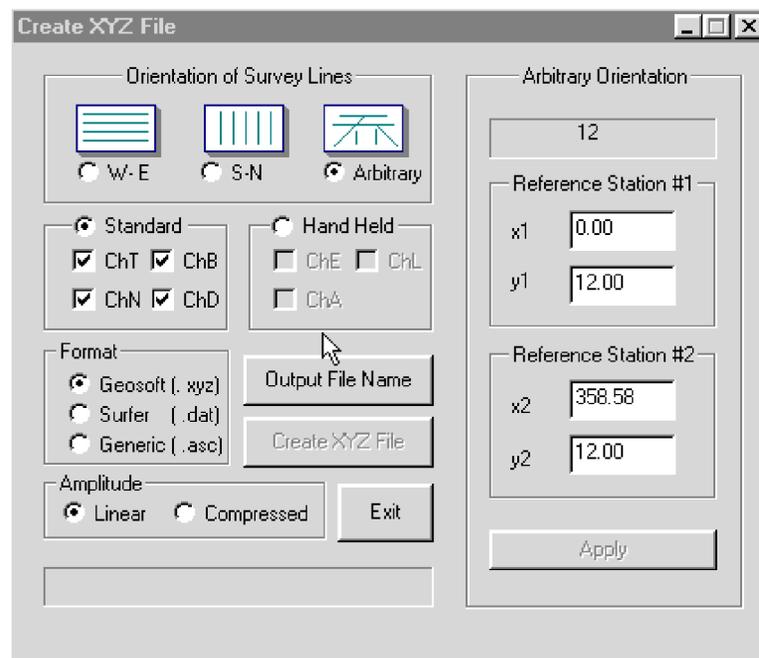


Figure 2.12: Create XYZ File window with the Arbitrary option

After the Output File Name is specified and the **Create XYZ File** button is clicked, two stations must be entered for each survey line. In the edit box of Reference Station #1, enter coordinates of the start station of the displayed survey line. For Reference Station #2, enter the coordinates of any other point on this survey line (assuming the line is a straight line only). A projection of coordinates for every station on the line will be calculated. Any XYZ file created with the arbitrary line orientation can be viewed using the **File | Open | XYZ** menu option, or by clicking the **Open XYZ File** button on the tool bar.

Standard

Only one type of the instrument (EM61 standard or Hand Held) is allowed per file. If Standard EM61 is selected channels T, B, N, and D can be written to the created file. Indicate the channels to be written into the created file. Data is always placed in the created XYZ file in the following order: Channel T, Channel B, Channel N, and Channel D.

Hand Held

Only one type of the instrument (EM61 standard or Hand Held) is allowed per file. If Hand Held EM61 is selected channels E, L, and A can be written to the created file. Indicate the channels to be written into the created file. Data is placed in the created XYZ file in the following order: Channel E, Channel L, and Channel A.

Format

Indicate the appropriate option for the contouring software to be used. The Generic option will create a four column file without any text strings. This file can be used as an input file for many contouring packages (including Geosoft and Surfer).

Compressed Amplitude

Indicate the Amplitude scale to be written into the created file. If this option is selected, readings will be written in compressed (signed square root of the value) scale. This option does not apply to Channel A.

After the **Output File Name** button is clicked, a Save As window is displayed (Figure 2.13). The EM61 file name with an extension corresponding to the selected output file format (xyz, dat, or asc) is given as a default.

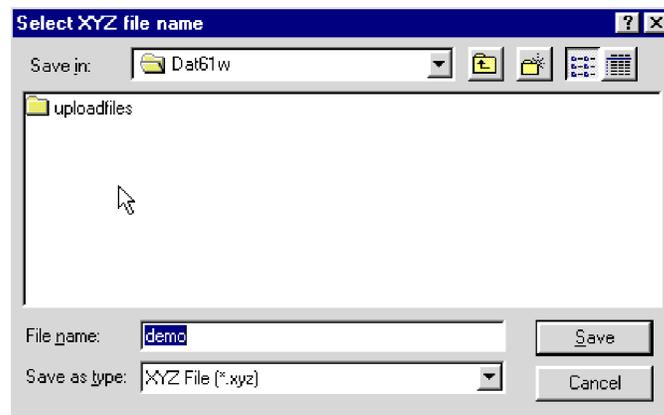


Figure 2.13: Save As window

Accept the default or specify a new file name and click the **Save** button. The Save As window will close and the selected file name will be displayed at the bottom of the Create XYZ File window. At the same time the Create XYZ File button is activated.. After this button is clicked a progress bar, located at the left bottom corner of the window, will indicate the percentage of the created file that has been completed.

The creation of XYZ files is generally very fast for the W-E and S-N line orientation. Not surprisingly it is a somewhat more lengthy process for the Arbitrary survey line orientations.

Files created by this portion of the program can be viewed at any time using the **File | Open | XYZ** menu, or by clicking the **View XYZ File** button located on the tool bar.

3. Data Transfer

This chapter describes the transfer of files (program and data files) between the Polycorder and the computer. Both types of Polycorders, 600 and 720, can be used with the EM61 Polycorder program. The transfer of data files from the Allegro or Pro4000 field computers operating under the control of the EM61alg or EM61pro programs is described in Section 3.4.

3.1 Polycorder Communication Parameters

The Polycorder communication parameters are the same for all Uploading and Downloading procedures. These parameters are usually properly set after resetting the logger with the RESET module. In case they are modified, set the communication parameters (using Polycorder Mode 5-2) according to Table 3.1.

Table 3.1: Polycorder communication settings

Parameter	Setting	Parameter	Setting
BAUD RATE	9600	INP LINE TERM	<CR>
DATA BITS	8	INP MAX LENGTH	95
PARITY	N	TRANSMIT DELAY	0
STOP BITS	1	CHECKSUM	N
DUPLEX	H	END OF LINE SEQ	<CR><LF>
XMT PMT'S	N	END OF PAGE SEQ	<CR><LF>
LINE REQ	A	END OF FILE SEQ	<CR><LF>
REPEAT REQ	B	MATING CALL	A or <CR>
CONTINUOUS REQ	C	BEEP TONE	55
STOP REQ	D	BEEP TIME	10

Character <CR> (Carriage Return) is represented on the Polycorder display as a left pointing arrow, while <LF> (Line Feed) is shown as a check mark.

If DOS based programs are used for Uploading or Downloading files, change the parameter MATING CALL to <CR>. To set <CR> in the Polycorder press the following keys on the Polycorder keypad: CTL (one key) 0 1 3.

If necessary, refer to the manufacturer documentation for more details regarding the Polycorder communication parameters.

3.2 Upload Program Files to Polycorder

General Information

Normally, the Polycorder 600 that is supplied with the EM61 system contain all the necessary programs for running the instruments. However, there are several circumstances when uploading the Polycorder program files should be performed:

- Polycorder does not contain necessary programs.
- loading updated versions of Polycorder programs.
- changing instrument that will be used with the logger.
- after routine or necessary clean up of the Polycorder.

The Polycorder EM61 program supplied with the Windows based software is almost identical to the previous versions supplied with the DOS based DAT61 program. Data files created during data collection are also compatible. The difference is in the downloading of files which is handled by new routine, DUMP61W. If data is to be downloaded with Windows based software, a new version of the Polycorder programs (version 2.0 or later) must be uploaded to the Polycorder.

If data is collected using an older version it should be downloaded with the DOS based software (DOS based DAT61) and then processed with the DAT61W.

It is advised to reset the Polycorder and reload the programming after several days of use. This will keep the directory file refreshed. The Polycorder has no system directory and the internal data file, DIRFILE, is used to log all entered file names. When the directory file contains many file names, the downloading procedure becomes more time consuming. In addition, there will be less choice in naming files. Since the EM61 program does not allow the appending of data files, the file names present in the directory file can not be used even in the case where they were previously deleted from the system.

The Polycorder is reset with the RESET module. To reset the Polycorder, make sure that all data are downloaded and saved, since all data will be permanently deleted. Insert the RESET module to the Polycorder connector with the RESET label facing the operator and press the ON key (or OFF and ON if the logger was ON initially).

Description of Polycorder Program Files

Two file types, format files and program files have to be transferred to the Polycorder to run the EM61 Polycorder program. The Polycorder procedure requires two files FORM61 and EM61. These files are placed in the subdirectory UploadFiles of the directory chosen during DAT61W installation. A description of Polycorder files is as follows:

- FORM61** this file contains format files necessary for EM6 data files and two files:
- DIRFILE** - directory file to log entered file names. Do not edit this file.
 - DUMMY01** - small text file that can be safely erased in case additional memory is needed to run downloading programs.
- EM61** contains programs for Polycorder. It includes following programs:
- EM61** - data acquisition program for Geonics EM61 instrument.

- DUMP61W** - program to download data files while using DAT61W (Windows based) computer program.
- DUMP61** - program to download data files while using DAT61 (DOS based) computer program.

Format files can be loaded only when the Polycorder is reset. The Polycorder system does not allow format files to be overwritten.

Format files must be present in the Polycorder prior to uploading the program files.

Download programs DUMP61 and DUMP61W require about 500 bytes (corresponds to about 50 records) of free memory in the Polycorder. In cases where the Polycorder memory is entirely used during field work and the dump programs can not be run, erase the file DUMMY01 using the Polycorder Mode 4-2.

When file DUMMY01 is erased and not immediately replaced through uploading, create your own “dummy” file by recording a file with about 100 readings that can be deleted, if necessary.

Uploading Files to the Polycorder

Select the **Data Transfer | Upload Files to Polycorder** in the program menu (Figure 3.1).

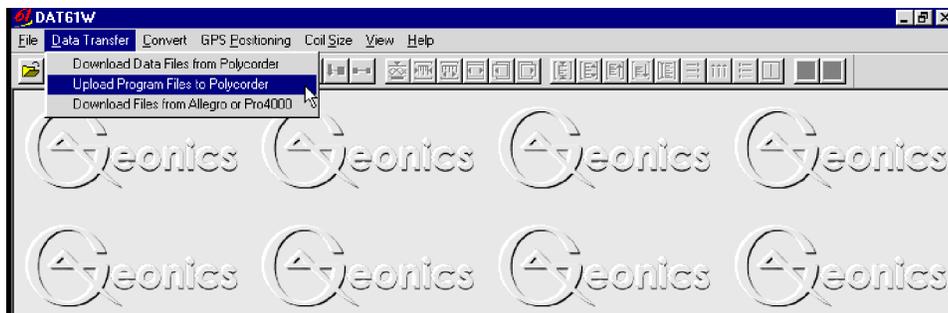


Figure 3.1: DAT61W Data Transfer

After clicking the **Upload Files to Polycorder** item shown in Figure 3.1, the Upload File(s) From PC to Polycorder window will appear (Figure 3.2). In this figure, files FORM61 and EM61 are displayed in the Files to Upload list box.

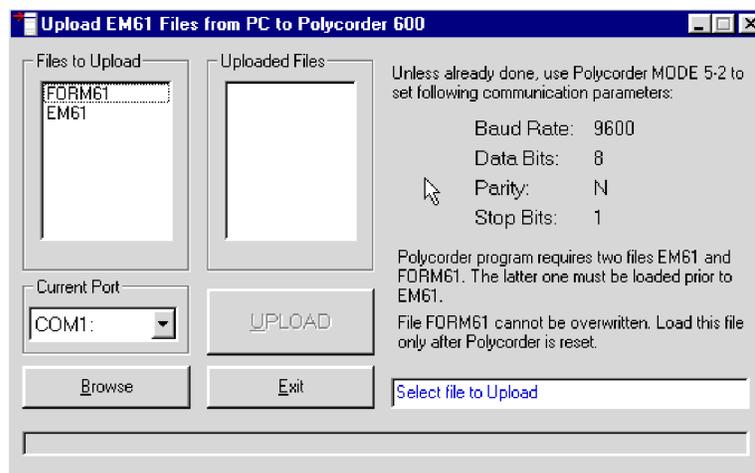


Figure 3.2: Upload EM61 Files to Polycorder 600 window

Normally, the Polycorder files are located in the subdirectory UploadFiles of the program folder (chosen during installation). The program checks this subdirectory. If the Files to Upload list box does not contain necessary files, click the **Browse** button to locate the Polycorder files.

The Upload window contains the **Port Setup** button. Press this button if a port other than COM1 is to be used, or default communication parameters require change. After this button is clicked, a Port Configuration window appears (Figure 3.3). The required (default) parameters are shown.

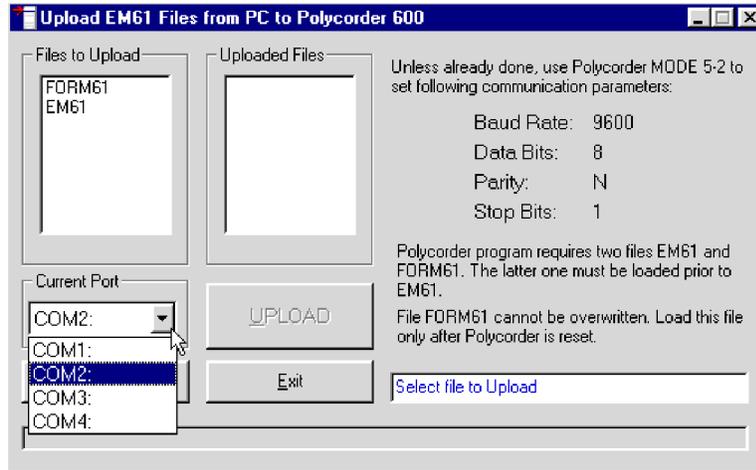


Figure 3.3: Selecting serial port number

To upload files to the Polycorder, follow the instructions on the screen (Figure 3.2). Select a file by clicking the left mouse button on the name in the list box. The file name will be highlighted and the **Upload** button will be activated. Using the left mouse button, click the **Upload** button and then, with the Polycorder turned ON, enter the Polycorder Mode 3-2. Information reminding you to enter Polycorder Mode 3-2 (Figure 3.4)

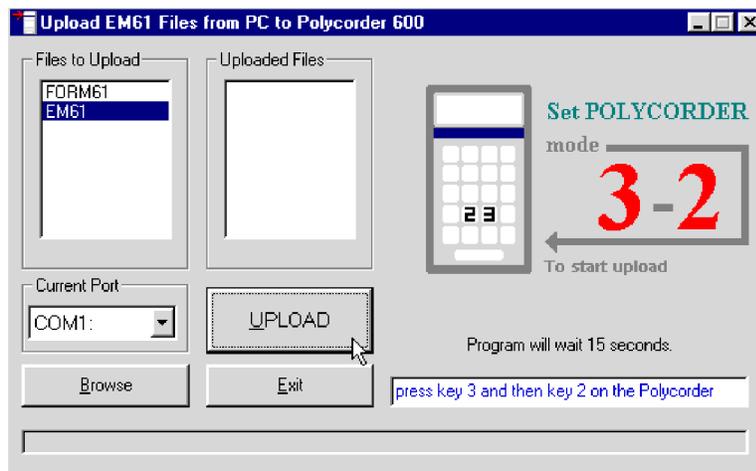


Figure 3.4: Upload File window waiting for Polycorder entry

After Mode 3-2 in the Polycorder is entered, uploading starts, which should be confirmed by an updated graphic and by a progress bar located at the bottom of the Upload File from PC to Polycorder window (Figure 3.5).

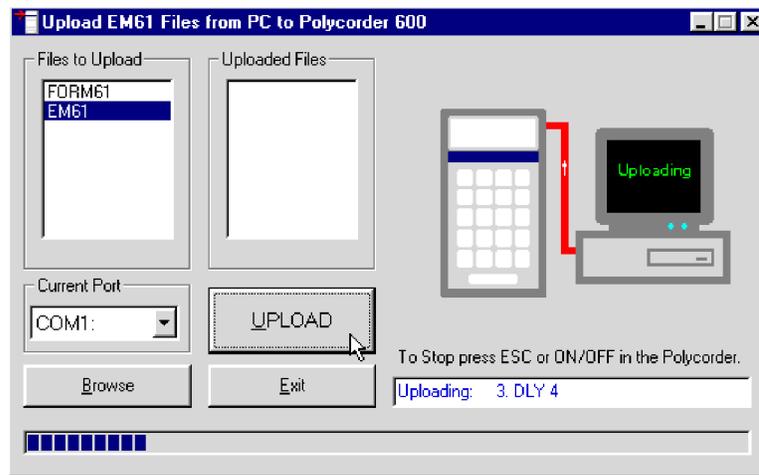


Figure 3.5: Upload EM61 Files from PC to Polycorder 600 window during transmission

When a file is uploaded, the file name is displayed in the Uploaded Files list box. At this point the next file can be uploaded.

Format file is loaded very quickly (within a few seconds), whereas uploading of the program file, EM61, will take approximately several minutes.

If there is a problem during the transmission of files, the progress bar will stop moving. At this point you should check the cable and the communication parameters.

3.3 Download Data from the Polycorder

Data File Formats

Data files in the logger are formatted in proprietary Polycorder format. The Polycorder (EM61) data is saved in one data file.

Files in the Polycorder format converted to the DAT61 format during the downloading of data. These new files have same base name with an added extension name G61. Files in the DAT61 format can be loaded and processed by the DAT61W program.

While only files in the DAT61 format are used in data processing, it is strongly advised that data in the Polycorder format be saved as well. In case of any hardware malfunction, e.g. a damaged instrument cable, only the file in Polycorder format may indicate the source of the problem. Additionally, Polycorder files also contain useful information about the instrument settings used during field work. Files in the Polycorder format can be converted to the DAT61 format at any time using the Convert Files option of the DAT61W menu.

Description and sample of the EM61 files in the Polycorder format, as well as an example of a file converted to the DAT61 format are placed in Appendix A.

Download Procedure

Select **Data Transfer** in the program menu and then click the **Download Files from Polycorder** menu item (Figure 3.6).

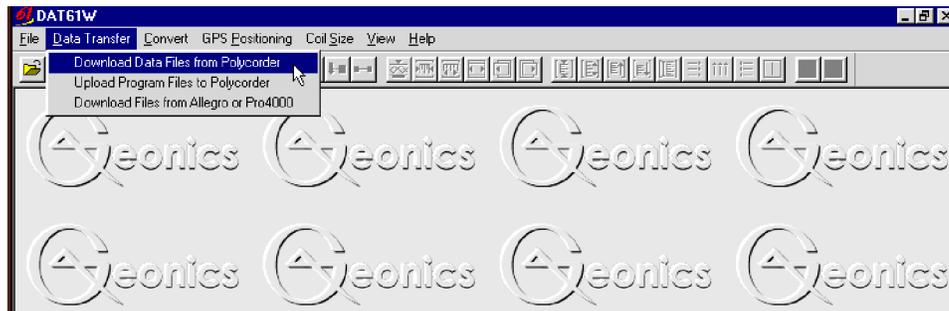


Figure 3.6: DAT61W Data Transfer menu

After clicking the **Download Files from Polycorder** item shown in Figure 3.6, the Download data from Polycorder window will appear (Figure 3.7).

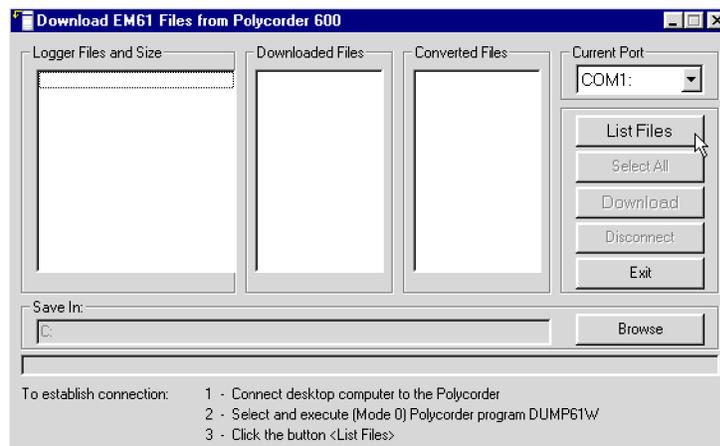


Figure 3.7: Download EM61 Files from Polycorder window

The Download data from Polycorder window has three list boxes. The first from the left, labeled **Logger File(s) and Size** will contain, after **List Logger Files** button is clicked, a list of data files located in the Polycorder and available to download. Along with file names, their size in bytes is displayed. The second list box, labeled **Transferred File(s)**, will list downloaded data files in Polycorder format, and the third, **Converted File(s)**, will list files converted from Polycorder to DAT61 format. If file names, either in Polycorder or DAT61 format, exist on the computer hard disk, an underscore followed by a letter will be added to the base name, e.g. file name ABC would be changed to ABC_a and ABC_a.G61.

The directory where transferred files will be placed can be selected by using the **Browse** function. Click the **Browse** button with the left mouse button and the Select Directory window will be displayed (Figure 3.8). After the directory is selected, it will be displayed in the bottom part of the Download data from Polycorder window. The selected directory will be saved and it will be displayed as a default directory during subsequent DAT61W executions. If the directory is removed the programs main directory will be used as a default directory.

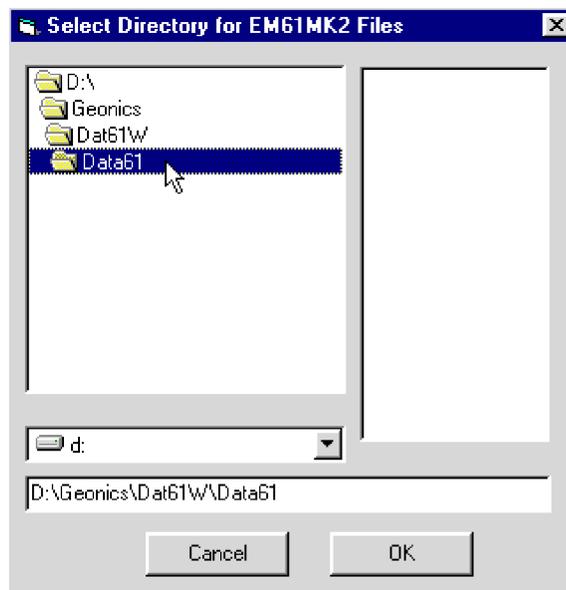


Figure 3.8: Select Directory for EM61 Files

Check the port assignment and configuration by clicking the **Port Setup** button. The Port Configuration window will be displayed (Figure 3.9). The required (default) parameters are shown. In most cases, only the port assignment may need to be changed.

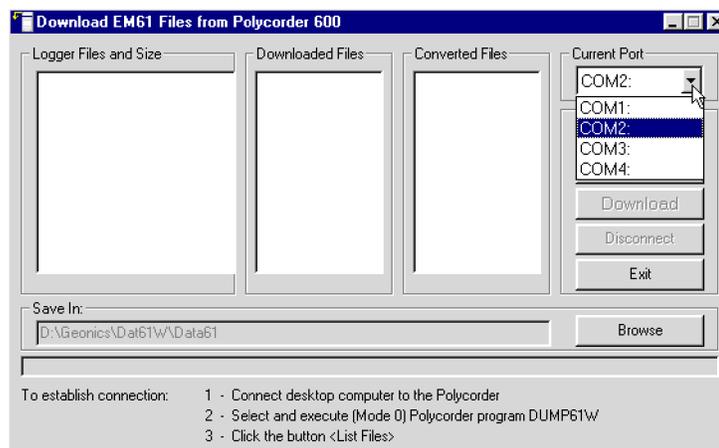


Figure 3.9: Selecting serial port number

To start downloading the data files, connect the Polycorder and computer with the dumping cable.

Run the Polycorder program **DUMP61W** for Polycorder. (*To run program in the Polycorder: enter MODE 0, select program name and press ENTER*).

Do not mistake the above program with DUMP61 file, which is included in the Polycorder for DOS based program only.

Using the left mouse button click the **List Logger Files** button. After several seconds the Logger File(s) and Size list box will be updated with names of data files available for download (Figure 3.10). At the same time, the window buttons **Select All Files** and **Download** will be activated.

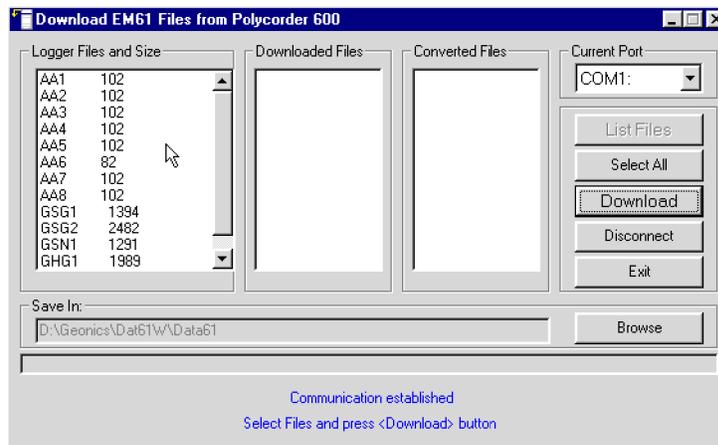


Figure 3.10: Download EM61 Files... window after Logger Files are listed

Select the files to be downloaded from the Polycorder by clicking on individual file names in the list box or click the **Select All Files** button to select all available files. When selection of files is complete, click the **Download** button. At this point the name of each transferred file is displayed at the bottom of the window and a progress bar indicates the percentage of downloading completed. Transferred files (in Polycorder format) will be displayed in the centre list box. After the transfer of all selected files is complete, files in the Polycorder format are automatically converted to the DAT61 format (with extension name G61). Converted files will be displayed in the Converted File(s) list box (Figure 3.11).

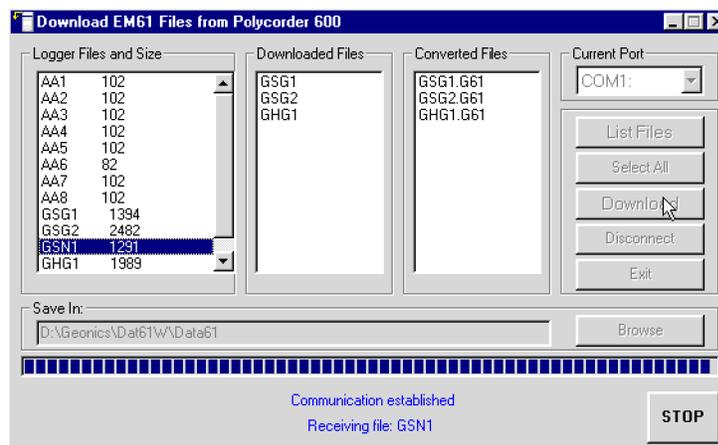


Figure 3.11: Download EM61 Files... window during data transfer

Converted files (with G61 extension name) can be loaded and processed further in the DAT61W program.

Click the **Disconnect** button to cancel communication with logger. The Download EM61 Files from Polycorder 600 window will remain on the screen and the next data transfer session (i.e. from another logger) can be performed. Clicking the **Exit** button will stop Data Transfer function and the Download EM61 Files from Polycorder 600 window will disappear.

3.4 Download EM61 Files from Allegro or Pro4000

This section describes the transfer of data files from the Allegro and Pro4000 field computers to PC computer using the **Data Transfer** option of program DAT61MK2. This option requires that the logger program EM61alg or EM61pro is version 1.06 or later. If an earlier version of the program EM61pro is in use in the logger, upload this newer version of the program (it will not damage any data files) or use other utility, i.e. Lynx, to transfer data files.

Data files can be downloaded by alternative utilities (e.g. ProShell, Lynx, or FileScout in Allegro Field PC). These files (raw data files with extension names R61) can be converted to DAT61 format (files with extension G61) by using the **Convert Files | Convert EM61pro Files** option which can be accessed from the main menu of the program.

Data File Formats

Data files in the field computer are formatted in proprietary EM61pro format. The EM61pro data is saved in one data file with the extension name \$61.

Files in the logger format are converted to the DAT61 format during the downloading of data. These new files have same base name with an added extension name G61. Files in the DAT61 format can be loaded and processed by the DAT61W program.

While only the DAT61 format is used in data processing, it is strongly advised that data in the raw (EM61pro) format be saved as well. In the case of any hardware malfunction, i.e. a damaged instrument cable, only the file in logger format may indicate the source of the problem. Additionally, raw data files also contain useful information about the instrument settings used during field work. Files in the EM61pro format can be converted to the DAT61 format at any time using the Convert EM61pro Files option of the DAT61W menu.

Description and sample of the EM61 files in the EM61pro format, as well as an example of a file converted to the DAT61 format are placed in Appendix A of DAT61W manual.

Download Files Procedure

To start downloading files from the field computer, select the **Data Transfer** item in the program menu and then click on **Download Data Files from Allegro or Pro4000** from the menu item (Figure 3.12)

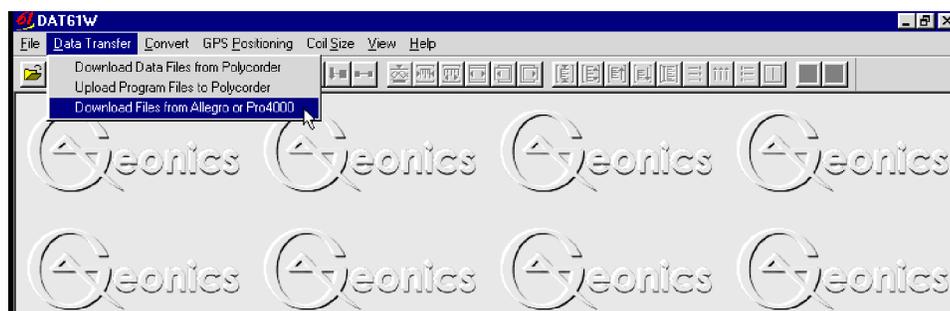


Figure 3.12: DAT61W Data Transfer menu

After you click the **Download Data Files from Allegro or Pro4000** item, the Download EM61pro Files from Allegro/Pro4000 window will appear (Figure 3.13).

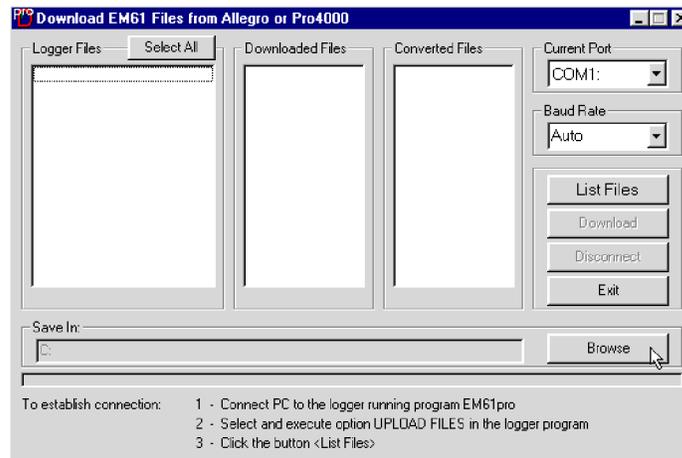


Figure 3.13: Download EM61 Files from Allegro or Pro4000 window

The Download window has three list boxes. The first from the left, labeled **Logger Files** will contain, after the **List Files** button is clicked, a list of data files located in the field computer and available to download. File names, with their size in bytes will be displayed as well. The second list box, labeled **Downloaded Files**, will list downloaded data files in the EM61pro format, and the third, **Converted Files**, will list files converted to DAT61 format. If a file name already exists on the computer hard disk, an underscore followed by a letter will be added to the base name. (ie. file name ABC.\$61 would be changed to ABC_1.\$61, ABC_2.\$61, and so on.)

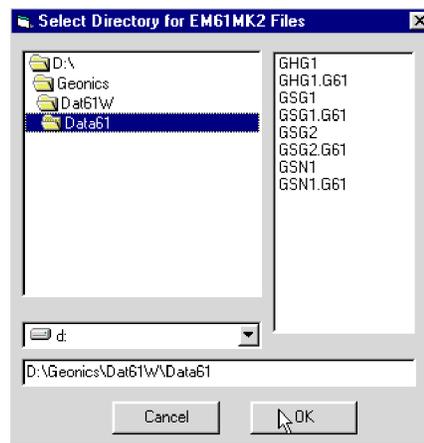


Figure 3.14: Select Directory for EM61 Files window

To select the directory where transferred and converted files will be placed click the **Browse** button. The Select Directory for EM61 Files window will be displayed (Figure 3.14).

After the directory is selected, it will be displayed in the text box labelled **Save In** at bottom part of the Download EM61pro Files from Allegro or Pro4000 window. The selected directory will be saved and it will be used as the default directory during subsequent DAT61W executions. If this directory is removed the C:\ directory will be used instead.

Change of the serial port assignment can be done by clicking the Down arrow button in the field labeled Current Port. The pull down list box will be displayed, as shown in Figure 3.15. Select required serial (COM) port number.

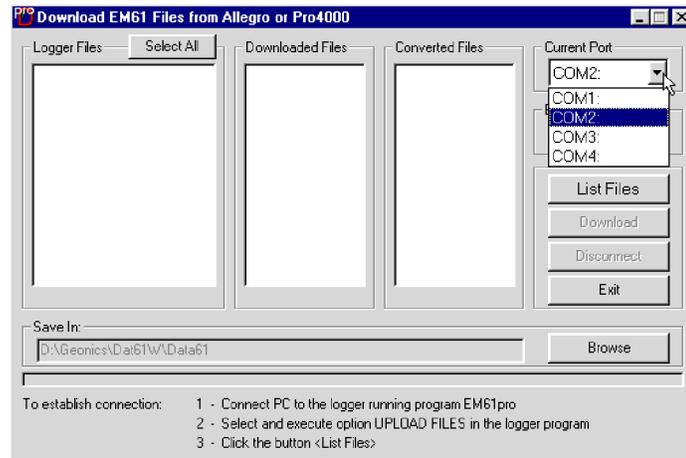


Figure 3.15: Select serial port number

Selecting Baud Rate can be done by clicking the Down arrow button in the field labeled Baud Rate. The pull down list box will be displayed (Figure 3.16). Select Auto setting or specify one of the given Baud Rates.

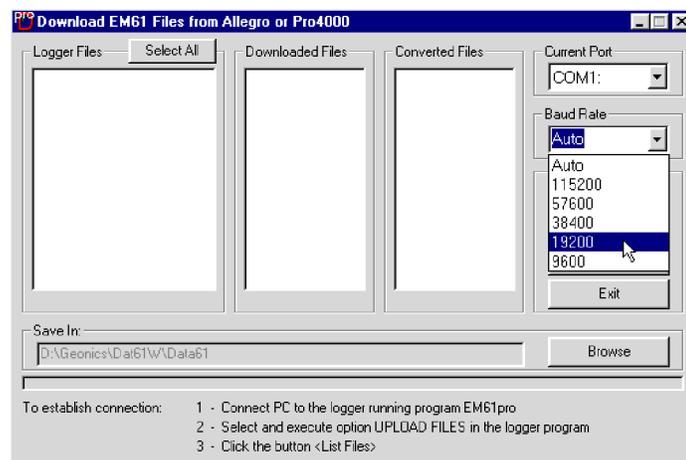


Figure 3.16: Selecting Baud Rate for selected serial port

The **Auto** setting will cause the program to establish and test the highest possible speed for data transmission for particular computer and logger. This setting is adequate for most computers. However if the program will prompt that one or more bytes were lost during transmission click on the **Disconnect** button, select a lower Baud Rate, and then repeat downloading.

To start downloading the data files, connect the field computer (Allegro or Pro4000) and PC computer with the serial cable.

Run the EM61alg or EM61pro program in the logger. In the Main menu of the program select **Upload Files** option, and press <ENTER>. The logger screen will display the message “**Waiting for PC**” (shown in Figure 3.17) for up to 1 minute (if time elapses repeat the procedure). On the computer click the **List Files** button in the Download EM61pro Files from Allegro or Pro4000 window. At that time both programs (EM61pro and DAT61W) will establish and test the communication at the highest possible speed of

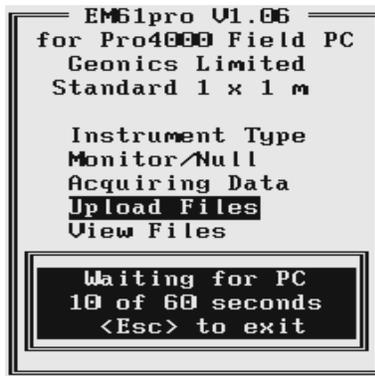


Figure 3.17: Pro4000 screen

data transfer. After several seconds the Logger Files list box will be updated with the names and sizes of data files available for download (see Figure 3.18). At the same time, the **Download** and **Disconnect** buttons will be activated, and the **List Files** button as well as **Current Port** and **Baud Rate** parameters selections will be deactivated.

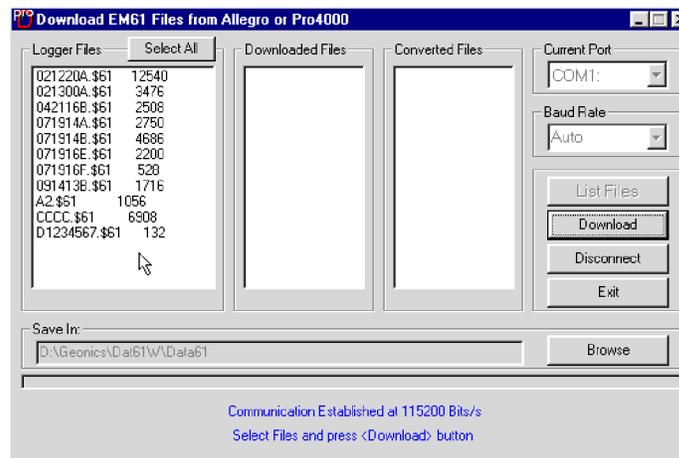


Figure 3.18: List of files available in Pro4000 for Download in Download EM61 Files from Pro4000 window

Select the files to be downloaded from the logger by clicking on individual file names in the list box (Figure 3.19) or click the **Select All** button to select all available files. When all files are selected the **Select All** button will change to the **Unselect All** button.

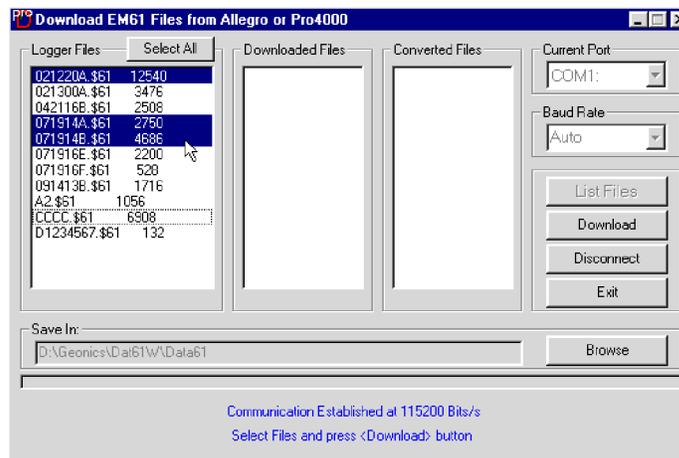


Figure 3.19 Selecting files to download

When file selection is complete click the **Download** button. The name of each transferred file is displayed at the bottom of the window as it transfers and a progress bar indicates the percentage completed, as shown in the Figure 3.20.

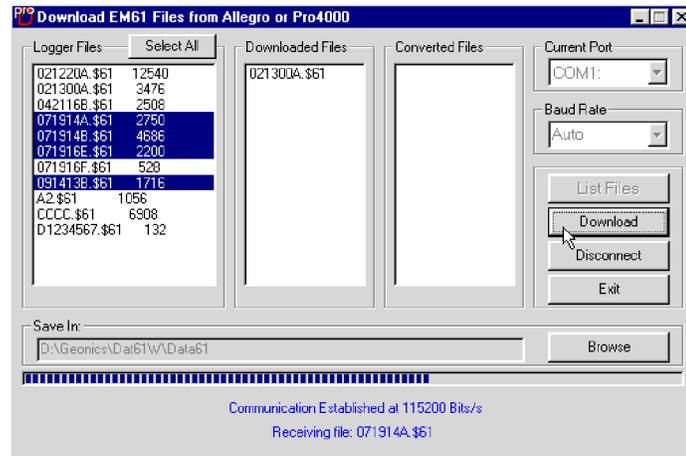


Figure 3.20: Download EM61 Files from Allegro or Pro4000 window during data transmission

At the same time the logger screen displays transmitted file name and percentage of completed uploading (Figure 3.21). The transfer procedure can be stopped at any time by pressing <Esc> key on the logger keypad.

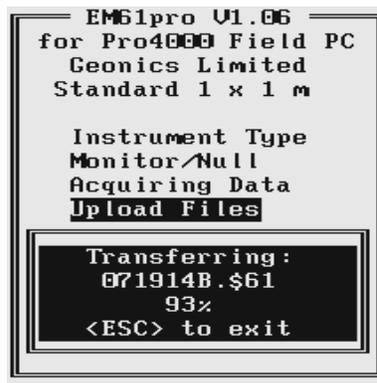


Figure 3.21: Pro4000 screen during data transfer

Transferred files (in EM61pro format) will be displayed in the centre list box. After the transfer of all selected files is complete, files in the EM61pro format are automatically converted to the DAT61 format (with extension name G61). Converted files will be displayed in the Converted Files list box (see Figure 3.22). Converted files (with extension name G61) can be loaded and processed further in the program.

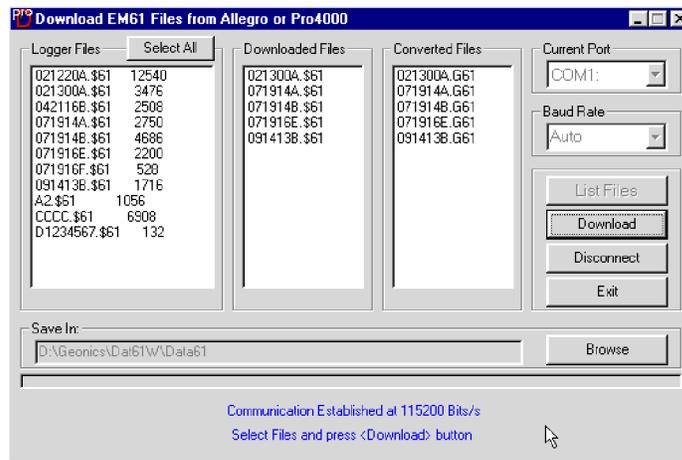


Figure 3.22: Download EM61 Files from Allegro or Pro4000 window after downloading selected files is completed

Click the **Disconnect** button to cancel communication with logger. The Download EM61 Files from Allegro or Pro4000 window will remain on the screen and next data transfer session (i.e. from another logger) can be performed. Clicking the **Exit** button will stop Data Transfer function and the Download EM61 Files from Allegro or Pro4000 window will disappear.

4. Loading and Displaying Data

Three types of files can be loaded to the DAT61W program. Files containing EM61 readings and displayed in the program as profiles have the extension name G61. These files are described in this section. DAT61W can also display the spatial distribution of stations in XYZ files, and the text of any ASCII file. The latter function is similar to Windows Notepad, and is limited to files not exceeding 64Kbytes in size in Windows 95 and 98.

4.1 Loading EM61 Files

Loading Data File

To display data select **File|Open Profile** in the menu (Figure 4.1) or click the left mouse button on the toolbar button (marked by yellow file symbol).

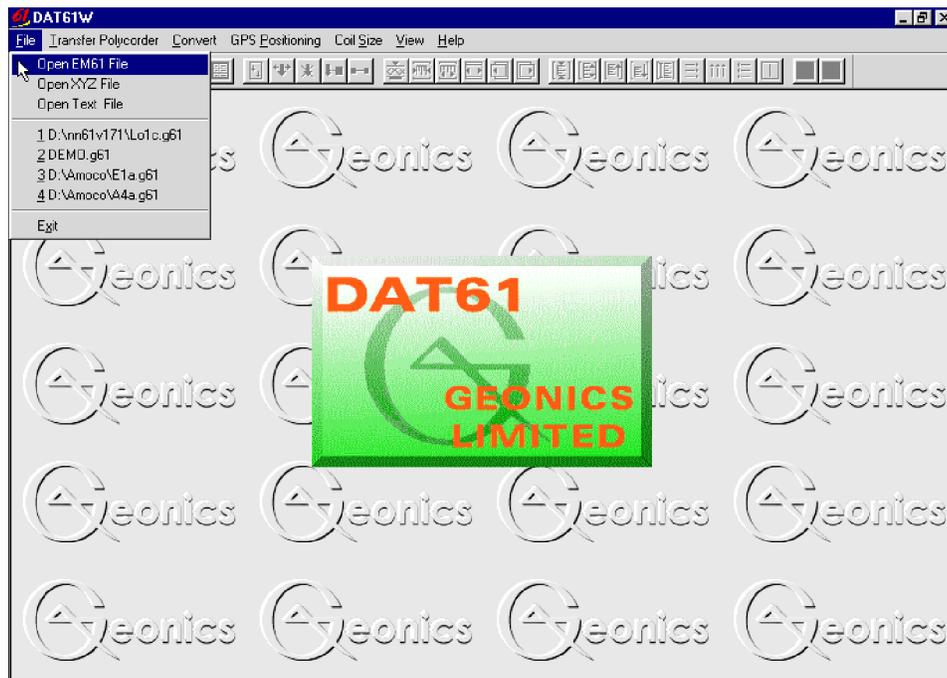


Figure 4.1: DAT61W File menu

The Open EM61 File window will be displayed (Figure 4.2). Select directory and file name and then click the **Open** button (or double click the left mouse button, or press **Alt_O** on the keyboard). Data files containing EM61 readings have the extension name G61.

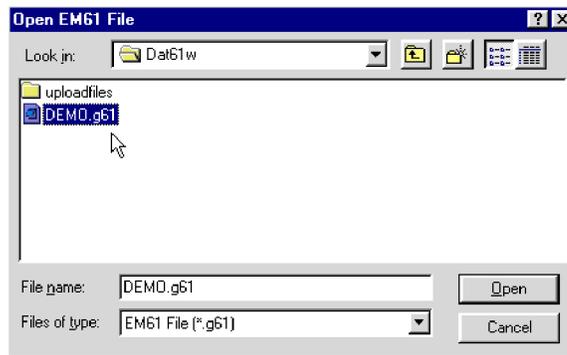


Figure 4.2: Open EM61 File window

After the DAT61 profile file is loaded, data is displayed in a stacked profile format as shown in Figure 4.3. Survey lines are organized in panels, which contain the recorded readings. In general, each survey line belongs to a separate panel. In the case where two or more survey lines have the same line name, however, they will be placed in the same panel. In order to display such lines in separate panels the line names must be changed (see portion 4.3 of this section).

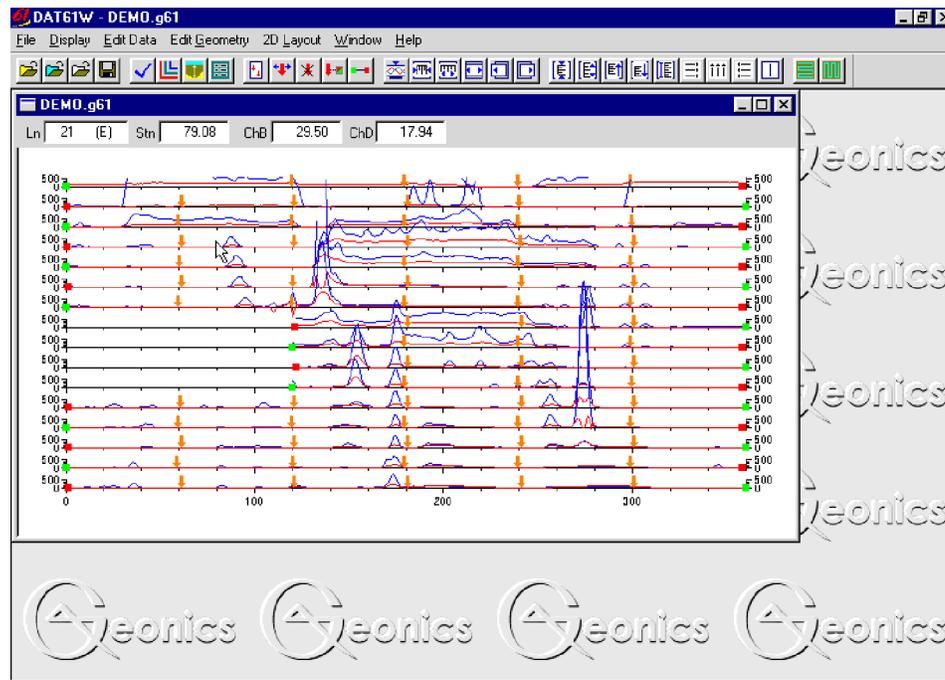


Figure 4.3: DAT61W screen with stacked profiles

Depending on number of channels selected for display (see portion 4.4 of this section), the stacked profile window will display appropriate EM61 channels in each panel. In default settings, Channels B and D are plotted. The left vertical axis, corresponds to EM61 Response in milliVolts (mV). The right vertical axis is generally the same with the exception when Channel A (Apparent Time Constant for EM61 Hand Held) is displayed. In the latter case the left axis, corresponds to Channel A curves and is scaled in microseconds (us).

Loading Additional Data Files to Separate Windows

To display data in a separate window select **File | Open | Profile** in the menu (Figure 4.4) or click the left mouse button on the toolbar button (marked by yellow file symbol).

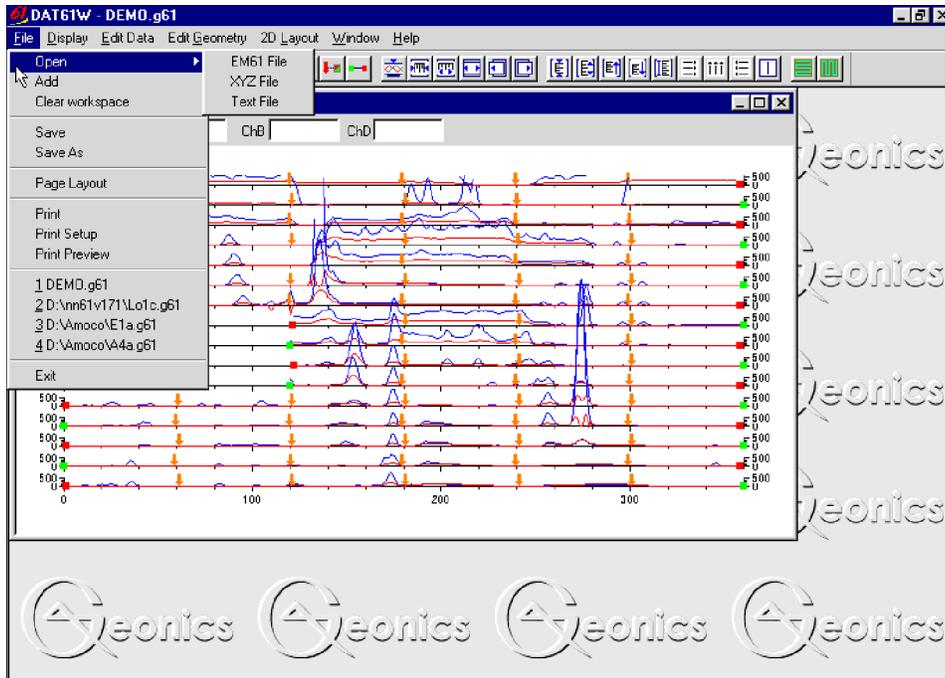


Figure 4.4: DAT61W File menu

The Open EM61 File window will be displayed (Figure 4.2). Select directory and file name and then click the **Open** button (or double click the left mouse button, or press **Alt_O** on the keyboard).

After the DAT61 profile file is loaded, data is displayed in a stacked profile format in a new window, as shown in Figure 4.5. Any number of windows (limited only by the memory of the computer) containing separate files can be opened. This includes multiple entry of the same file name, such that the same data set can be displayed in separate windows. Windows can be resized or tiled (vertically or horizontally) using the Window menu. The menu displayed at the top of the screen is always associated with the active window.

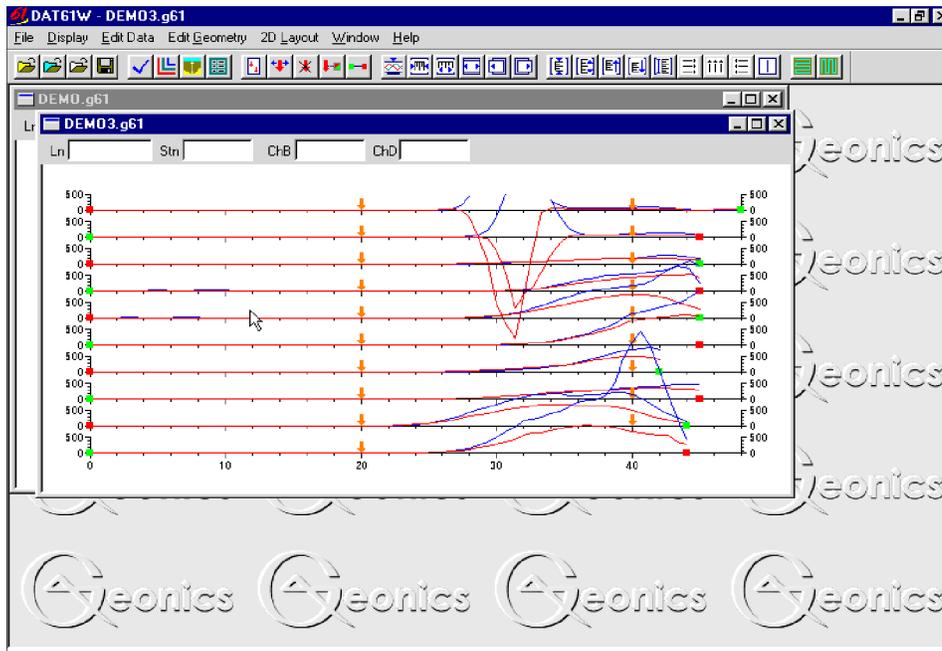


Figure 4.5: DAT61W screen with stacked profiles in two windows

Adding Data to the Existing Window

To insert data to the existing window select **File|Add** in the menu (Figure 4.4). The Open EM61 File window will be displayed (Figure 4.2). Select directory and file name and then click the **Open** button (or double click the left mouse button, or press **Alt_O** on the keyboard).

After the DAT61 profile file is loaded, data is appended to the existing data set and displayed in a stacked profile format in the same window (Figure 4.6). Any number of files (limited only by the capacity of the computer memory) can be loaded to one window.

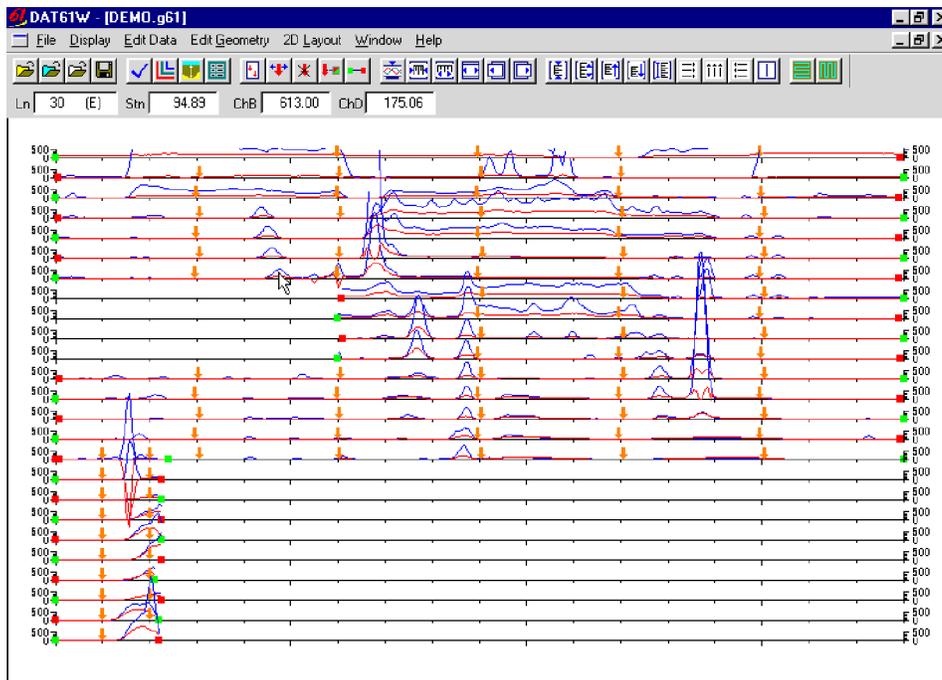


Figure 4.6: DAT61W screen with content of two files in one window

4.2 Closing Profile Window and Saving Data

Closing Active Window

To close existing windows select **File | Clear Workspace** in the menu (Figure 4.7). Any editing of data is **not saved** during this procedure. To close each window separately click the close button of the active window.

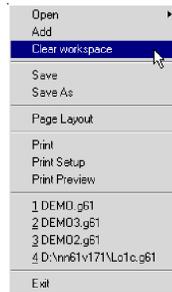


Figure 4.7: File menu

Save Data

To save data to the currently opened file name select **File | Save** in the menu (Figure 4.7). If several files are open, the caption displayed at the top of the active window will be used as a file name.

It is recommended that you use the option Save As since it is worthwhile to maintain the original data in an unedited form.

Save Data to Specified File (Save As)

To save data to the currently opened file name select **File | Save As** in the menu (Figure 4.7) or click the left mouse button on the  toolbar button. The Save As window will be displayed (Figure 4.8). Select directory and specify file name and then click the **Save** button (or double click the left mouse button, or press **Alt_S** on the keyboard). Data files containing EM61 readings will have the extension name G61.

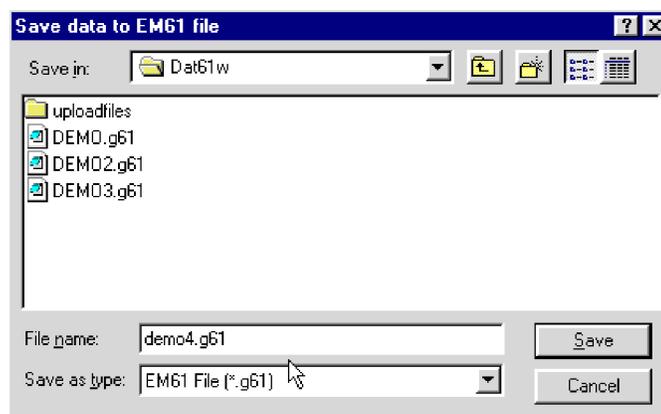


Figure 4.8: Save As window

4.3 Select, Delete and Rename Survey Lines

Selecting Survey Lines

When a data file is loaded, all survey lines contained in the file are displayed. To display a selection of survey lines select **Display | Select Lines** in the menu (Figure 4.9) or click the left mouse button on the  toolbar button.

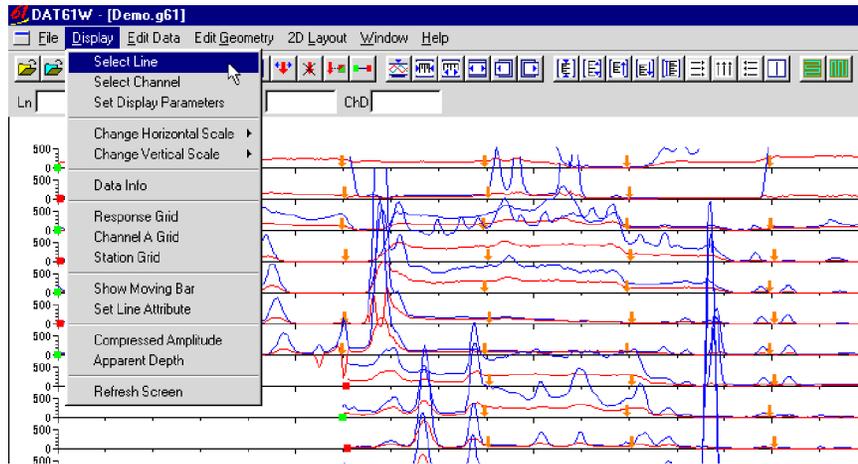


Figure 4.9: Display menu

The Select Lines window is shown in Figure 4.10. At the top right portion of the window the number of available survey lines (Total), the number of currently selected lines (Selected.), and the number of deleted lines (Deleted) are displayed.

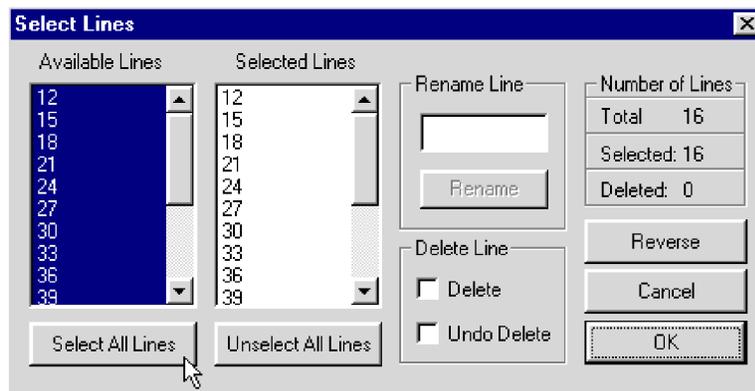


Figure 4.10: Select Lines window

The left list box, labeled Available Lines, displays all available lines. The right list box, labeled Selected Lines, shows a set of selected lines to be displayed. When saving data (**Save** or **Save As** options), data will be saved in the order shown in the Select Lines window.

Select (and deselect) lines to be displayed by clicking the line names in the corresponding list box. A button **Select All Lines/Unselect All Lines** is also available. All highlighted line names will be displayed on the screen after clicking the **OK** button. An example of a screen with three selected lines and corresponding Select Lines window is shown in Figure 4.11.

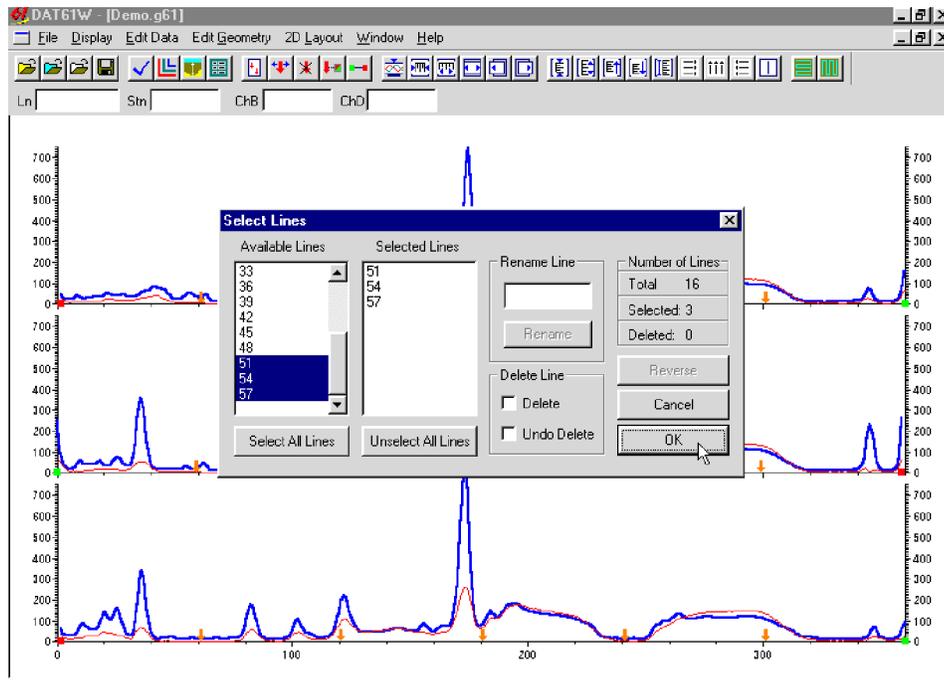


Figure 4.11: The DAT61W screen with selected lines.

The selection of lines has no effect on the execution of **Save**, **Save As**, and **Create XYZ File** options. Select Lines only affects the current display. Therefore, one or two survey lines can be displayed and examined in detail and then saved with all other survey lines not deleted to a new file.

Deleting and Renaming Survey Lines

Deleting and renaming lines can be accomplished in the Select Lines window (Figure 4.10).

To delete a survey line from the loaded set of data, click the check box next to the Delete label in the section labeled Delete Line in the Select Line window. When a check mark is visible in the check box click the appropriate line name in the list box. The letter **D** will be displayed next to the line name in the Available Lines list (Figure 4.12). These lines will not be displayed nor written to the output file during **Save**, **Save As**, **Create XYZ File** tasks.

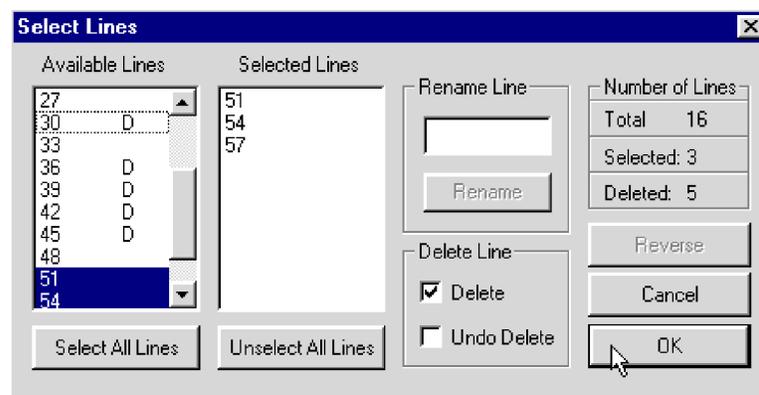


Figure 4.12: Select Lines window during Delete Line procedure

Renaming of survey lines can be accomplished in the Select Lines window as well. To rename a line, click on the appropriate line name in the list box. The highlighted line name will appear in the edit box located at the Rename Line label. Edit the name in the Edit Box (Figure 4.13) and click the **Rename Line** button. The updated name will now be displayed in the line names list.

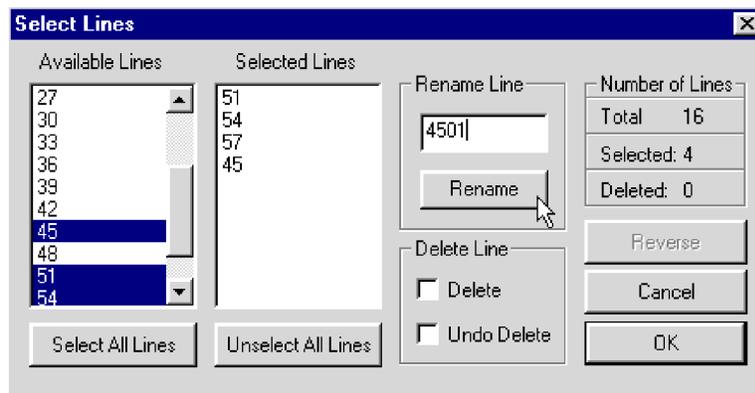


Figure 4.13: Select Lines window during Rename Line procedure

Deleted and Renamed lines will be valid as long as the program is running. In order to save changes permanently, use Save As or Save option to create a new data file which can be used later by the program. It is recommended that you use the option Save As since it is worthwhile to maintain the original data in an unedited form.

4.4 Select Channels

To select the type of data to be displayed select **Display | Select Channels** in the menu (Figure 4.9) or click the left mouse button on the  toolbar button. The Select Channels window that will appear is shown in Figure 4.14.

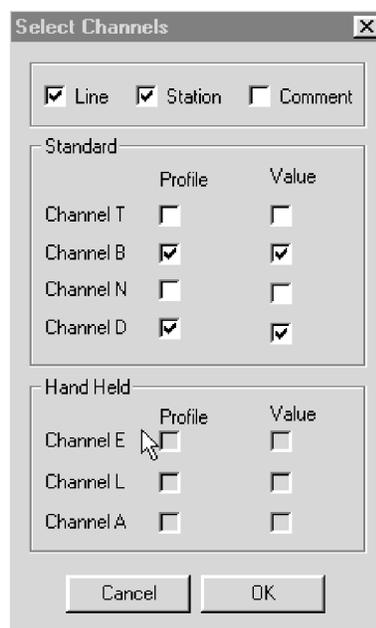


Figure 4.14: Select Channels window

The Select Channels window contains one row of check boxes at the top of the window. To display line name, station, and comment in windows located under the tool bar check the appropriate box. Selected items will be displayed in small windows reflecting current position of the mouse cursor in the profile view screen. To display a text of a comment place the mouse cursor on a small green rectangle which indicates presence of comment.

The remaining portion of the window is divided in to two sections: Standard and Hand Held. If data for one of the EM61 instrument type is not available the corresponding section is greyed out. Each section contains two columns of check boxes labeled Profile and Value.

The Profile column indicates channels that will be displayed in the form of profiles. To select or deselect a desired parameter as a profile, click the appropriate check box. Any combination of available channels can be displayed in the form of profiles. The program displays profiles of Channels B and D for the Standard EM61 by default. This procedure affects only the display.

The Value column indicates the parameters that will be displayed in numeric form in windows labeled with corresponding channel name (e.g. ChT), located under the tool bar (Figure 4.11). To select desired channels to be displayed in these windows click on the appropriate check box. The program displays values of channels B and D for the Standard EM61, as well as channels E and L for Hand Held EM61 by default. This procedure affects only the display.

4.5 Changing Display Parameters

The display parameters can be changed by using the Set Display Parameters window or by employing Quick scale adjustments accessible from the tool bar. The Set Display Parameters window allows for a more detailed setting of parameter, including separate adjustment for Channel A (Apparent Time Constant) if the EM61 Hand Held data is displayed by the program While viewing the data, however, the Quick scale adjustments provide a simple and interactive means of adjusting the display parameters.

Set Display Parameters Window

To adjust the range of the displayed parameters select **Display | Set Display Parameters** in the menu (Figure 4.9) or click the left mouse button on the  toolbar button. The Set Display Parameters window is shown in Figure 4.15.

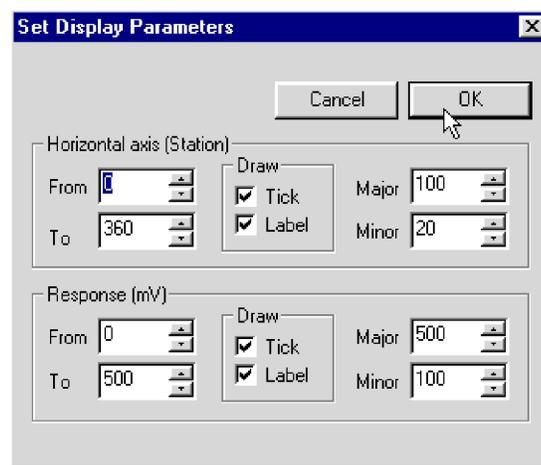


Figure 4.15: Set Display Parameters window

This option allows a range to be set for the length of the line (stations displayed), and the EM61 Response amplitude. The frequency of major and minor axis ticks is also controlled through this window. (Labels and optional grid lines are plotted at the major ticks only.) After all parameters are set, press the **OK** button and the profile display will be updated. In case EM61 Hand Held data is present and Channel A is displayed, the Set Display Parameters will be extended to accommodate Apparent Time axis scaled in microseconds (Figure 4.16).

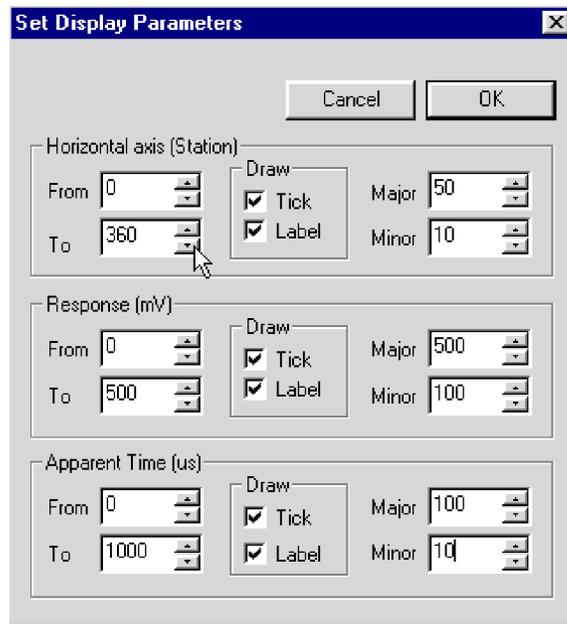


Figure 4.16: Set Display Parameters window

Quick Change of Horizontal and Vertical Scales

To adjust the horizontal range of the displayed parameters you can select **Display | Change Horizontal Scale | ...** in the menu (Figure 4.17), although it is much more convenient to use buttons located on the toolbar (Figure 4.18). To access these functions click the left mouse button on the appropriate toolbar button.

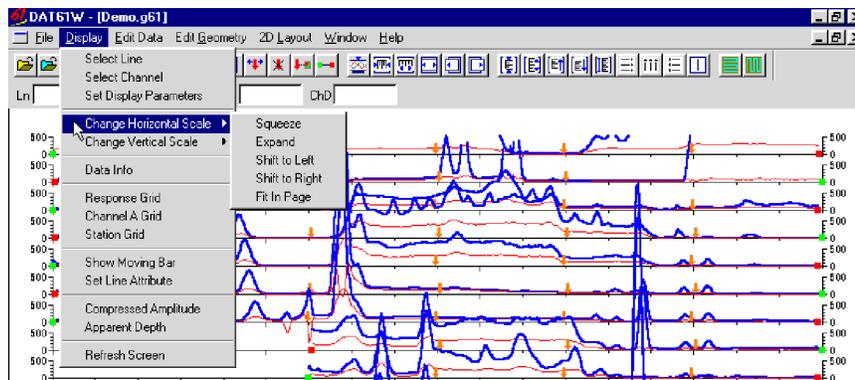


Figure 4.17 Change Horizontal Scale menu



Figure 4.18 *Change Horizontal Scale toolbar buttons*

This option allows a quick change of the horizontal scale in increments equal to the minor tick setting (refer to Set Display Parameters Window earlier in this section). The menu options are self explanatory. Buttons shown in Figure 4.18 are as follows (from left): compress, expand, fill from minimum to maximum value, shift left, and shift right.

To adjust the vertical scale of the displayed parameters you can select the **Display | Change Vertical Scale | ...** in the menu (Figure 4.19), although similarly to horizontal scale, it is much more convenient to use the buttons located on the toolbar (Figure 4.20). To access these functions click the left mouse button on the appropriate toolbar button.

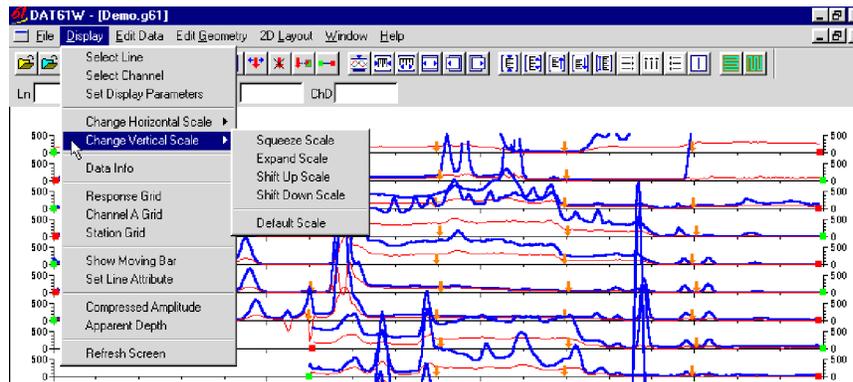


Figure 4.19: *Change Vertical Scale menu*



Figure 4.20: *Change Vertical Scale toolbar buttons*

This option allows a quick change of the vertical scale in increments equal to the minor tick setting. The menu options are self explanatory. The buttons shown in Figure 4.21 are as follows (from left): compress, expand, shift up, shift down, and fill from minimum to maximum value of the response.

4.6 Data Info

To obtain information about data entered into the program select **Display | Data Info** in the menu (Figure 4.9). The Data Info window that will appear is shown in Figure 4.21.

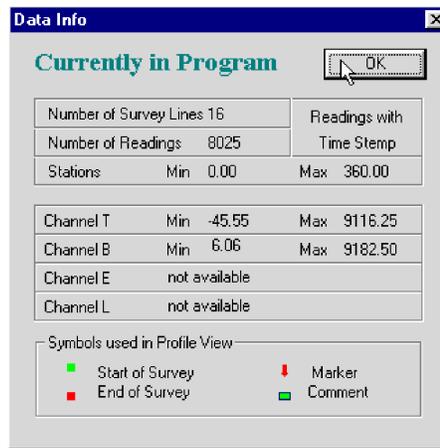


Figure 4.21: Data Info window

This window shows the number of readings, the number of survey lines, and the range of stations and EM61 channels. At the bottom, the symbols used in denoting the start and end station of each line, and all markers and comments are displayed. In the top right portion of the window there is an indication whether the data set was taken with Time stamp option.

4.7 Grid Lines

To obtain horizontal and/or vertical lines at major ticks along the axes, select the **Display | Response Grid**, **Display | Channel A Grid**, or **Display | Station Grid** items from the display menu (Figure 4.17). These options can also be executed by clicking the left mouse button on buttons , , or  corresponding to Response Grid, Station Grid, and Channel A Grid on the toolbar. (The toolbar button for Channel A Grid is not active if this channel was not selected for the display.) The screen with grid lines is shown in Figure 4.22.

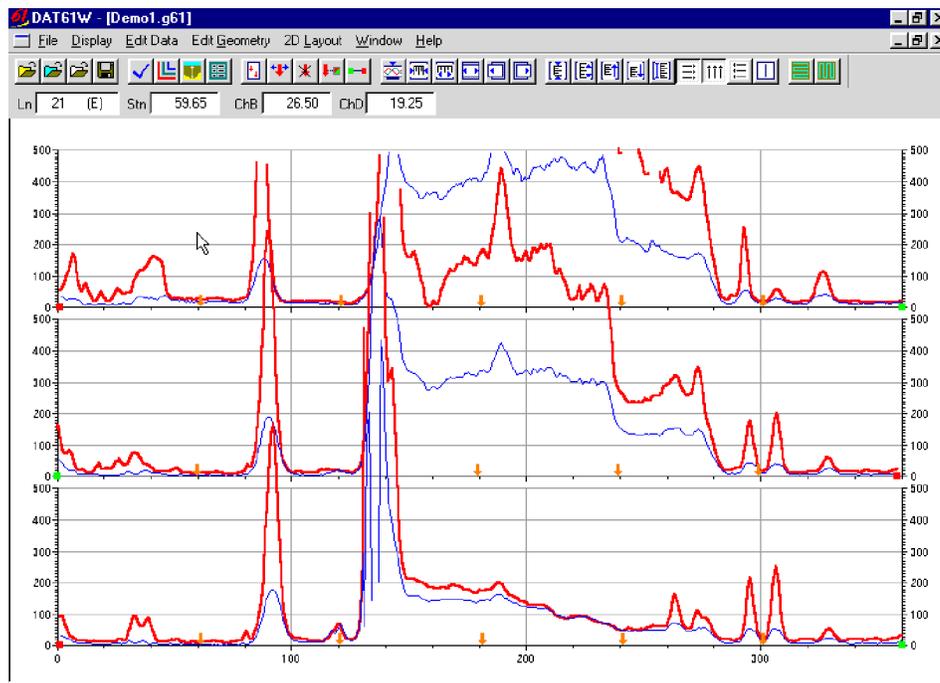


Figure 4.22: DAT61W screen with grid lines

Grid lines are plotted across each panel at corresponding major ticks as light grey lines. These options can be useful in examining the alignment of anomalies which are distributed across more than one survey line, as well as in comparing amplitudes of detected anomalies.

4.8 Moving Bar

To obtain a vertical line (bar) that can be dragged by the mouse across survey lines, select the **Display | Show Moving Bar** item from the display menu (Figure 4.17). This option can also be executed by clicking the left mouse button on the button  located on the toolbar. A vertical line will appear on the display (Figure 4.23). To move this line, point the mouse at the line and drag (while having the left mouse button depressed) either left or right. This option can be useful in examining the alignment of anomalies which are distributed across more than one survey line.

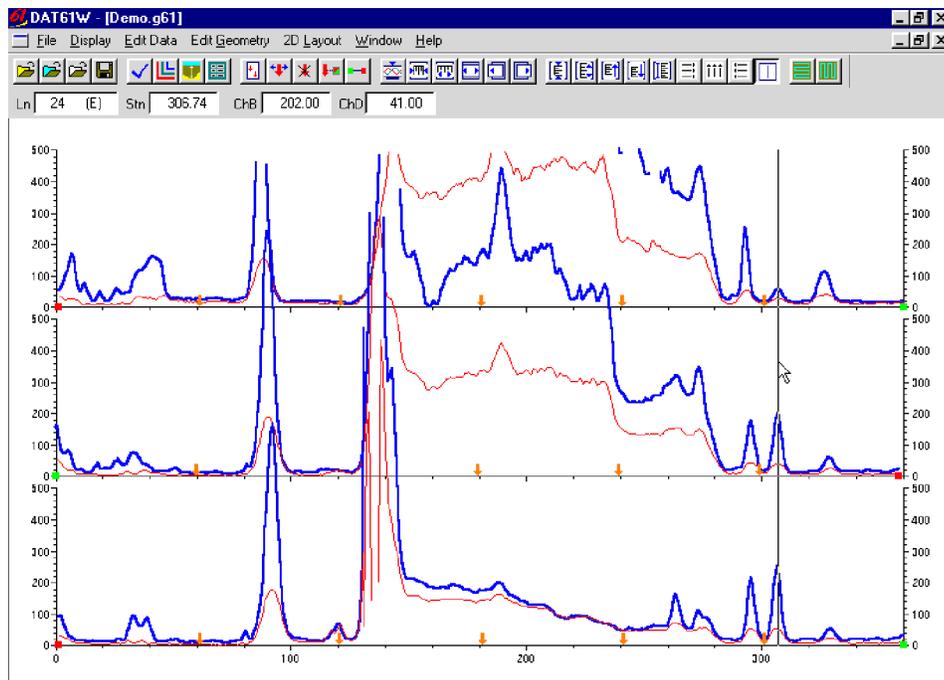


Figure 4.23: DAT61W screen with the moving bar

4.9 Set Line Attributes

To change the colour and/or thickness of lines representing each channel select **Display | Set Line Attribute** in the menu (Figure 4.9). The Set Line Attributes window is shown in Figure 4.24.

The type of line is represented by abbreviation of each channel name, e.g. ChT for channel T, etc. These line types are displayed in the list box together with samples of lines. To change the colour or thickness of

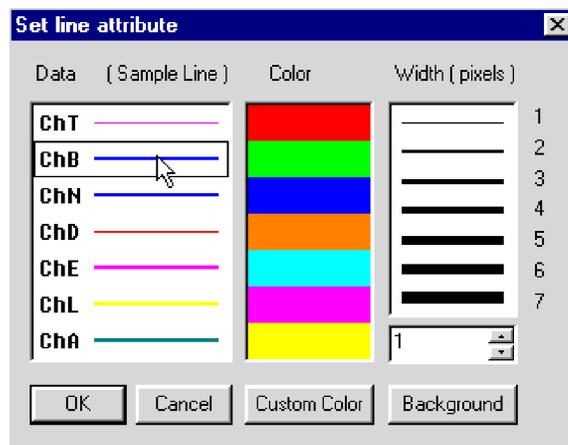


Figure 4.24: The Set Line Attributes window

any line type, click the appropriate line in the list box, then click the desired colour bar in the Color box and thickness in the Line box. If any colour other than that provided in the Color box is desired, click the **Custom** button and the Color window, with a larger selection of available colours, will be displayed (Figure 4.25).

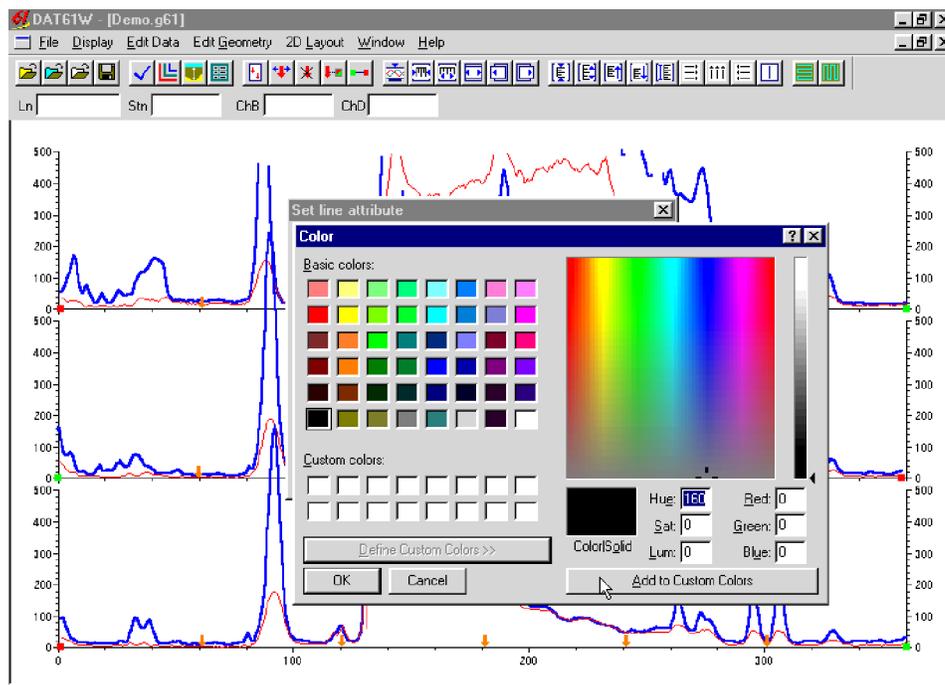


Figure 4.25: The Color window

The background colour can be changed as well. To change the background colour click the **Background** button. The window shown in Figure 4.25 will appear.

After all attributes are set, click the **OK** button and the profile display will be updated. Line attributes are written to the DAT61W initial file (DAT61W.INI); during future executions of the program, therefore, these attributes will be used as default settings.

4.10 Compressed Amplitude

To display EM61 response in compressed amplitude mode, select the **Display | Compressed Amplitude** item from the display menu (Figure 4.17). This function can also be executed by clicking the left mouse button on the button  located on the toolbar. Profiles displayed in compressed amplitude are shown in Figure 4.26. (This data can be compared with the same data displayed in linear amplitude shown in Figure 4.23.)

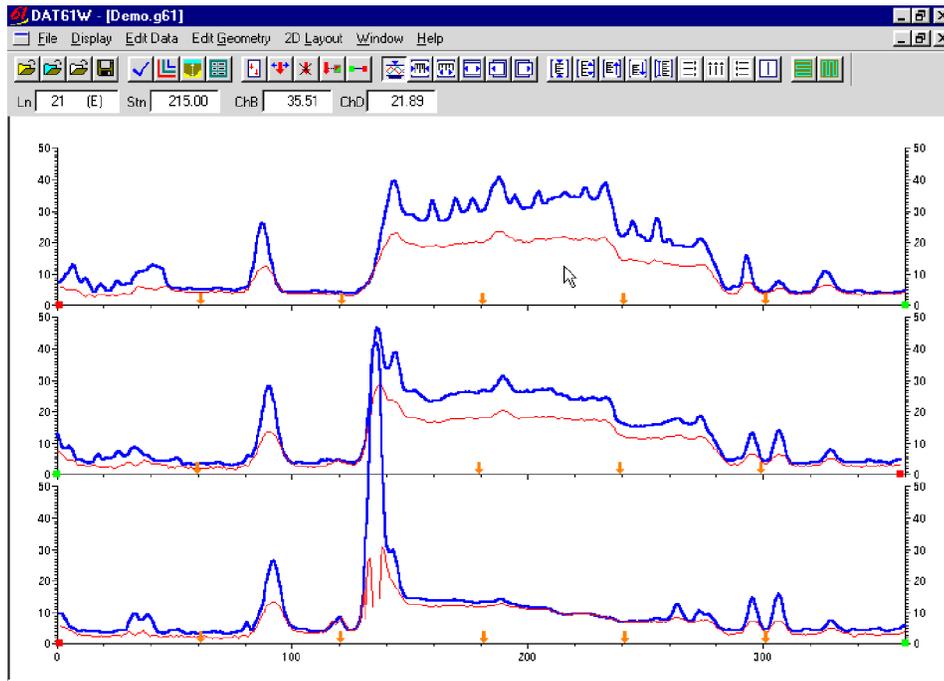


Figure 4.26: DAT61W screen with data displayed in compressed amplitude mode

Compressed amplitude is a square root of the response with no effect on sign e.g. amplitude 100 mV will be displayed as $10 \sqrt{\text{mV}}$, while -4 mV will be shown as $-2 \sqrt{\text{mV}}$.

Since the EM61 response can be extremely dynamic, the compressed amplitude allows the comparison of high readings without significant loss of information in the low range of data; the entire data set, therefore, can be usefully examined at one scale. This method is suitable for high dynamic data with relatively low noise. In general, data collected in the vicinity of power lines, and other sources of high frequency noise, should be presented in linear scale. The method of presentation depends on the particular data set and should be determined by the user.

4.11 Apparent Depth

The EM61 coil geometry allows the calculation of the apparent depth of a target. To display apparent depth, select the **Display | Apparent Depth** item from the display menu (Figure 4.17). This option can also be executed by clicking the left mouse button on the button  located on the toolbar. The apparent depth window will appear on the display (Figure 4.27).

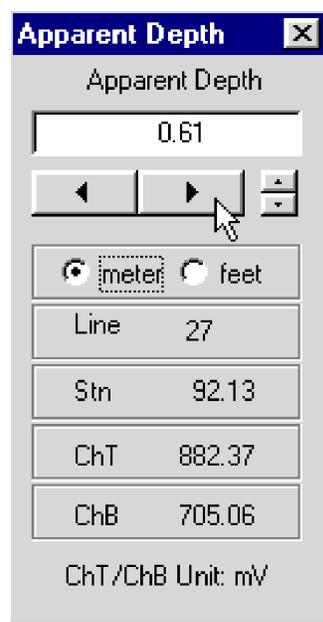


Figure 4.27: Apparent Depth window

The Apparent Depth window consists of the display box to display calculated depth, speed buttons to move cursor along the line (left and right arrows) and across survey lines (up and down arrows), two radio buttons to select units for calculated depth, and four sections to display Line, Station, and amplitudes of Channels T and B at the current location. To display apparent depth, point the mouse cursor at desired station and click the left mouse button. The apparent depth will be displayed in the Apparent Depth window. To pinpoint the location of the cursor more precisely, the left and right buttons located in the window can be used to move the cursor station by station along the survey line. The cursor is simultaneously displayed on the channel B curve indicating the location of the calculated depth (Figure 4.28).

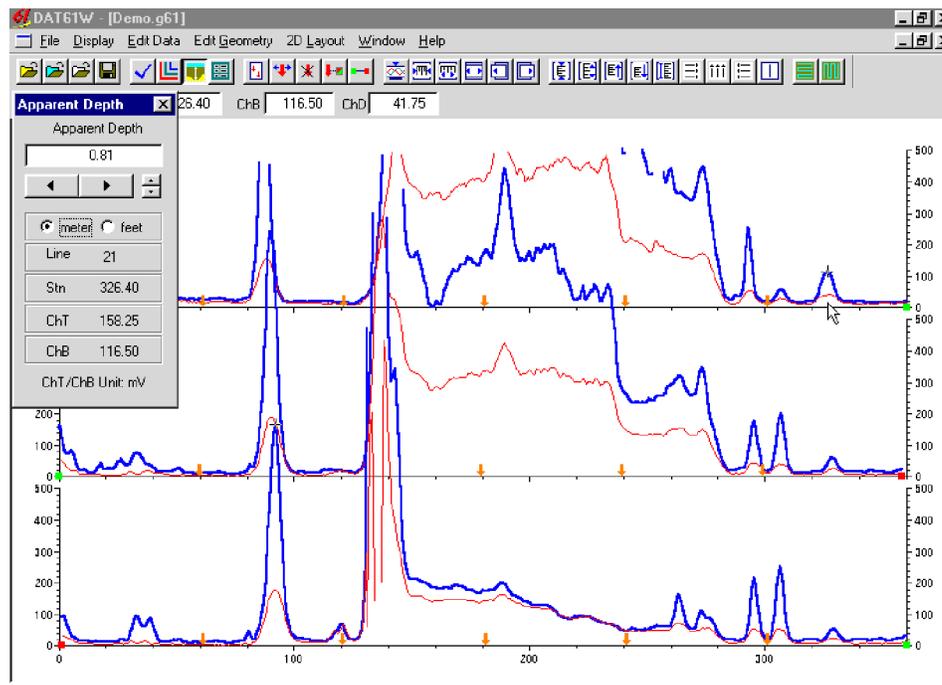


Figure 4.28: DAT61W screen with the Apparent Depth window

The most reliable value of the apparent depth calculation is obtained at the center of any anomaly. This applies to the location along the survey line, as well as across survey lines. Therefore, the amplitudes of Channels T and B should be examined closely during the calculation of apparent depth for any particular anomaly.

4.12 Refresh Screen

To redraw the screen, select the **Display | Refresh Screen** item in the Display menu (Figure 4.17). The entire screen will be redrawn immediately.

5. Editing Data

To display Edit Data menu select **Edit Data** from the main menu at the top of the screen (Figure 5.1).

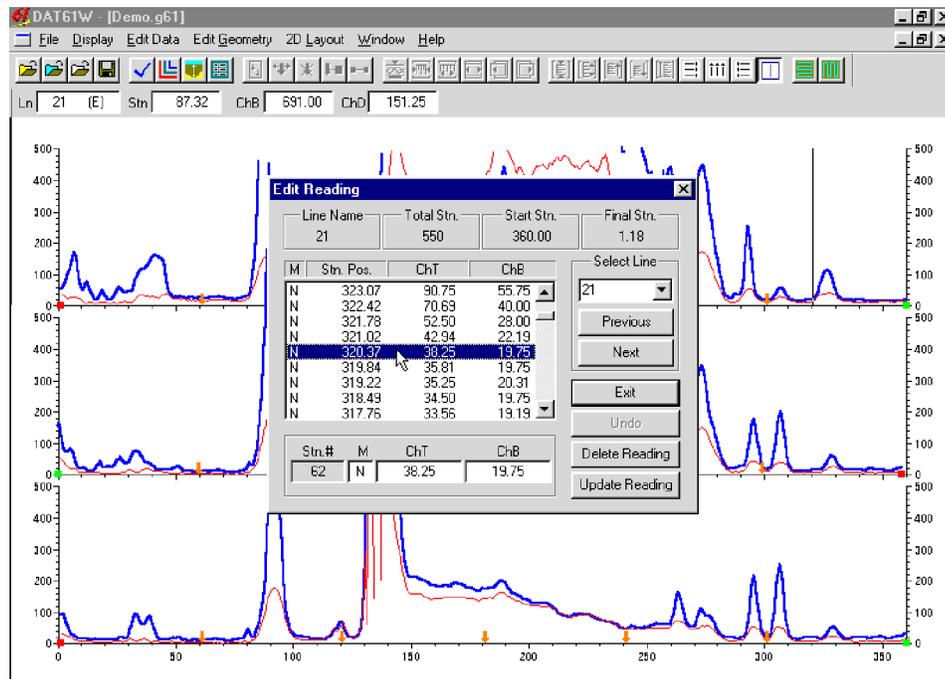


Figure 5.1: DAT61W Edit Data menu

The Edit Data menu contains five items: **Edit Reading** is used to display the numeric values of readings, delete selected readings, change Channel T and Channel B values, and insert or remove fiducial markers, **Shift Data Set** is used to increase or decrease Channel T and Channel B readings for the entire data set, or selected survey lines, **Correct Linear Drift** is used to apply a linear shift along selected survey lines, or a specified section of the survey line; **Smoothing** is used to smooth data using linear and quadratic filters; and **ChT Multiplier** can be used to change the multiplier of Channel T used during the calculation of Channel D.

5.1 Edit Reading

To display the Edit Reading window select **Edit Data | Edit Reading** from the main menu (Figure 5.1). The Edit Reading window is shown in Figure 5.2.

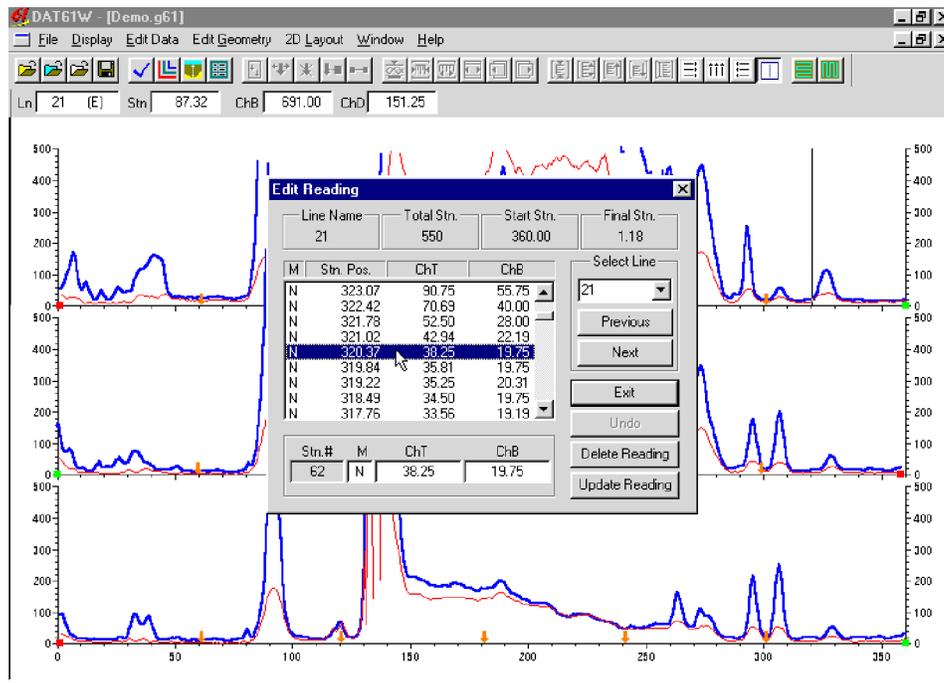


Figure 5.2: Edit Reading window

Survey lines are selected in the section labeled Select Line. Any line can be selected by displaying a pull down list of available lines and clicking on the appropriate line name, or by navigating through the displayed lines using the **Previous** and **Next** buttons. The information about the selected survey line is displayed at the top of the Edit Reading window. It contains the line name, the number of stations on the line, and the start and final stations.

Readings are displayed in the list box located in the left portion of the window. Each row in this box consists of the reading parameter **M** (fiducial marker: N - no marker, F - marker, Y - non active marker), **Stn.** (station number), **ChT** (channel T response in mV), and **ChB** (channel B response in mV). In case a survey line contains data taken with the EM61 Hand Held, **ChT** and **ChB** will be replaced with **ChE** and **ChL** (channel E and channel L response). The scroll bar located at the right edge is used to scroll through the readings of the selected line. Scrolling can also be performed using the keyboard by pressing the Up and Down keys. A short grey bar on the graphic display indicates the position of the active (highlighted) reading.

Closing the Edit Reading window with **OK**, or the close window button (right top corner of the window) will temporarily save all changes performed while the window was active. Change can be saved permanently with the **Save** or **Save As** options, see Section 4.2. Pressing the **Cancel** button will discard any editing, and data will be returned to original values.

Deleting Readings

To delete a reading at a selected station, point and click the left mouse button on the appropriate station in the list box of the Edit Reading window (Figure 5.2). The readings at the selected station will be highlighted. Then click the **Delete Reading** button. The Channel T and Channel B values will be removed from the selected station in the list box (Figure 5.3).

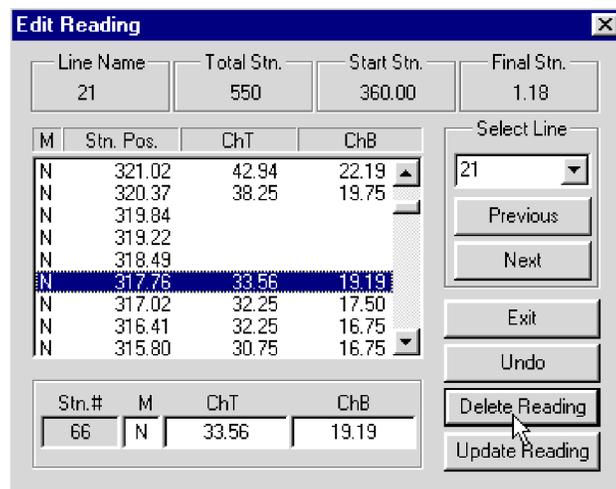


Figure 5.3: Edit Reading window during Delete Reading procedure

The graphic display will be updated in real time. The Delete Reading function can be applied to any number of stations.

Note, that this function is applied simultaneously to all available EM61 channel values.

Updating Readings

To update the value of any reading, point the mouse to the appropriate station and click the left mouse button. The selected station will be highlighted. At the same time, the values of Channel T and Channel B, as well as the status of the fiducial marker will be displayed in the edit boxes located in the bottom left corner of the Edit Reading window (Figure 5.3). These boxes are labeled **M** (marker), **ChT** and **ChB**.

To edit any of these values, point and click the left mouse button on the appropriate edit box. Enter the new value(s), then press the **Update Reading** button. The updated values will be displayed in the list box, and on the graphic display as well.

The status of the fiducial marker can be changed using the same procedure. The character **N** indicates that no fiducial marker is associated with the station. **F** indicates a fiducial marker is present, and **Y** indicates that a fiducial marker is present but is not active (for the purpose of adjusting the data - see Section 6).

Note that changes can be removed by clicking the Undo button. The Undo function associated with this procedure removes changes one by one and has an unlimited number of steps.

5.2 Shift Data Set

To display the Shift Data Set window select the **Edit Data | Shift Data Set** from the main menu (Figure 5.1). The window that will appear is shown in Figure 5.4.

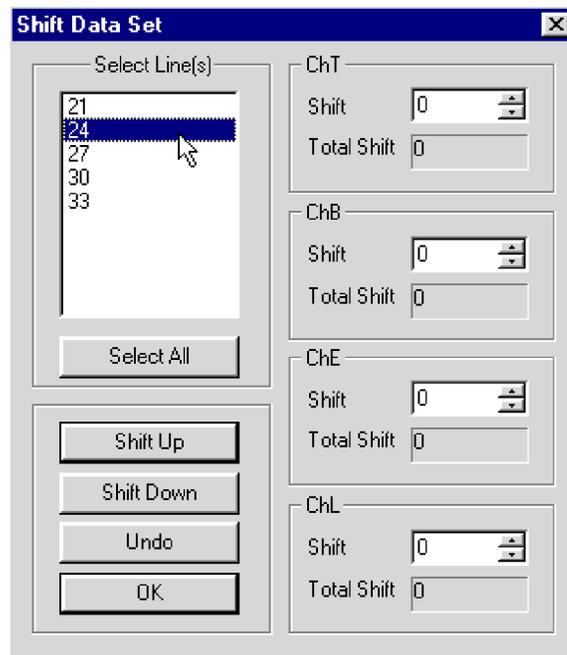


Figure 5.4: Shift Data Set window

The shifting of data function - to increase or decrease the values of all readings on a survey line by a constant amount - can be applied to any number of selected survey lines. To select lines point and click the left mouse button on all appropriate lines in the list box labeled **Select Line(s)**. Data are shifted in increments which must be specified in the edit boxes labeled **Shift** located in the windows labeled **ChT**, **ChB**, **ChE**, and **ChL**. Increments can be entered from the keyboard (after positioning the cursor in the edit box), or by pressing the speed buttons located at the right edge of each edit box. Increment 0 causes no shift for the particular component.

To shift data along selected survey lines click the left mouse button on the **Up** or **Down** buttons located at the bottom of the window. Values of the total shift will be shown in the display boxes labeled **Total Shift**. The graphic display will be updated in real time. The original curves will be displayed in grey. The screen with the shifted readings is shown in Figure 5.5.

Where results are not satisfactory, changes can be removed by clicking the **Undo** button. The Undo function can not remove changes after the selection of survey lines is updated.

Closing the Shift Data Set window using **OK** or the close window button will temporarily save any changes in the data set.

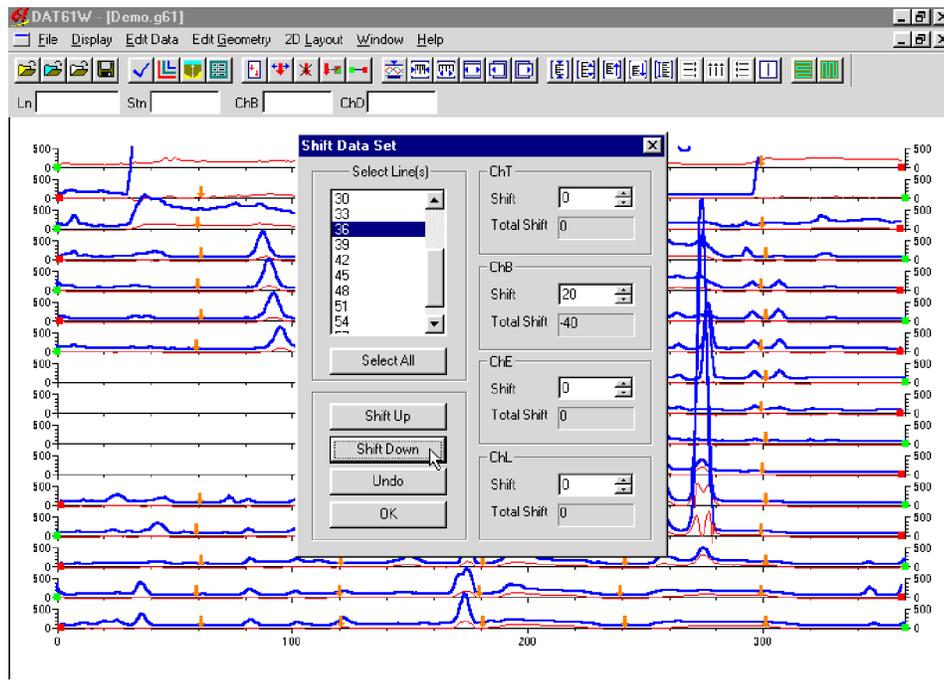


Figure 5.5: DAT61W screen during Shift Data Set procedure

5.3 Linear Drift Correction

To display the Linear Drift Correction window select **Edit Data | Linear Drift Correction** from the main menu (Figure 5.1). The window that will appear is shown in Figure 5.6.

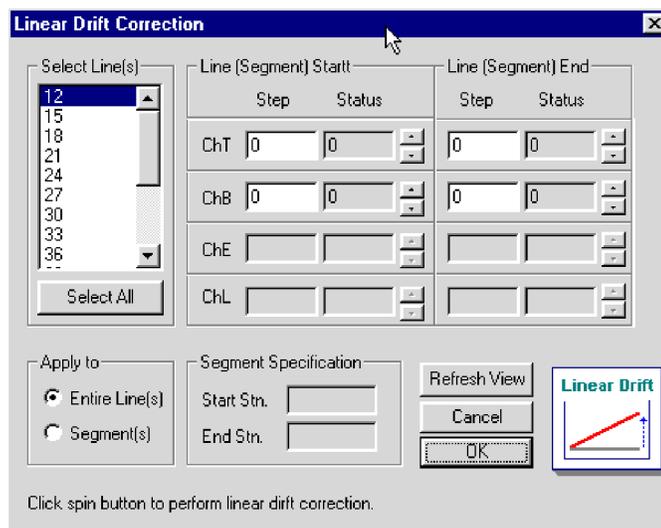


Figure 5.6: Linear Drift Correction window

Editing the Entire Survey Line

The linear shifting of data - to increase or decrease the values of all readings along the survey line as determined by a linear interpolation between the values at the two end points - can be applied to any number of selected survey lines. To select lines point and click the left mouse button on all appropriate lines in the list box labeled Select Line(s). Data are shifted in increments which must be specified in the edit boxes labeled **Step** located in the window labeled ChT and ChB. Increments (steps) can be entered from the keyboard, after positioning the cursor in the edit box. Increments must be specified separately for each channel, and the Start and Final stations of the survey lines. Note that the Start station corresponds to the actual start of the survey line in the filed, which may be located at the left or right end of the graphic display.

After the step is specified, data can be changed by pressing the speed buttons located at the right side of the Status display box. The values of steps for stations located between the start and end stations will be calculated using linear interpolation. Values of the total shift will be shown in the display boxes labeled **Status**. The graphic display will be updated in real time. The original curves will be displayed in grey. The screen with the shifted readings (Channel B curve of the selected survey line) is shown in Figure 5.7.

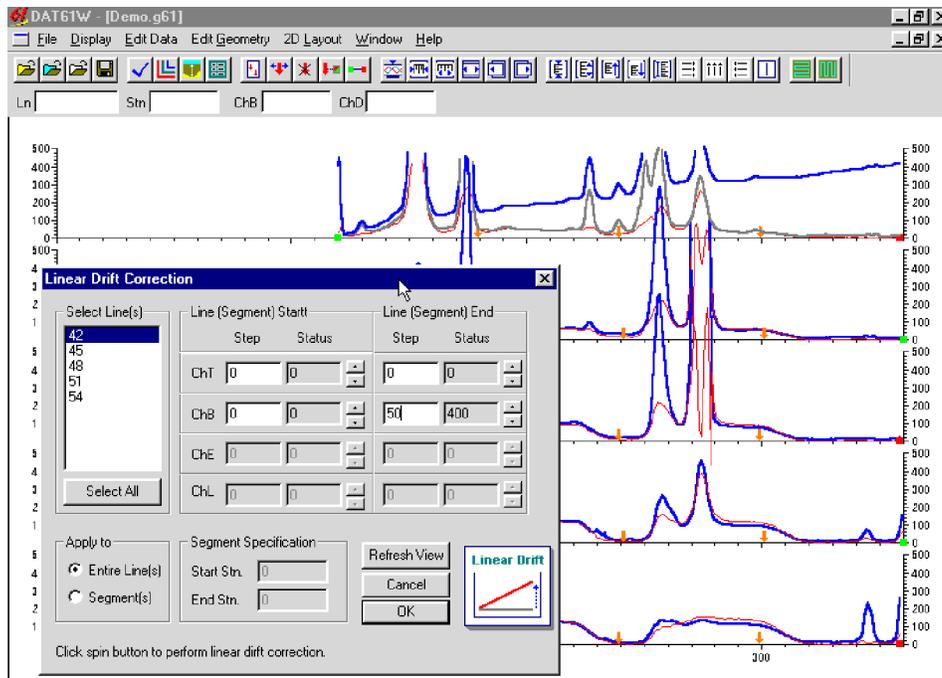


Figure 5.7: DAT61W screen during Linear Drift Correction

Where results are not satisfactory, changes can be removed by clicking the appropriate speed button until the Status value displays 0.

Editing a Segment of the Survey line

To correct drift from within a segment of the survey line only click the **Segment(s)** button located in the **Apply to** window (Figure 5.6). The Segment Specification window will be activated as shown in Figure 5.8.

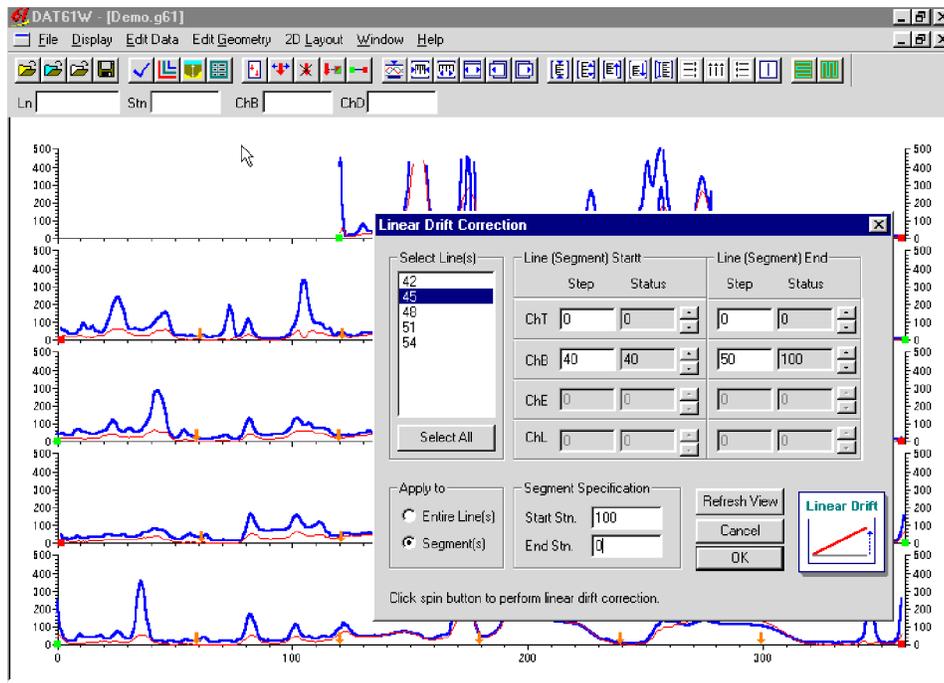


Figure 5.8: DAT61W screen during correcting segment of Survey Line

After specifying a segment of the survey line, the procedure is the same as for correction of the entire line. Changes will be applied only within the specified segment. An example is shown for a segment of line 45, in Figure 5.8.

Closing the Shift Data Set window using **OK** or the close window button will temporarily save any changes in the data set.

5.4 Smooth Data

To display the Smooth Data window select **Edit Data | Smooth Data** from the main menu (Figure 5.1). The window that will appear is shown in Figure 5.9.

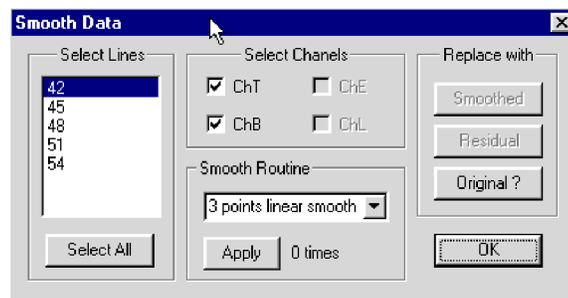


Figure 5.9: The Smooth Data window

The smoothing procedure can be applied to any number of selected survey lines. To select lines point and click the left mouse button on all appropriate lines in the list box labeled Select Line(s). Smoothing can be applied separately to the channel T and B (or channel E and L) data. To choose channels mark the appropriate boxes in the Select Channels window. Several methods of smoothing are available: 3 point linear smooth,

5 point linear smooth, etc. They are listed and selected using the Select Smooth Routine pull down menu (Figure 5.10).

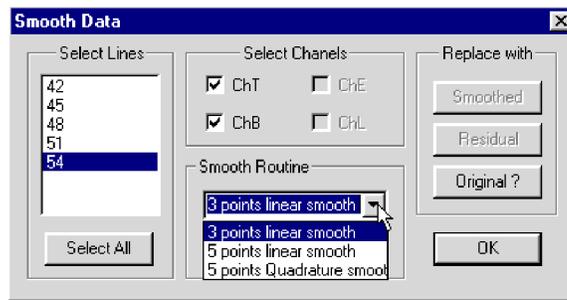


Figure 5.10: The Smooth Data window with list of available smooth functions.

After all survey lines, components, and the method of smoothing have been selected, the smoothing routine can be applied by pressing the **Apply Smoothing** button. The smoothing routine can be applied to a selected set of data several times. The number of smoothing applications is displayed and updated in the display box labeled **Times**. The graphic display will be updated in real time. The original curves will be displayed in grey. A screen with smoothed readings is shown in Figure 5.11.

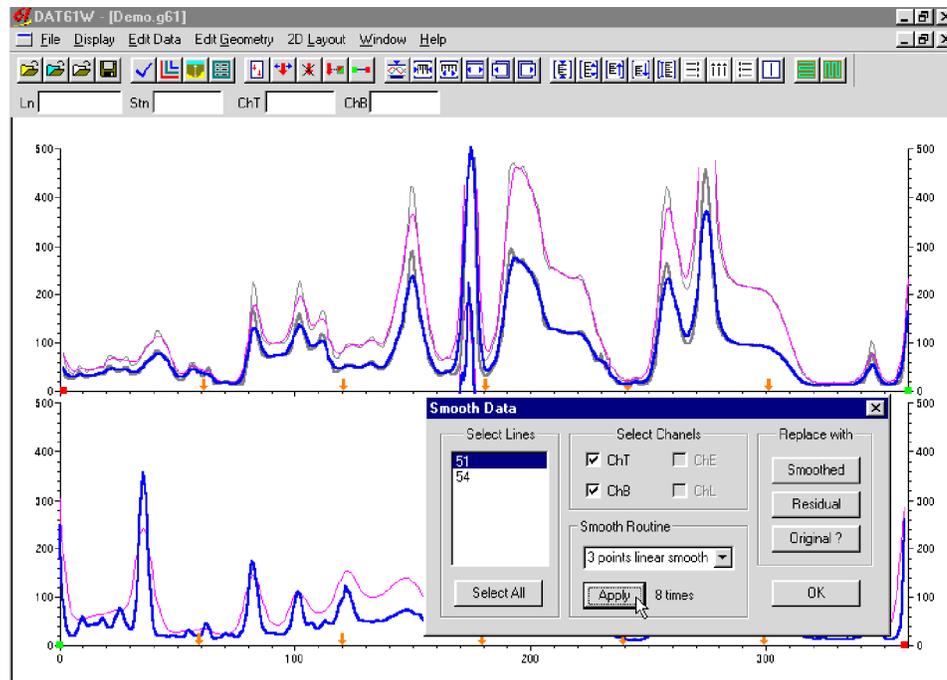


Figure 5.11: DAT61W screen during smoothing selected data

After a smoothing routine is applied, the buttons located in the **Replace with** window become active. The original data can be replaced with the Smoothed or Residual values at any time by pressing the corresponding button. If the smoothing result is not desired, the data can be returned to the original values by clicking the button labeled **Original**.

The simple, three point linear smoothing function is adequate for “average” EM61 data. Ultimately, however, the method of smoothing (or generating residual curves) and the degree of smoothing depends on the particular data set, objectives, desired method of the presentation, etc.

Closing the Smooth Data window using **OK** or the close window button will temporarily save changes in the data set.

5.5 Channel T Multiplier

To change the value of the channel T multiplier, select **Edit Data | ChT Multiplier** from the main menu (Figure 5.1). The window that will appear is shown in Figure 5.12.

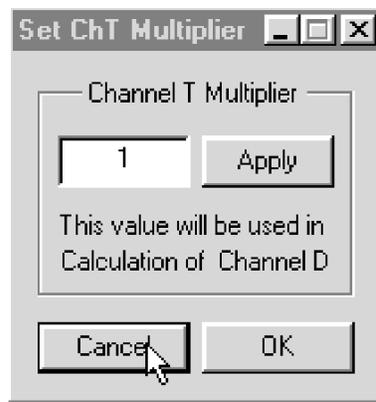


Figure 5.12: Set ChT Multiplier window

The Channel T multiplier is used during calculations of the differential channel (Channel D) according to the formula: $\text{Channel D} = k \times \text{Channel T} - \text{Channel B}$, where k is the Channel T multiplier. This multiplier is 1 by default.

6. Editing Survey Geometry

The Edit Geometry option allows the adjustment of profile geometry, including the repositioning of both the start and end stations of each line, as well as any station marked with the fiducial switch. To display the Edit Geometry menu select **Edit Geometry** in the main menu at the top of the screen (Figure 6.1).

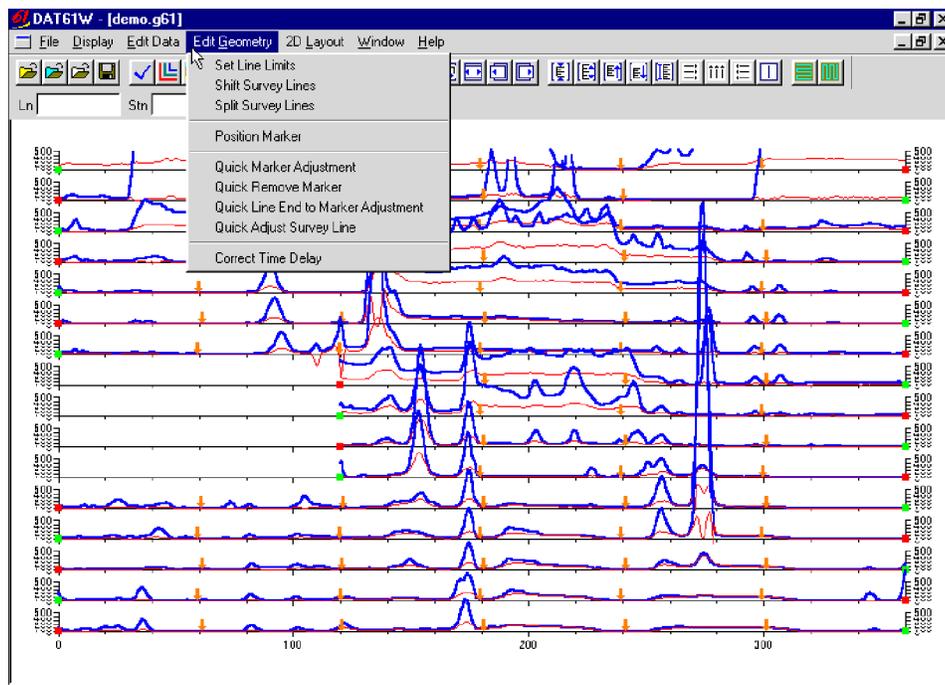


Figure 6.1: DAT61W Edit Geometry menu

The Edit Geometry menu contains four groups of items. In the first group, **Set Line Limits** will change the position of the start and end stations of any selected group of survey lines; **Shift Survey Lines** can be used to move any selected group of survey lines in either a positive or negative direction along the profile axis; **Split Survey Lines** will separate any related survey line into two independent survey lines.

The second group contains only one item, **Position Markers**, which is an efficient tool for aligning fiducial markers and the start and end points of survey lines.

The third group contains four items that allow quick (although less accurate) positioning of fiducial markers, and the start and end stations of each survey line. These “quick” tools are easily accessible from buttons located on the tool bar.

The fourth group contains only one item, **Correct Time Delay**, which is a tool for adjusting station positions according to the rate of travel during data collection. To use this function files must include a Time Stamp with each reading (GPS option in the Polycorder).

6.1 Set Line Limits

To display the Set Line Limits window select **Edit Geometry** | **Set Line Limits** in the menu (Figure 6.1). The Set Line Limits window is shown in Figure 6.2.

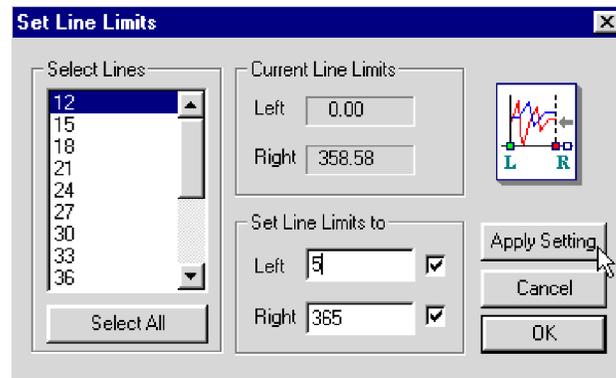


Figure 6.2: Set Line Limits window

The option to set line limits (positions of the start and end stations) can be applied to any number of selected survey lines at one time. To select lines, use the list box labeled Select Line(s). In the display box labeled Current Line Limits, the minimum (Left) and maximum (Right) positions of stations are shown. (In this option, Left corresponds to the minimum stations on the left side of the screen, while Right corresponds to the maximum position of stations on the right side of the screen for the selected survey lines.) New values of Left and Right positions can be specified in the two edit boxes labeled Set Line Limits to.

If both edit boxes are checked (Figure 6.2), both ends of the selected survey lines will be repositioned to the specified values. In this case, the station intervals will be adjusted accordingly. If only one edit box is checked (Figure 6.3), the active station will be repositioned to the specified location, while the non-active station will remain unchanged.

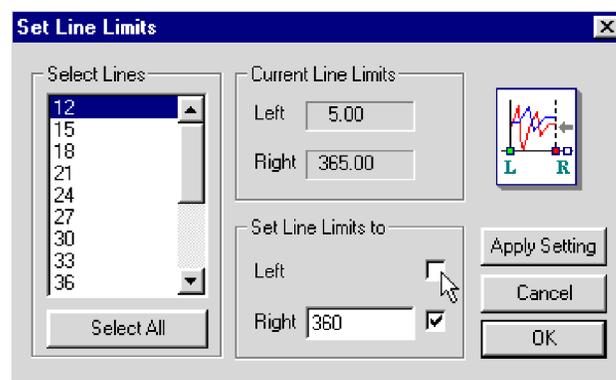


Figure 6.3: Set Line Limits window with one edit box checked

After the **Apply Setting** button is clicked, the specified adjustments are completed. The graphic display will be updated in real time. The procedure can be repeated for any additional sets of survey lines and settings.

If any change is not satisfactory, clicking the **Cancel** button will close the Set Line Limits window and will return all stations to positions prior to the last operation. Clicking the **OK** button will close the Set Line Limits window and accept the changes.

6.2 Shift Survey Lines

To display the Shift Survey Lines window select **Edit Geometry | Shift Survey Lines** in the menu (Figure 6.1). The Shift Survey Lines window is shown in Figure 6.4.

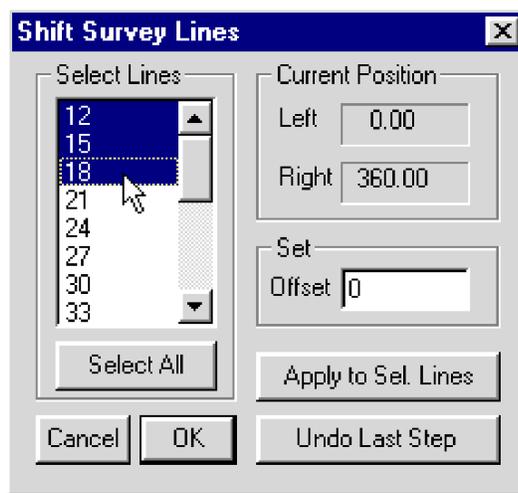


Figure 6.4: Shift Survey Lines window

This option allows any number of selected survey lines to be shifted, left or right, along the profile axis. The survey lines to be shifted can be selected from the list box labeled **Select Line(s)**. The information on current positions of the end points of selected survey lines is shown in the display box labeled Current Position. The shift increment (step) can be entered in the edit box labeled Set Step. If the step is positive, the selected lines will be shifted to the right, with the station numbers increasing accordingly. A negative step will shift survey lines to the left, with station numbers decreasing accordingly. This operation will not change the length of the survey lines.

After the step is entered, clicking the button labeled Apply to Sel. Lines(s) will shift the selected lines. The graphic display will be adjusted in real time. The last operation can be canceled by clicking the **Undo Last Step** button.

To end this operation, click the button labeled Exit, and the Shift Survey Lines window will close, accepting all changes.

6.3 Split Survey Lines

To display the Split Survey Lines window select **Edit Geometry | Split Survey Lines** in the menu (Figure 6.1). The Split Survey Lines window is shown in Figure 6.5.

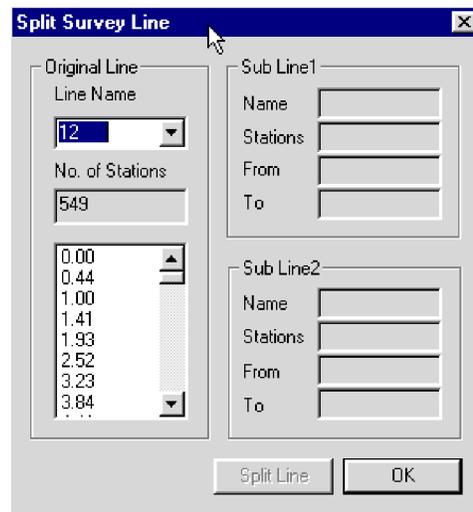


Figure 6.5: Split Survey Lines window

This option allows the division of one survey line into two independent survey lines. The survey line can be further divided into any number of separate lines or segments, simply by repeating the procedure.

The survey line to be split is selected in the window labeled Original Line. To select a line, display the pull down list of available lines (in box labeled Line Name), and click on the line name (Figure 6.6). The number of stations contained in the selected line, and the positions of the stations, will be displayed below the Line Name box.

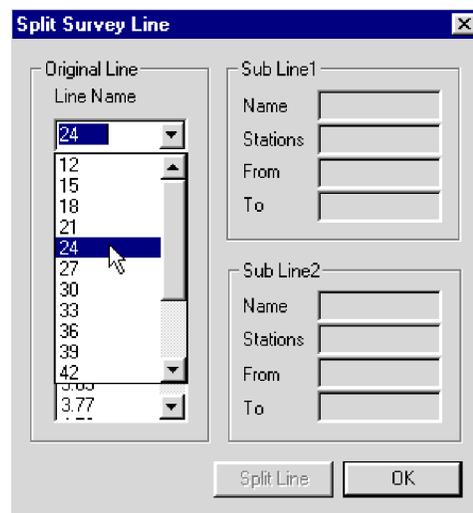


Figure 6.6: Selecting a line in the Split Survey Line window

To select the station at which the line will be split, scroll to and highlight the desired station. The selected station will be the last station of the first line (after split), while the following station will be the first station of the second line. This information, as well as the number of stations in each new line, is provided in windows labeled Sub Line 1 and Sub Line 2 (Figure 6.7).

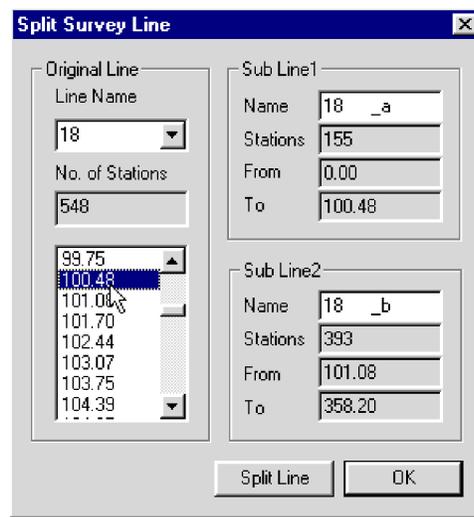


Figure 6.7: Selecting the station in the line

A vertical bar will move along the selected line indicating the position of the selected station on screen (Figure 6.8).

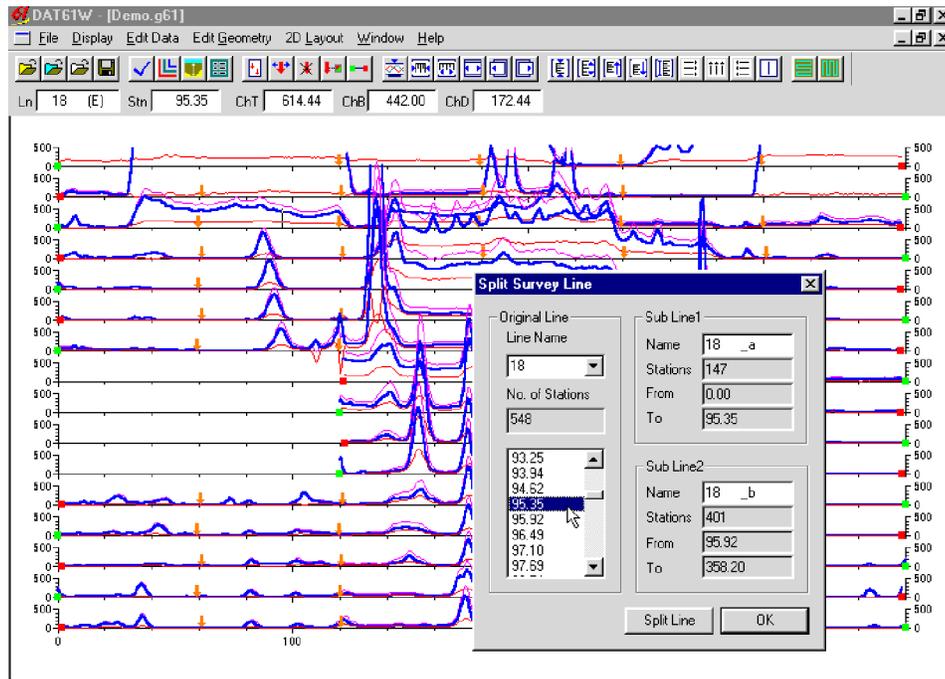


Figure 6.8: Graphical display before survey line split

After the station is selected the survey line can be split by clicking the button labeled **Split Line**. The effect of the line split is shown in Figure 6.9.

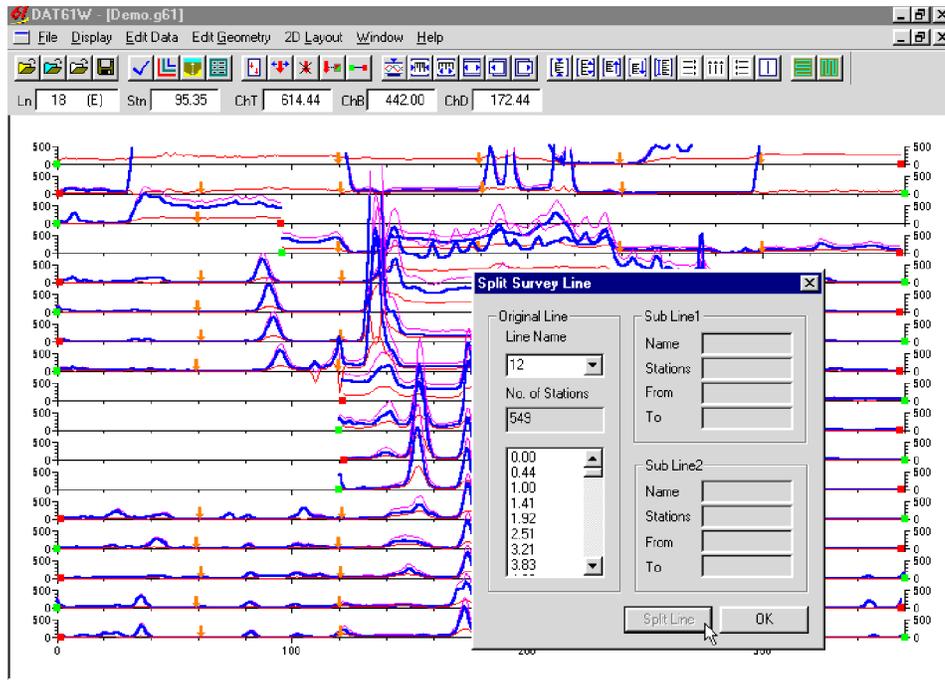


Figure 6.9: Graphical display after survey line split

New lines are named by using the original name with an added underscore and an alphabetic character in sequence. Survey lines can be renamed later using the Select Line option.

Please note that the DAT61 file format (G61 file) does not allow line names to exceed 8 characters.

To exit this option click the **OK** button, and the Split Survey Line window will close accepting all changes.

6.4 Position Markers

To display the Position Markers window select **Edit Geometry** | **Position Markers** in the menu (Figure 6.10), or click the Position Markers button  located on the tool bar. The Position Markers window is shown in Figure 6.11.

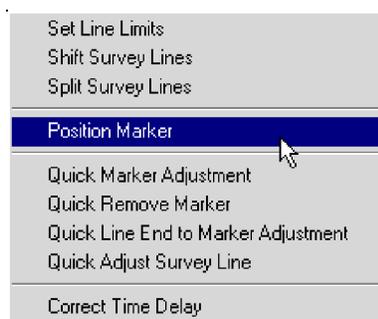


Figure 6.10: Edit Geometry menu

This option allows you the repositioning of points that were marked with the fiducial switch (marker) in the AUTO or WHEEL mode. The procedure can adjust a selected marker or a selected group of markers. It also allows the changing of start and end stations. In this option, the start and end stations of each survey line can be edited in the same way as stations tagged by fiducial markers.

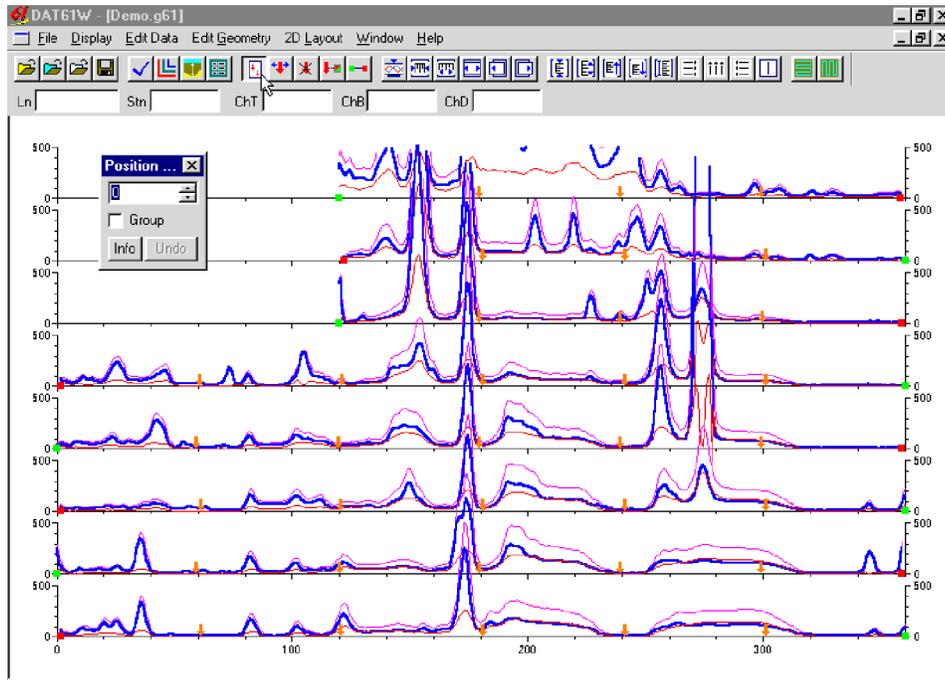


Figure 6.11: Position Markers window

The Position Marker window is simple and small in order to allow a maximum view of the profiles display at all times. An unlabeled edit box is provided for entry of the station number to where the marker or the start/end station will be moved. The station number can be entered using either the keyboard, or the two speed buttons provided.

A check box labeled **Group** is located below the edit box. The Group option is toggled on/off by clicking the check box. When the check box is marked (on), repositioning will be applied to a selected group of markers. Otherwise, if the check box is unmarked (off, default) repositioning will apply to a single marker or start/end station only.

After the **Info** button is clicked by the left mouse button the window with related help information will be displayed.

The **Undo** button will cancel the most recently applied repositioning only. The window can be closed by clicking the **Close** button located in the top right corner of the window, by clicking **Position Markers** button  on the tool bar, or by unchecking the **Position Markers** item in the **Edit Geometry** menu (Figure 6.10).

Repositioning A Selected Marker

To reposition a selected marker, the **Group** box in the **Position Markers** window must be unchecked. This is the default setting. In the edit box, enter or select a station number (position) to which the marker (or start/end station) is to be moved. Position the cursor on (or near) the marker that is to be moved and press the left mouse button. The marker will be repositioned to the station entered in the edit box. Figure 6.12 shows markers that were moved from station 300 to 320 in the top three survey lines.

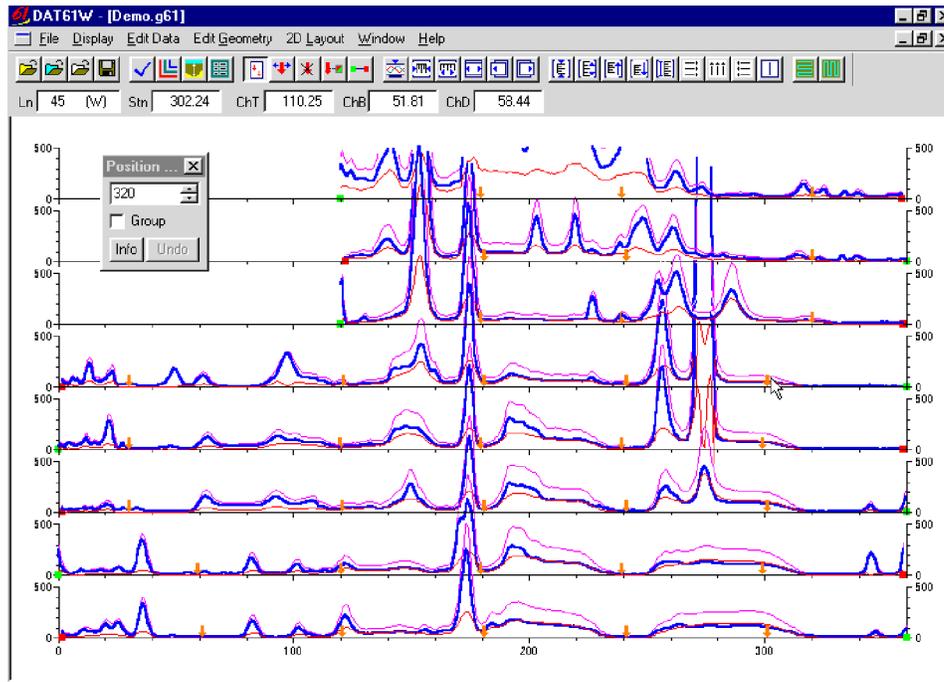


Figure 6.12: Positioning selected markers

Please note that the station where the marker is to be moved must be located between two neighboring markers (or start/end station). If the specified station is beyond this range a warning message will be displayed. In the event that a marker must be repositioned beyond the range of a neighboring marker, either reposition or delete the adjacent marker first.

Reposition a Group of Selected Markers

To reposition a group of selected markers the **Group** box in the **Position Markers** window must be checked. In the edit box, enter or select the station number (position) to which the selected markers (or start/end stations) are to be moved. Drag a rectangle around the group of markers to be repositioned (Figure 6.13). Position the cursor inside the rectangle and press the left mouse button. All markers (or start/end stations) enclosed in the rectangle will be repositioned to the station entered in the edit box (Figure 6.14).

The above procedure can be completed in reverse order as well. First, a rectangle is dragged around the selected markers, and then the station is specified in the edit box. Positioning the cursor inside the rectangle and pressing the left mouse button will reposition all selected markers.

Rules for the repositioning of a group of markers are the same as those for a single marker. The station where the markers are to be moved must be located between two neighboring markers (or start/end station) for each selected marker. If the specified station is beyond this range a warning message will be displayed,

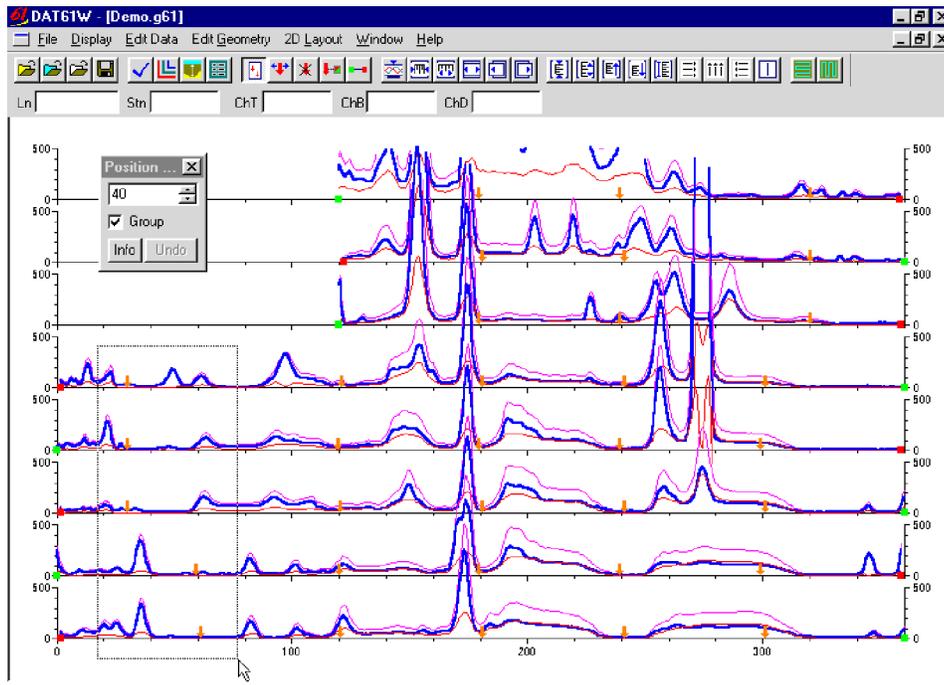


Figure 6.13: Positioning Group of Selected Markers

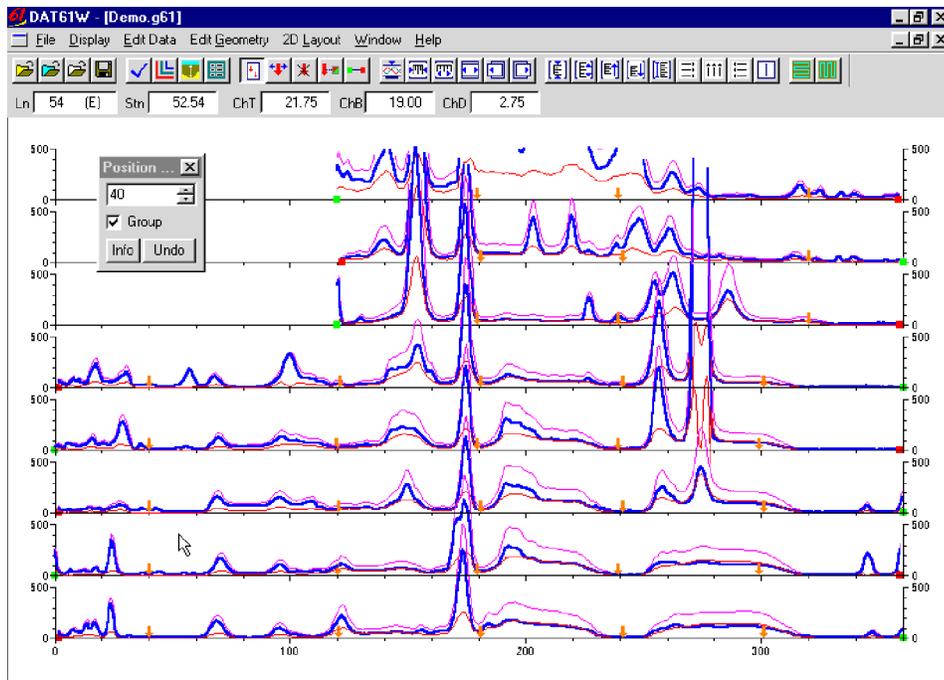


Figure 6.14: DAT61W screen after Positioning Group of Selected Markers (see Figure above)

and the affected marker will not be repositioned. In the event that the marker must be repositioned beyond the range of two neighboring markers, either reposition or delete the adjacent marker first.

Methods for adjusting profiles and fiducial markers for surveys conducted in MANUAL, AUTO, and WHEEL modes are also described in section 2.3 of this manual (Quick Start - Editing Survey Geometry).

6.5 Quick Marker and Profile Adjustments

Four tools for quick adjustments of start and end stations, and for deleting and repositioning fiducial markers, are provided in the Edit Geometry menu (Figure 6.15).

These are:

-  Quick Marker Adjustment
-  Quick Remove Marker
-  Quick Line End to Marker Adjustment
-  Quick Adjust Survey Line

The accuracy of the “quick” repositioning of markers and stations is relatively limited as compared to the **Position Markers** option (described in section 6.4) due to the limited resolution of the screen. They are very useful, however, for the initial adjustments of survey geometry.

To access any of these tools select **Edit Geometry | Quick...** in the menu (Figure 6.15), or by clicking the appropriate buttons: , , , and  located on the tool bar.

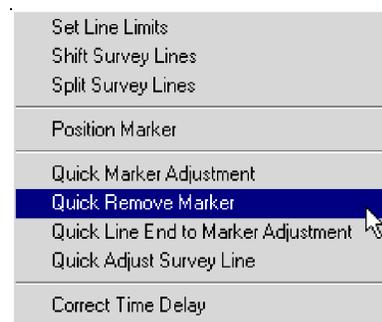


Figure 6.15: Edit Geometry menu

Quick Marker Adjustment

Select **Quick Marker Adjustment** in the Geometry menu, or click the  button on the tool bar. To reposition the marker, position the cursor over the marker, press and hold the left mouse button, and drag the marker along the survey line. The marker cannot be moved beyond the neighboring marker in either direction or the Start and End stations.

Quick Remove Marker

Select **Quick Remove Marker** in the Geometry menu or click the  button on the tool bar. To remove the marker, position the cursor over the marker, and press the left mouse button. A window confirming deletion (Yes/No) will be displayed. After confirmation the marker will be deleted. This tool has no Undo feature.

Quick Line End to Marker Adjustment

Select **Quick Line End to Marker Adjustment** in the Geometry menu or click the  button on the tool bar. This option allows the adjustment of a section of line between the start/end station and the closest fiducial marker. To reposition the ends of any survey line, position the mouse over the start or end station

of the survey line. (These points are marked by small green (start) or red (end) circles on the display.) Press and hold the left mouse button, and drag the selected station to the desired position. The position of the selected station will be changed without affecting the closest marker.

Quick Adjust Survey Line

Select **Quick Adjust Survey Line** in the Geometry menu or click the  button on the tool bar. This option allows an adjustment to the start and end stations of each survey line. To reposition any end point of a survey line, position the cursor over the start or end station of the survey line. (These points are marked by small green (start) or red (end) circles on the display.) Press and hold the left mouse button, and drag the selected station to the desired position. The position of the selected station will be changed with the following rules applied:

If the start station is repositioned, the entire line will be shifted without changing the length of the survey line. The end station, therefore, will be moved as well.

If the end station is repositioned, only the end station will move while the start station remains fixed. The length of the survey line and distance between stations (increment) will be changed (expanded or squeezed) according to the change applied to the end station.

6.6 Correct Delay Time

If data were collected in the field using the GPS option, this function allows the correction of station positions caused by the instrument time delay. To access this option select **Edit Geometry | Correct Time Delay** in the menu (Figure 6.15). The Correct Time Delay window will appear on the screen (Figure 6.16).



Figure 6.16: Edit Geometry menu

There are two options for the manner in which correction can be applied. The first (while Standing) applies to any survey where the operator begins each survey line from a standing position; instrument movement and data acquisition, in this case, are initiated at the same time.

The second option (while Walking) applies to any survey where the operator begins each survey line off the grid and moves toward the first station; in this case, instrument movement is initiated before data acquisition.

The difference in correction between these two options will be evident in the initial section of each survey line only.

After the Start Line option is selected, the time delay correction is applied by clicking the **Apply** button. A progress bar, indicating the percentage of calculations performed, appears at the bottom of the Correct Time Delay window (Figure 6.17).

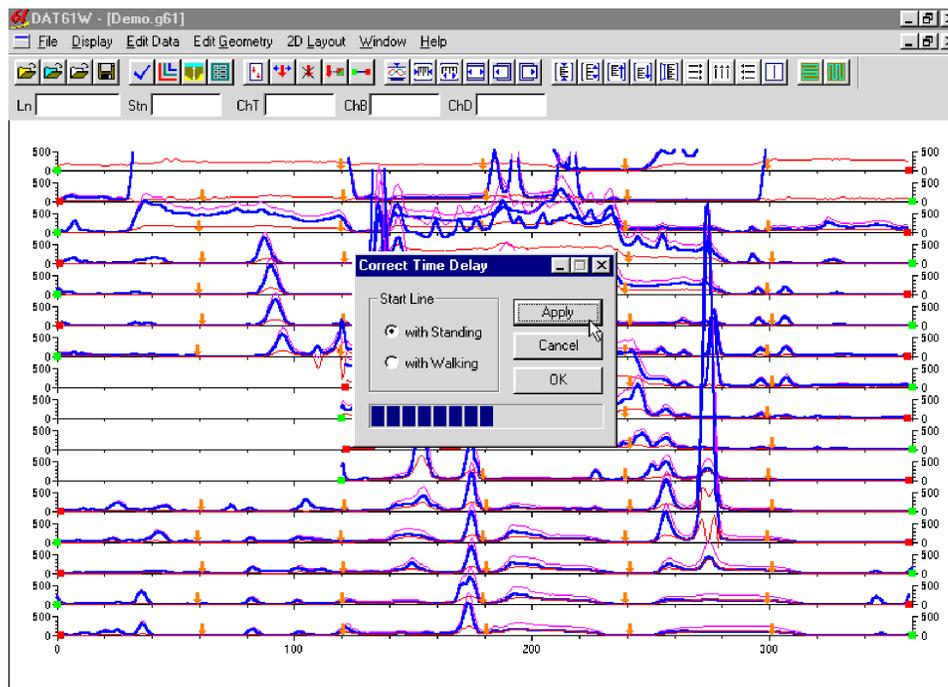


Figure 6.17: DAT61W Screen during Correction for the Instrument Time Delay

During calculations, the position of each station is adjusted according to the instrument speed while passing given station. After the calculations are performed, the profile screen is updated. The display, particularly the alignment of anomalies indicating linear features, should be examined. Results can be accepted by pressing the **OK** button. Clicking the **Cancel** button will cancel all changes and the display will return to the state before the Correct Time Delay window was displayed.

7. 2D Layout (Create XYZ File)

The 2D Layout option allows for the creation and viewing of two dimensional layouts of survey lines. The **View Survey Layout** options require that the survey line names indicate one of the coordinates, X or Y (Easting or Northing) and stations along the lines are associated with the other coordinate. **Create XYZ File** allows the generation of files with any configuration of survey lines, including Arbitrary Orientation, however this procedure is relatively time consuming since it requires manual entry of coordinates for two points per survey line. Therefore, it is strongly recommended that each data file be organized so that each file contains parallel lines surveyed in one direction, either W-E or S-N. If line names do not correspond to an appropriate coordinate, they can be easily changed by the **Rename** function in the **Select Survey Lines** window.

To display 2D Layout menu select **2D Layout** in the main menu at the top of the screen (Figure 7.1).

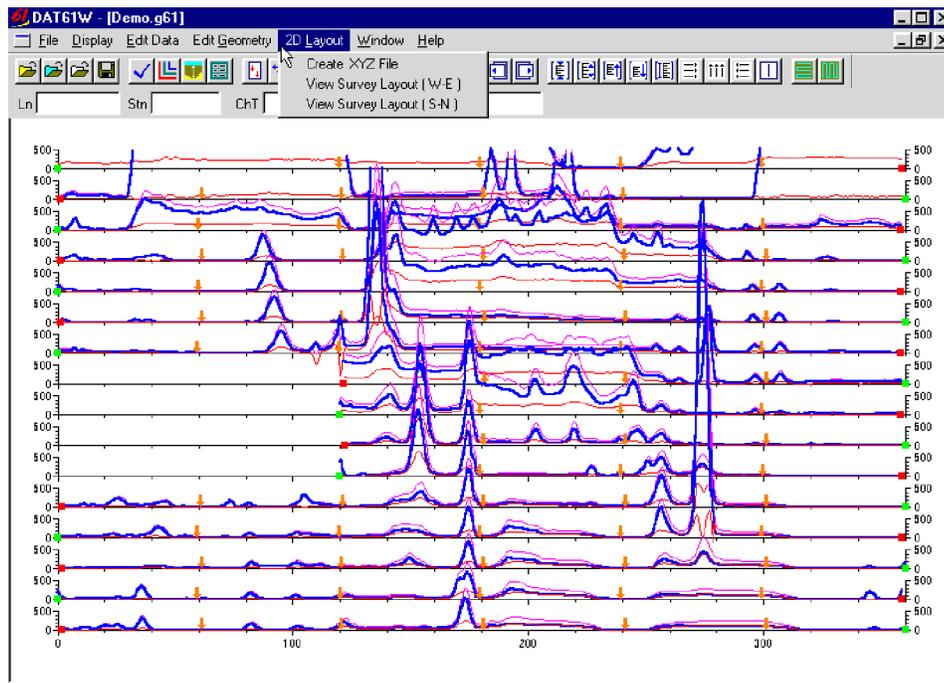


Figure 7.1: 2D Layout menu

The **2D Layout** menu contains three items. The first item, **Create XYZ File** generates an XYZ file which can be used as an input file for various contouring systems.

The two remaining items on the menu, **View Survey Layout (W-E)** and **View Survey Layout (S-N)**, can be used to view a two dimensional layout of stations for surveys (or a portion of a survey) carried in the W-E direction (along the X coordinate) and in the S-N direction (along the Y coordinate). These last two items are also accessible through buttons  and  located on the tool bar.

The two **View Survey Layout** options show a two dimensional layout of stations and survey lines. Each station is represented by a dot on the screen. At this point the configuration of the layout can be examined visually and corrected if required.

7.1 Create XYZ File

This option creates a file containing three to six columns: X, Y, Z1, to Z2 (where Z1 is e.g. Channel T, Z2 is Channel B, and so on) in ASCII format. The generated file can be used as an input file for the Geosoft or Surfer contour programs (or any other program that accepts a four column format). All data must be entered through the **Load EM61 Profile** or **Add** menus prior to running this option.

After **2D Layout | Create XYZ File** from the profile menu is selected, the **Create XYZ File** window is displayed (Figure 7.2).

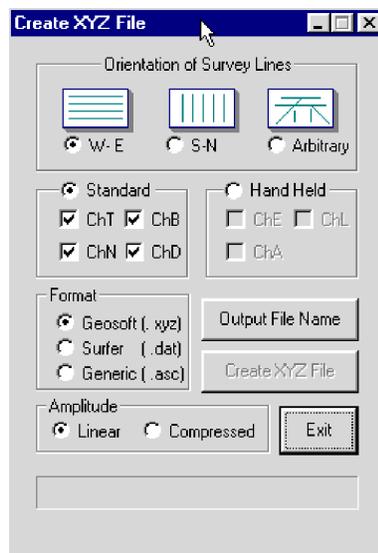


Figure 7.2: Create XYZ File window

Parameters describing contents and format of XYZ file

Several parameters which affect the contents and format of the created XYZ file must be specified. Specifically, these are the Orientation of Survey Lines, type of the instrument (Standard or Hand Held EM61), Format of the output file, Amplitude scale (Compressed or Linear), and the output file name. For each parameter, only one option can be chosen for each layout, selected by clicking the appropriate radio button.

Orientation of Survey Lines

Choose **W-E**, **S-N**, or **Arbitrary** orientation of survey lines. The W-E orientation corresponds to the layout where lines are parallel and oriented in the X direction (assuming that the North and Y coordinate point to the top, and that the East and X coordinate point to the right edge of a page). The S-N orientation corresponds to a similar, but perpendicular layout; lines are parallel to and oriented in the Y direction. The Arbitrary option is designed for layouts where survey lines are not parallel.

If the W-E orientation is selected, it is assumed that the line name is the Y (S-N) coordinate and stations are aligned along the X (W-E) axis. If survey lines are parallel and oriented in W-E direction, but the line names do not correspond to the Y coordinate, then rename the lines in the Select Lines window (see section 4.3). It should be noted that if the line name starts with a number and ends with letters, e.g. 10N, only the number will be recognized as a Y coordinate.

If the S-N orientation is selected, the line name corresponds to the X (W-E) coordinate and stations are aligned along the Y (S-N) axis. Again, if survey lines are parallel and oriented in S-N direction, but the line names do not correspond to the X coordinate, then rename the lines in the Select Lines window (see section 4.3). It should be noted that if the line name starts with a number and ends with letters, e.g. 10E, only the number will be recognized as an X coordinate.

The Arbitrary option is used only in the case where lines are not parallel. A description of creating of the XYZ file while using this option is given separately at the end of this section.

Instrument Type

Check the appropriate button in the Create XYZ File window labeled Standard or Hand Held. Readings collected by the indicated instrument will be written into the created file. Only one instrument type data is allowed per file. If data set includes data from both instruments, create a separate XYZ file for each type of the instrument.

Channels

Check the appropriate button in the Standard or Hand Held section of the Create XYZ File window. Any set of EM61 channels can be written to the created file, however they will be always placed in the output file in one order. For Standard EM61 channels will be placed in columns in the following order: Channel T, Channel B, Channel N, and Channel D. If data was taken by the EM61 Hand Held channels will be written as follows: Channel E, Channel L, and Channel A.

Format

Check the appropriate option for the contouring software to be used. The Generic option will create a three to six column file (see Channels above) without any text strings. This file can be used as an input file for many contouring packages (including Geosoft and Surfer). The Geosoft format will cause the program to write LINE # at the beginning of each survey line, which is necessary if the Geosoft BIGRID module is used to grid the data.

Amplitude

Check the appropriate button in the Create XYZ File window section labeled Amplitude. Readings will be written in linear (original) scale, or if Compressed amplitude is checked the square root of each channel will be placed in the output file. The latter (compressed scale) does not apply to Channel A.

Output File Name

After the **Output File Name** button is clicked, a Select XYZ File Name window is displayed, as shown in Figure 7.3. The EM61 file name with an extension corresponding to the selected output file format (xyz, dat, or asc) is given as a default.

Accept the default or specify a new file name and click the Save button. The Select XYZ File Name window will close and the selected file name will be displayed at the bottom of the Create XYZ File window. At the same time the **Create XYZ File** button is activated.

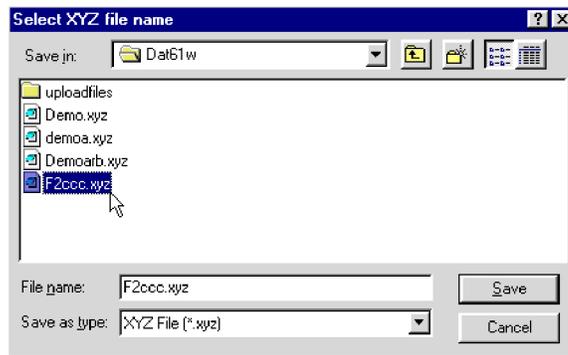


Figure 7.3: Select XYZ File Name window

Creating an XYZ file with W-E or S-N line orientation

When the Orientation of Survey Lines parameter is set to W-E or S-N then clicking on the active **Create XYZ File** button is the only action required to start writing the file. After this button is clicked a progress bar located at the left bottom corner of the window will indicate the percentage of the created file that has been completed (Figure 7.4).

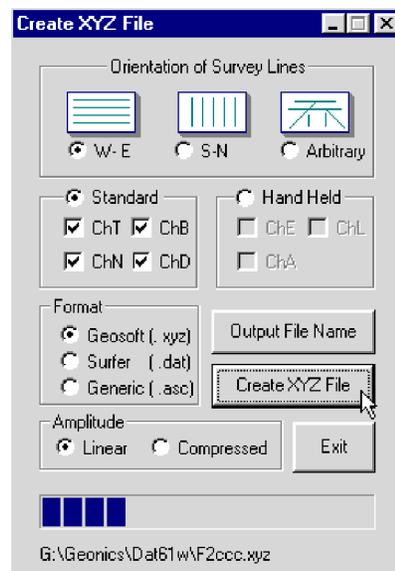


Figure 7.4: Create XYZ File window during file writing

This operation is usually very fast for the W-E and S-N line orientations. (It is a more lengthy process for the Arbitrary survey lines orientation, since several locations must be manually entered by the operator.) After the file is created, the Create XYZ File window is minimized, and the two dimensional layout of stations is displayed (Figure 7.5).

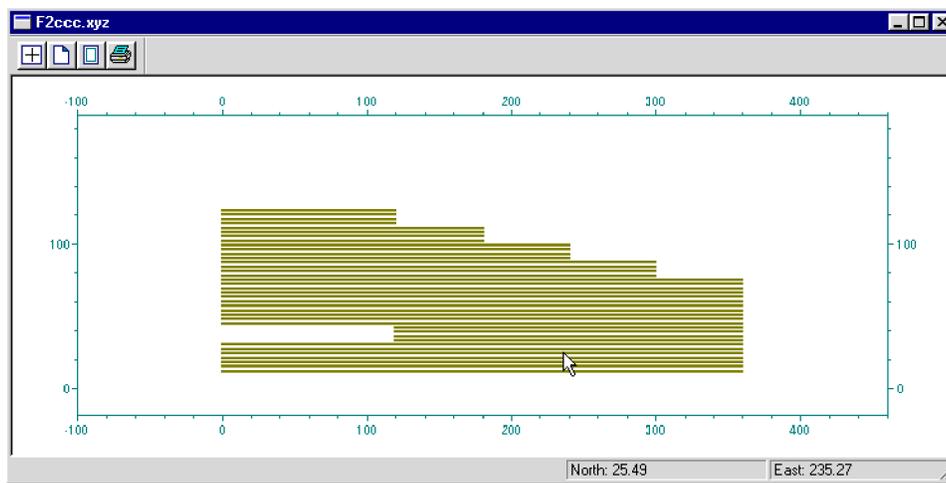


Figure 7.5: Layout of stations after an XYZ file is created

The displayed image shows the spatial layout of lines and stations to scale, based on the station coordinates written to the created file. The layout can be examined and printed. An option located on the menu and tool bar of this screen allows for the identification of coordinates through the use of two perpendicular lines, horizontal and vertical, and a display of coordinates in the bottom right portion of the screen.

Files created by this portion of the program can be also viewed at any time using the **File | Open | XYZ** menu or by clicking the **View XYZ File** button located on the tool bar.

Creating the XYZ file with Arbitrary orientation

The Arbitrary option is used only for those surveys where lines are not parallel. When this option is selected the right portion of the Create XYZ File window, labeled Arbitrary Orientation, becomes active. After the Output File Name is specified (see Output File Name) and the **Create XYZ File** button is clicked, two stations for each survey line in the file must be entered. (The program will systematically preview each survey line for entry of required station coordinates.) In the edit box of the Reference Station #1, enter the coordinates of the start station of the indicated survey line and, for Reference Station #2, enter the coordinates of any other point on this survey line assuming that the survey line is a straight line only. A projection of the coordinates for every station will be calculated. A progress bar located at the bottom of the window indicates percentage of data written to the file. The Create XYZ File window during this procedure is shown in Figure 7.6.

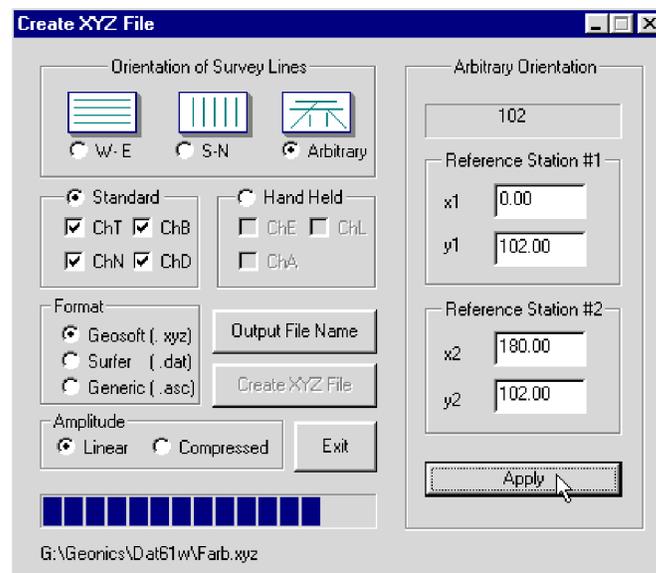


Figure 7.6: Create XYZ File window during writing file

After the file is created, the Create XYZ File window is minimized and the two dimensional layout of stations is displayed (Figure 7.7).

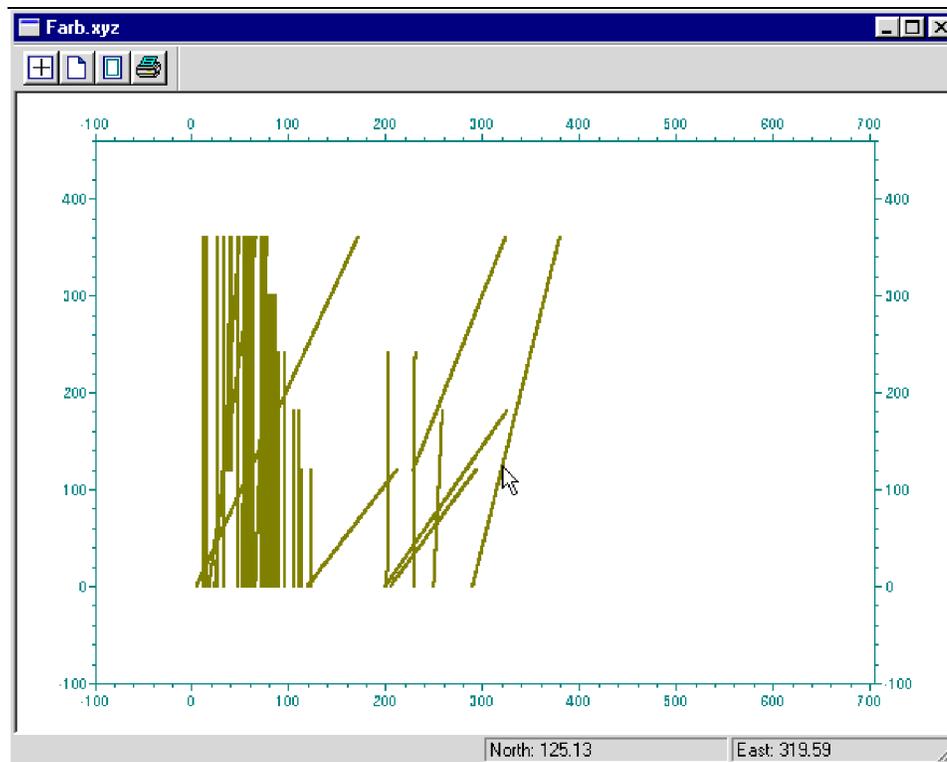


Figure 7.7: Example of layout after an XYZ file is created using the Arbitrary line orientation.

The displayed image shows the spatial layout of lines and stations to scale written to the created file.

The displayed image shows the spatial layout of lines and stations to scale, based on the station coordinates written to the created file. The layout can be examined and printed. An option located on the menu and tool

bar of this screen allows for the identification of coordinates through the use of two perpendicular lines, horizontal and vertical, and a display of coordinates in the bottom left portion of the screen.

Files created by this portion of the program can be also viewed at any time using the **File | Open | XYZ** menu or by clicking the View XYZ File button located on the tool bar.

7.2 View Survey Layout (W-E) or (S-N)

Two items in the **2D Layout** menu, **View Survey Layout (W-E)** and **View Survey Layout (S-N)**, allow the viewing of a two dimensional layout of stations for surveys which are carried in the W-E direction (along the X coordinate) or in the S-N direction (along the Y coordinate). The program assumes that the survey line names indicate one coordinate (X or Y) and stations along each line are associated with the second coordinate. These two options, therefore, can be used only if the entered data set consists of parallel lines.

To view the spatial layout of stations, select **2D Layout | View Survey Layout (W-E)** or the **2D Layout | View Survey Layout (S-N)** in the menu (Figure 7.1). These two items are also easily accessible from buttons  and  located on the tool bar of the program. The screen displaying the survey lines oriented in W-E direction is shown in Figure 7.8.

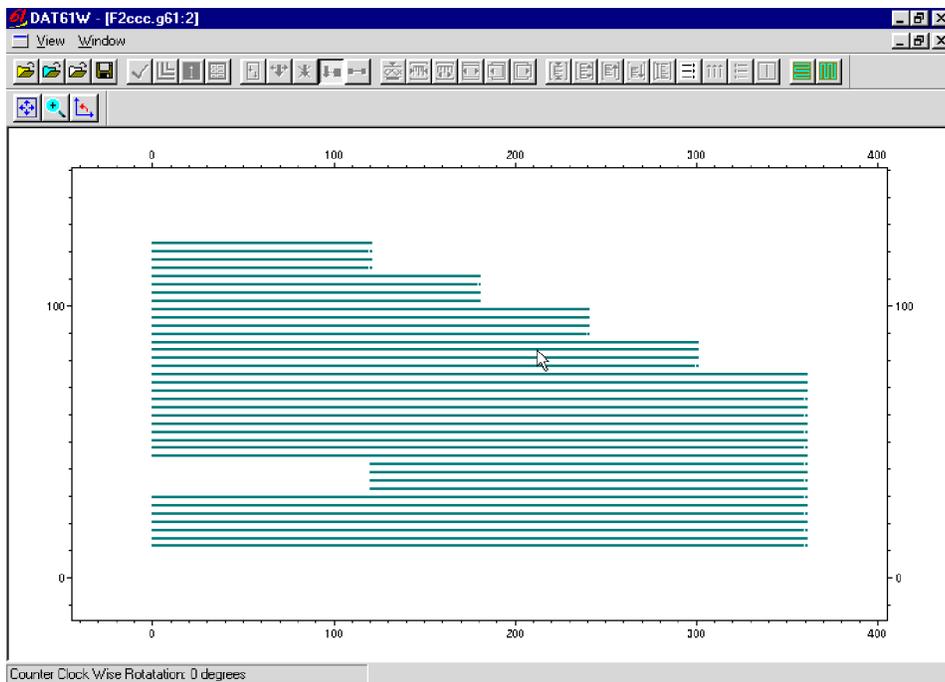


Figure 7.8: View Survey Layout (W-E) screen

View Survey Layout (W-E) offers a quick view of the spatial configuration of survey lines to determine if any corrections are necessary. Each station is represented by a dot on the screen. Tools provided in the screen menu and the associated tool bar allow selected areas of the survey to be enlarged for closer examination. The layout can also be rotated in 45 degree increments.

The View Survey Layout (N-S) provides a similar screen containing the layout of survey lines oriented in the vertical direction (along the Y coordinate).

8. GPS Positioning

This portion of DAT61W uses any EM61 data file in the .G61 format with a recorded time for each reading (available while using EM61 Polycorder program) with any differentially corrected (post processed) GPS file, also with a recorded time for each reading. The data from these two files are combined in the resulting file which contains three to six of data: location X and Y, Channel T, and/or Channel B, and any other selected EM61 channels.

To display the GPS Positioning menu select the **GPS Positioning** in the main menu at the top of the screen (Figure 8.1).

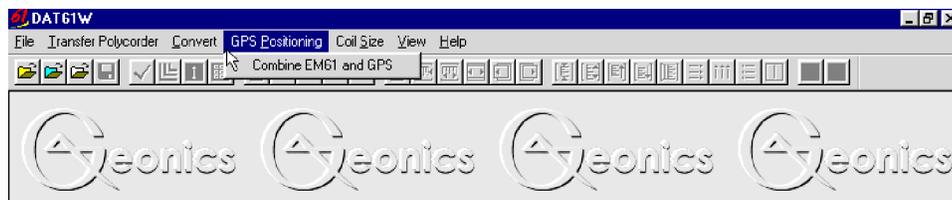


Figure 8.1: GPS Positioning menu

After **GPS Positioning | Combine EM61 and GPS Files** from the program menu option is selected, the GPS Positioning window is displayed (Figure 8.2).

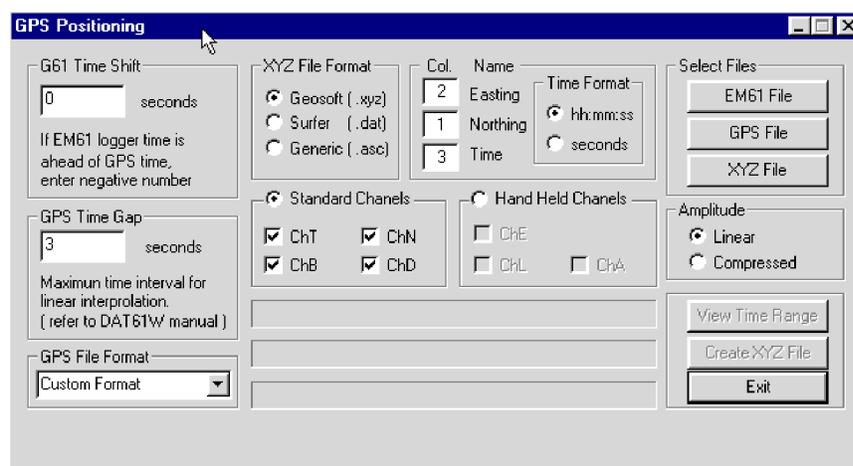


Figure 8.2: GPS Positioning window

Parameters to be specified in GPS Positioning window

Several parameters which affect the contents and format of the created XYZ file must be specified. These are **EM61 Time Shift**, **GPS Time Gap**, **XYZ File Format**, **Type of the EM61**, **Selection of Channels**, **GPS File Format**, and **GPS Time Format**.

EM61 Time Shift

If the Polycorder (EM61) and GPS system clocks are not synchronized prior to the survey, an appropriate correction (in seconds) can be entered in the edit window labeled EM61 Time Shift. In most cases, it is much easier to determine the time difference between the clocks in these two devices than to synchronize the two clocks at the outset.

During calculations the Time Shift is applied to the recorded Polycorder time. If the Polycorder time is ahead of the GPS time, therefore enter a negative value; and, if the Polycorder time is behind the GPS time, enter a positive value.

GPS Time Gap

The differentially corrected GPS data often has gaps, due to differences in the constellation of satellites visible to two (fixed and moving receivers), lack of beacon signal, etc. Small gaps can also occur due to a difference in the frequency of data acquisition between the EM61 and GPS systems. These gaps are filled by DAT61W with the assumption that the moving (with EM61) GPS receiver speed is essentially constant and that the operator is moving along a straight line during the time of the gaps.

The **GPS Time Gap** parameter specifies the maximum time during which the EM61 data will be linearly interpolated between two GPS positions. Enter this parameter (in seconds) in the edit box labeled GPS Time Gap. In most cases a value 2 to 3 times larger than the GPS acquisition frequency is adequate.

XYZ File Format

Check the appropriate option for the contouring software used. The Generic option will create a six (default; or less, if not all channels were chosen) column file without any text strings. This file can be used as an input file for many contouring packages (including Geosoft and Surfer). The Geosoft format will cause the program to write **LINE #** at the beginning of each survey line, which is necessary if the Geosoft **BIGRID** module is used to grid the data.

Instrument Type

Check the appropriate button in the Create XYZ File window labeled Standard or Hand Held. Readings collected by the indicated instrument will be written into the created file. Only one instrument type data is allowed per file. If data set includes data from both instruments, create a separate XYZ file for each type of the instrument.

Channels

Check the appropriate button in the Standard or Hand Held section of the Create XYZ File window. Any set of EM61 channels can be written to the created file, however they will be always placed in the output file in one order. For Standard EM61 channels will be placed in columns in the following order: Channel T, Channel B, Channel N, and Channel D. If data was taken by the EM61 Hand Held channels will be written as follows: Channel E, Channel L, and Channel A.

Amplitude

Check the appropriate button in the Create XYZ File window section labeled Amplitude. Readings will be written in linear (original) scale, or if Compressed amplitude is checked the square root of each channel will be placed in the output file. The latter (compressed scale) does not apply to Channel A.

GPS File Format

This version of DAT61W is designed to work with the custom format of the GPS file in ASCII format. The GPS file in ASCII format is usually obtained by executing the Export ASCII File option available in most GPS data processing programs. This approach assures compatibility with most formats provided by GPS software manufacturers.

In order to describe the format of the GPS file, the locations of columns containing Easting, Northing, and Time in the corresponding edit boxes labeled Col. (Several formats of GPS files in ASCII format are presented in the Appendix A of this manual.)

During the reading of the GPS file, the DAT61W confirms that each value of the indicated column is a valid numeric parameter; if it is not, that record in the GPS file is ignored. GPS files that contain comment lines, or field description header lines, therefore are accepted.

Time Format

This parameter further describes the format of the GPS file. GPS time is usually specified in either of two formats: hh:mm:ss (hours:minutes:seconds) or, the number of seconds elapsed from GPS midnight or from the beginning of the GPS week. Both formats can be used by DAT61W. Specify the format by checking the appropriate button.

While using the hh:mm:ss format, make sure that 24 hour time format is used by the GPS software.

Specifying the EM61 and GPS Input File Names

After the **Input EM61 File** button is clicked the Open EM61 File window is displayed, as shown in Figure 8.3.

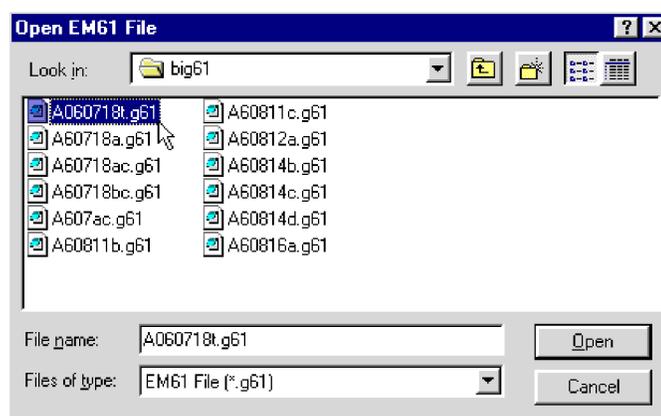


Figure 8.3: Open EM61 File window

Select a file name and click the **Open** button. The Open EM61 File window will close and the selected file name will be displayed at the bottom of the GPS Positioning window.

When the **Input GPS File** button is clicked the Open GPS File window is displayed, as shown in Figure 8.4.

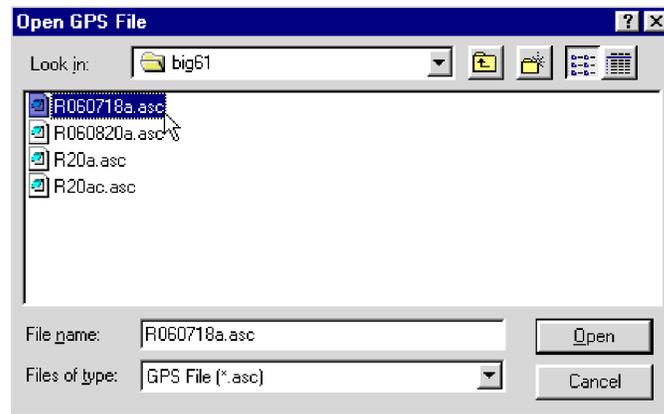


Figure 8.4: Open GPS File window

Select a file name and click the **Open** button. (GPS files in ASCII format usually have extension names ASC or TXT). The Open GPS File window will close and the selected file name will be displayed at the bottom of the GPS Positioning window.

View Time Range

After both the EM61 and GPS files had been specified, the View Time Range button is activated. When the View Time Range button is clicked, the program begins to read both files. The progress bar at the bottom of the screen shows the percentage of files read (Figure 8.5).

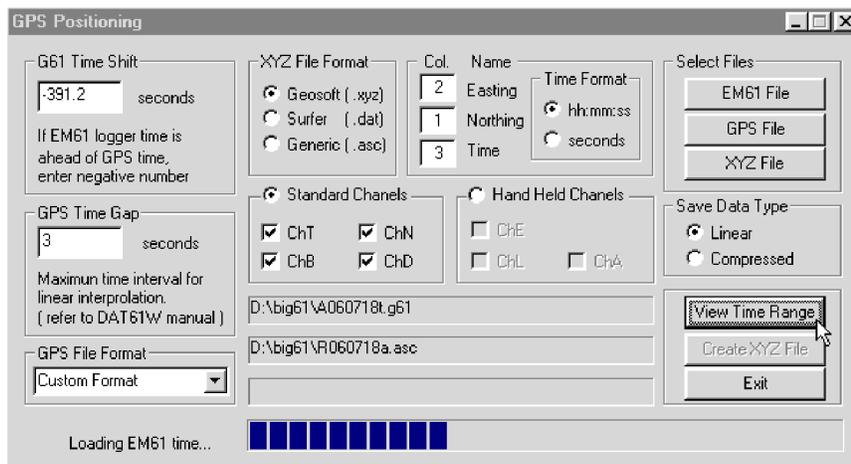


Figure 8.5: GPS Positioning window during reading of EM61 and GPS files

Once the files are read, the GPS Positioning window will be minimized and the Time Range window will be displayed (Figure 8.6).

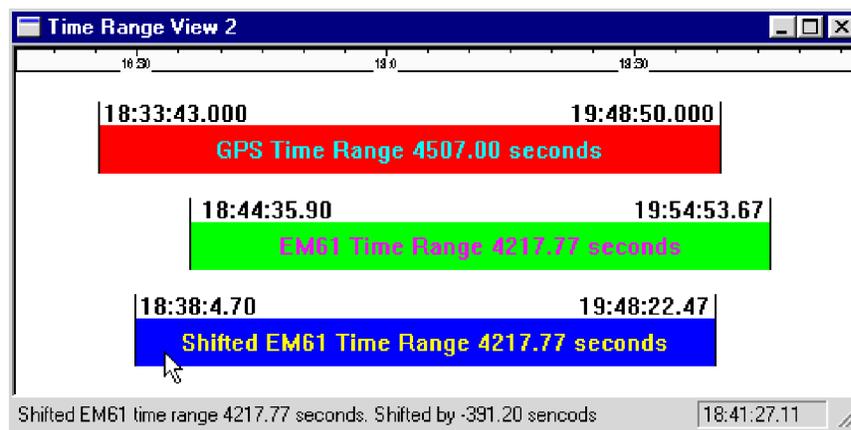


Figure 8.6: Time Range window

Although the Time Range viewing is not necessary during the procedure of combining the EM61 and GPS files, the presented graph is a quick way to visually estimate the value of the implemented Time Shift. In those cases where the Time Shift applied is incorrect (e.g. wrong sign or value), the GPS Time Range and the Shifted EM61 Time Range graphs are not coincident (Figure 8.6). The most common error is an entry of the wrong sign (+/-) for the time shift. If the results are satisfactory, close the Time Range View window and restore the GPS Positioning window.

Specifying the Output File Name

After the **Output File Name** button is clicked, the Select XYZ File window is displayed, as shown in Figure 8.7.

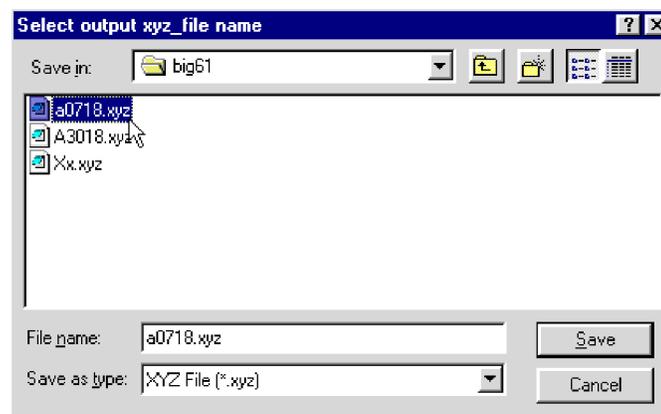


Figure 8.7: Select XYZ File window

Select file name and click the **Open** button. The Select XYZ File window will close and the selected file name will be displayed at the bottom of the GPS Positioning window. At the same time the **Create XYZ File** button is activated.

Creating XYZ File

When all parameter are set and three file names (EM61, GPS, and output XYZ file) are specified, the **Create XYZ File** button is activated. After the **Create XYZ File** button is clicked, the program begins to read the EM61 and GPS files and writes them to an output XYZ file. The progress bar at the bottom of the screen shows the percentage of files read (Figure 8.8).

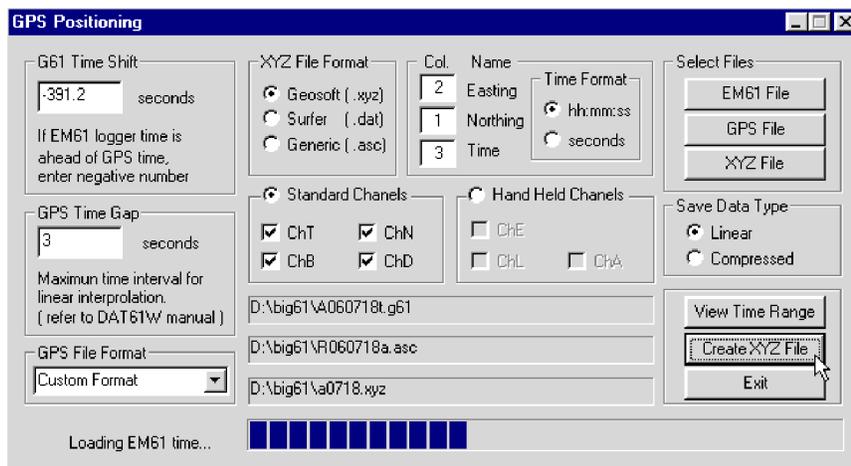


Figure 8.8: GPS Positioning window during writing of XYZ file

The speed of this operation depends on the size of the input files. After the XYZ file is created, the GPS Positioning window is minimized and the two dimensional layout of the survey is displayed (Figure 8.9).

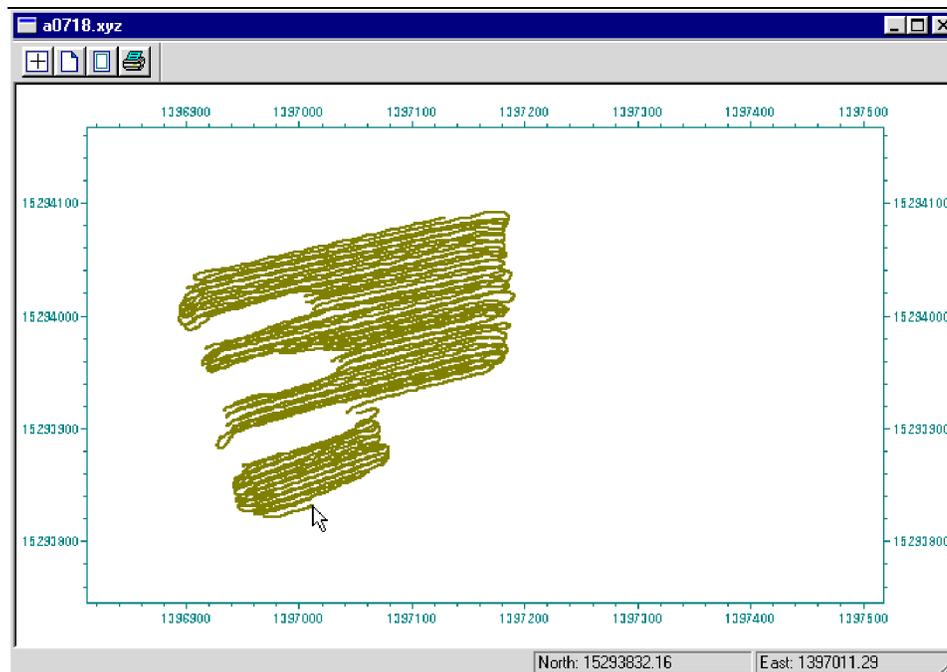


Figure 8.9: Layout of survey as created in the XYZ output file

The displayed image shows the spatial layout of lines and stations to scale, based on the station coordinates written to the created file. The layout can be examined and printed. An option located on the menu and tool

bar of this screen allows for the identification of coordinates through the use of two perpendicular lines, horizontal and vertical, and a display of coordinates in the bottom left portion of the screen.

Files created by this portion of the program can be also viewed at any time using the **File | Open | XYZ** menu or by clicking the  (**View XYZ File**) button located on the tool bar.

APPENDIX A

A.1 The Data File in DAT61 (G61) Format

The first row of the DAT61 data file contains name of the instrument and version of the program. This line appears only once, at the beginning of each data file.

The second line (optional) that starts with **F** indicates Channel B multiplication factor for calculating the differential profile. This line is created when files are saved in DAT61 program. If a line starting with **F** is not present in the file the default multiplication factor is **1**.

The row that starts with **L** specifies the survey line name, line direction (**N**, **S**, **W**, or **E**), and start station (value that follows letter **S**).

The following row starts with character **T** and contains: time and date when line was recorded, which is followed by a recording increment (value that follows letter **I**).

Next line of the file starts with character **P** and contains: operator name, original name of file, and name of the Polycorder format file that was used.

The above sequence of three lines that start with **L**, **T**, and **P** appears at the beginning of each survey line.

The rows containing data (four fields) starts with the one character. The meaning of this character is as follows:

- 0** - reading,
- 1** - reading and fiducial marker pressed at this station (only in AUTO, WHEEL, or HIP CHAIN mode),
- N** - start of new segment of the line,
- D** - deleted reading,
- C** - comment, the text of comment follows this field.

The first character field is followed by station number [user units, usually meters], Channel T reading [mV], and Channel B reading [mV].

If a file was created with the EM61 Polycorder program using GPS option it will contain an additional column that indicate time that reading was recorded (in 24 hour clock format).

Values of readings of 800000.00 indicate skipped reading.

The DAT61 data file can be easily edited using any text editor, however care should be taken on preserving proper placement of all parameters.

Example of EM61 File in DAT61 Format

```
EM61 V1.70 (or EM61G V1.70 in GPS option format)
F 1.055
L 1 E A.3 H S.00
T 06/20/92 13:16:33 I0.198
P JOHN DON1 RS61 (or GPS61 in GPS option format)
0 0.000 6380.00 1121.00
0 .198 6640.00 1172.00
0 .396 7020.00 1251.00
0 .594 7520.00 1327.00
0 .792 8140.00 1434.00
0 .990 8640.00 1520.00
1 1.188 7640.00 1528.00 fiducial marker
0 1.386 8540.00 1512.00
0 1.584 8400.00 1519.00
0 1.782 8360.00 1548.00
0 1.980 8140.00 1513.00
0 2.178 7760.00 1441.00
0 2.376 7560.00 1415.00
0 2.574 7520.00 1438.00
0 2.772 7440.00 1427.00
0 2.970 7360.00 1404.00
0 3.168 7100.00 1364.00
1 3.366 6800.00 1296.00 fiducial marker
0 3.564 6560.00 1268.00
0 3.762 6300.00 1229.00
0 3.960 5900.00 1151.00
0 4.158 5680.00 1100.00
0 4.356 5580.00 1071.00
L 2 W A.3 L S18.00
T 06/20/92 13:19:37 I-0.198
P JOHN DON1 RS61
0 18.000 887.00 140.00
0 17.802 903.00 143.00
0 17.604 906.00 150.00
0 17.406 916.00 156.00
0 17.208 931.00 159.00
0 17.010 931.00 163.00
0 16.812 948.00 168.00
0 16.614 951.00 168.00
0 16.416 955.00 168.00
0 16.218 947.00 168.00
```

A.2 The Data in the Polycorder Format

The EM61 POLYCODE program records a set of data in one file. The file name is supplied by the user at the **FILE:** prompt (xxxx). (There is no Header and Data file as in Geonics EM31, EM38 or EM34-3 Polycorder 720 programs). The example of data file and the format of the file is as follows.

DAT:1992 *Initial line of data file*
DON1 *Name of the file as specified by the user*
@RS61 (GP61, RH61, or GH61) *The Polycorder format file (RS61 - standard, GP61 - standard & GPS, RH61 - Hand Held, GH61 - HH &GPS)*

JOHN *Operator name*
W *Mode (here Wheel, can be A-auto and M-manual)*
L1 *Name of Line (name follows letter L)*
06/20/92 *Date*
13:16:33 *Time (it is the time when line was specified)*
E *Direction (East)*
.00 *Start Station*
I0.198 *Increment between readings (follows letter I)*
T +0319+1121 *Each reading starts with letter T (or M indicating marker in AUTO mode), and it is followed by a single character. The ASCII number of this character indicates internal gain for each EM61 channel.*
T +0332+1172 *The gain is followed by two fields (5 places each) which indicates readings for channel T and B.*
T +0123+2345
T +0351+1251
T +0376+1327
T +0298+6344
T +0407+1434 *Table of Internal Gain:*

ASCII No	GAIN	Channel T	Channel B
4	Low	High	High
8	Low	High	Low
12	Low	Low	High
16	Low	Low	Low
20	High	High	High
24	High	High	Low
28	High	Low	High
32	High	Low	Low

T +0376+1438 *Gain Low - multiply readings by **0.75***
T +0372+1427 *Gain High - multiply readings by **0.1875***
T +0412+1397 *Channel High - multiply the corresponding channel by **20***
T +0368+1404
L2.5 *Start of the next Line (2.5)*
06/20/92 *Date*
13:19:37 *Time*
W *Direction (West)*
18.00 *Start Station*
I-0.198 *Increment (-0.198 m)*
T +0887+0140
.....

EM61 file with time stamp (GPS option) will contain two more columns Seconds/Hundreds of Seconds and Hour/Minute eg line

T +0906+0150 1215 1614

means:

Reading, time (24 h clock) is 16:14:12.15

A.3 Description of the EM61pro Format

Each record in the data file contain 21 characters, including carriage return at the end of the record.

Header of the file (contains three records starting with characters P, P, and O)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
P	R	O	6	1			V	1	0	0							UT	IT	IM	CR	
P																					CR
																					CR

PRO61	-	identification of program file
V100	-	version number (V1.00)
UT	-	unit type (0 - meters, 1 - feet)
IT	-	instrument type (0 - sensor 1x0.5m, 1 - 1x1m, 2 - 0.5x0.5m, 3 - HH61)
IM	-	instrument mode (0 - Auto, 1 - Wheel, and 2 - Manual)
File Name	-	file name, maximum 7 characters
Time Inc.	-	time increment (Auto Mode)
Offset	-	offset for ChT and ChB (or ChE and ChL) in mV
CR	-	Carriage Return

Header at the start of survey line (contains three records starting with L, D, and Z)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
L																					CR
D	Dir																				CR
Z																					CR

Line Name	-	Line Name, maximum 8 characters
Start Station	-	Start Station for the Line, format F11.2
Dir	-	Direction of the Line (E, W, N, or S)
Station Inc.	-	Station Increment, format F11.3
Date	-	Date when Line was created, format DD-MM-YYYY
Time	-	Time when Line was created, format HH:MM:SS
CR	-	Carriage Return

Reading

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
T	Gain																				CR

Each record containing reading starts with character **T** or **M**

T	-	indicates reading at station without fiducial marker
M	-	indicates reading at station with fiducial marker

Gain - one character parameter contains Gain and Range,

Table of Gain and Range

ASCII No	Gain	ChT Range	ChB Range
4	Low	High	High
8	Low	High	Low
12	Low	Low	High
16	Low	Low	Low
20	High	High	High
24	High	High	Low
28	High	Low	High
32	High	Low	Low

Gain Low - multiply reading by **0.75**
 Gain High - multiply reading by **0.1875**
 Range Low - multiply reading by **1** (or ignore)
 Range High - multiply reading by **20**

Channel T (or E) - five character field containing instrument output includes sign (+ or -) and four digits
 Channel B (or L) - five character field containing instrument output includes sign (+ or -) and four digits
 Time - time stamp for each reading, format HHMMSShh, where hh hudreths of second
 CR - carriage return

Other possible records

Comment

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
C	Comment (maximum 11 char.)											Time Stamp for Comment					CR			

New Station

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
T	New Station (format F11.2)											Time Stamp					CR			

Deleted Record with Reading or Comment

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
X	Gain	Channel T or E			Channel B or L			Time Stamp for Reading					CR							
X	Comment (maximum 11 char.)											Time Stamp for Comment					CR			

Deleted records (lines starting with X) can be found only at the end of data files. During delete procedure program moves pointer to the previous record, therefore, in most cases deleted lines of file are overwritten by new readings.

Example of Data File in EM61pro Format

```
PRO61   V100      000
P060807B  0.062
O       0.00      0.00
L8              0.00
DE              1.000
Z06-08-2000 07:32:32
T +1172+227307323516
T +1193+227207323521
T +1199+227307323527
T +1190+228407323538
T +1166+232807323543
T +1136+235607323549
T +1124+236707323560
T +1096+236407323565
T +1076+235607323576
T +1072+234807323582
T +1083+234207323587
T +1096+232807323598
T +1116+230407323604
T +1160+229807323615
T +2305+032807343001
T +2300+032407343006
T +2270+031807343012
T +2236+611007343023
T +2216+595907343028
L9              1492.00
DW              -1.000
Z06-08-2000 07:34:38
T +1912+485507344270
T +1912+484707344275
T +1920+485907344286
T +1915+486107344292
Cfence      07344303
T +1911+484607344308
T +1912+484807344314
T +2252+033807353861
T +2248+033707353872
T +2246+033707353877
T +2256+033607353883
T +2260+033807353894
L11              0.00
DW              -1.000
Z06-08-2000 07:36:08
T +2235+033807361118
T +2246+033807361129
```

A.4 Examples of GPS File Formats

GPS File in Trimble Pathfinder ProXL/XR ASCII Format (PFINDER for DOS)

```
SSF->ASCII V2.05   Thu May 23 23:26:55 1996
Input File   : C:\BRAMP\BRA1\R052314B.COR
Output File  : C:\BRAMP\BRA1\R052314B.ASC
```

```
Datum           : WGS-84
Coordinate System : UTM [ 17T ]
```

Output positions

Parameter -----	Columns -----	Units -----
Northing	[1, 18]	Meters
Easting	[20, 38]	Meters
Time	[52, 70]	
4841594.028,	607685.406,	14:07:38.00
4841594.027,	607685.378,	14:07:39.00
4841594.021,	607685.380,	14:07:40.00
4841498.297,	607795.311,	14:47:38.00
4841498.312,	607795.306,	14:47:39.00
4841498.322,	607795.310,	14:47:40.00
4841498.366,	607795.372,	14:47:41.00
4841498.367,	607795.352,	14:47:42.00
4841498.373,	607795.344,	14:47:43.00
4841498.375,	607795.346,	14:47:44.00
4841498.383,	607795.349,	14:47:45.00
.....		

GPS File in Trimble Pathfinder ProXL/XR/XRS ASCII Format (Pathfinder Office for Windows)

```
"Note",4835682.630,608991.847,03/31/97 16:54:57,"Logging started: 16:54:37
03/31/1997 Mon (UTC time)"
"PosnPnt",4835682.630,608991.847,03/31/97 16:54:57
"PosnPnt",4835682.681,608992.009,03/31/97 16:54:58
"PosnPnt",4835678.692,609001.027,03/31/97 16:56:35
"PosnPnt",4835678.584,609001.345,03/31/97 16:56:36
"PosnPnt",4835678.571,609001.320,03/31/97 16:56:37
"PosnPnt",4835678.644,609001.372,03/31/97 16:56:38
"PosnPnt",4835678.901,609001.519,03/31/97 16:56:39
"PosnPnt",4835682.131,608998.615,03/31/97 16:57:02
"PosnPnt",4835682.232,608998.446,03/31/97 16:57:03
"PosnPnt",4835682.314,608998.214,03/31/97 16:57:04
```

```

"PosnPnt" , 4835682.314, 608998.214, 03/31/97 16:57:04
"PosnPnt" , 4835682.465, 608998.030, 03/31/97 16:57:05
"PosnPnt" , 4835682.560, 608997.817, 03/31/97 16:57:06
"PosnPnt" , 4835682.716, 608997.629, 03/31/97 16:57:07
"PosnPnt" , 4835682.802, 608997.354, 03/31/97 16:57:08
"PosnPnt" , 4835682.906, 608997.108, 03/31/97 16:57:09
"PosnPnt" , 4835683.022, 608996.908, 03/31/97 16:57:10
"PosnPnt" , 4835683.216, 608996.664, 03/31/97 16:57:11
"PosnPnt" , 4835683.341, 608996.315, 03/31/97 16:57:12
"PosnPnt" , 4835683.586, 608995.864, 03/31/97 16:57:13
"PosnPnt" , 4835683.713, 608995.362, 03/31/97 16:57:14
"PosnPnt" , 4835683.791, 608994.738, 03/31/97 16:57:15
"PosnPnt" , 4835683.873, 608994.046, 03/31/97 16:57:16
"PosnPnt" , 4835683.903, 608993.194, 03/31/97 16:57:17
"PosnPnt" , 4835683.789, 608992.349, 03/31/97 16:57:18
"PosnPnt" , 4835683.608, 608991.462, 03/31/97 16:57:19
"PosnPnt" , 4835683.336, 608990.643, 03/31/97 16:57:20
"PosnPnt" , 4835682.928, 608989.785, 03/31/97 16:57:21
"PosnPnt" , 4835682.425, 608988.938, 03/31/97 16:57:22
"PosnPnt" , 4835681.860, 608988.083, 03/31/97 16:57:23
"PosnPnt" , 4835681.249, 608987.245, 03/31/97 16:57:24
"PosnPnt" , 4835680.687, 608986.457, 03/31/97 16:57:25
"PosnPnt" , 4835680.374, 608985.911, 03/31/97 16:57:26
"PosnPnt" , 4835678.668, 608982.945, 03/31/97 16:57:31
"PosnPnt" , 4835673.620, 608973.493, 03/31/97 16:57:45

```

GPS File in Ashtech Reliance ASCII Format (TXT file)

Generic Line

line1, 1

274.337096

```

1997/08/25 21:11:24.000000, 612093.955494, 4829523.731399, 29.440896, unprocessed, unprocessed, unprocessed
1997/08/25 21:11:25.000000, 612094.114538, 4829523.297356, 30.102338, unprocessed, unprocessed, unprocessed
1997/08/25 21:11:26.000000, 612094.257011, 4829522.893570, 30.760720, unprocessed, unprocessed, unprocessed
1997/08/25 21:11:27.000000, 612094.418909, 4829522.445676, 31.465749, unprocessed, unprocessed, unprocessed
1997/08/25 21:11:28.000000, 612094.566163, 4829521.952000, 32.320072, unprocessed, unprocessed, unprocessed
1997/08/25 21:11:29.000000, 612094.762445, 4829521.535781, 33.021448, unprocessed, unprocessed, unprocessed
1997/08/25 21:11:30.000000, 612094.945979, 4829521.078066, 33.708173, unprocessed, unprocessed, unprocessed
1997/08/25 21:11:52.000000, 612097.071026, 4829508.319582, 55.519831, unprocessed, unprocessed, unprocessed
1997/08/25 21:11:53.000000, 612097.122641, 4829507.634384, 56.631542, unprocessed, unprocessed, unprocessed
1997/08/25 21:11:54.000000, 612097.193598, 4829506.968742, 57.766556, unprocessed, unprocessed, unprocessed
1997/08/25 21:11:55.000000, 612097.210344, 4829506.280821, 58.909510, unprocessed, unprocessed, unprocessed
1997/08/25 21:11:56.000000, 612097.299837, 4829505.565310, 60.169696, unprocessed, unprocessed, unprocessed
1997/08/25 21:11:57.000000, 612097.330491, 4829504.829847, 61.551281, unprocessed, unprocessed, unprocessed
1997/08/25 21:11:58.000000, 612097.368627, 4829504.078207, 62.862995, unprocessed, unprocessed, unprocessed
1997/08/25 21:11:59.000000, 612097.408089, 4829503.355091, 64.188279, unprocessed, unprocessed, unprocessed
1997/08/25 21:12: 0.000000, 612097.477111, 4829502.628739, 65.517481, unprocessed, unprocessed, unprocessed
1997/08/25 21:12: 1.000000, 612097.507643, 4829501.900515, 66.905964, unprocessed, unprocessed, unprocessed
1997/08/25 21:12: 2.000000, 612097.734534, 4829501.045441, 68.851515, unprocessed, unprocessed, unprocessed
1997/08/25 21:12: 3.000000, 612097.765026, 4829500.260793, 70.270240, unprocessed, unprocessed, unprocessed
1997/08/25 21:12: 4.000000, 612097.793748, 4829499.532996, 71.672743, unprocessed, unprocessed, unprocessed
1997/08/25 21:12: 5.000000, 612097.771597, 4829498.740119, 73.099184, unprocessed, unprocessed, unprocessed
1997/08/25 21:12: 6.000000, 612097.785117, 4829497.951017, 74.565783, unprocessed, unprocessed, unprocessed
1997/08/25 21:12: 7.000000, 612097.801732, 4829497.133588, 76.062175, unprocessed, unprocessed, unprocessed
1997/08/25 21:12: 8.000000, 612097.824221, 4829496.406020, 77.435334, unprocessed, unprocessed, unprocessed
1997/08/25 21:12: 9.000000, 612097.822452, 4829495.550900, 79.115956, unprocessed, unprocessed, unprocessed
1997/08/25 21:12:10.000000, 612097.821974, 4829494.736255, 80.667121, unprocessed, unprocessed, unprocessed
1997/08/25 21:12:11.000000, 612097.784378, 4829493.896549, 82.171453, unprocessed, unprocessed, unprocessed
1997/08/25 21:12:12.000000, 612097.744524, 4829493.074271, 83.860423, unprocessed, unprocessed, unprocessed

```

1997/08/25	21:12:13.000000	612097.729891	4829492.253269	85.360021	unprocessed	unprocessed	unprocessed
1997/08/25	21:12:14.000000	612097.734037	4829491.367924	86.970995	unprocessed	unprocessed	unprocessed
1997/08/25	21:12:15.000000	612097.741723	4829490.545390	88.530588	unprocessed	unprocessed	unprocessed
1997/08/25	21:12:16.000000	612097.709871	4829489.666035	90.265125	unprocessed	unprocessed	unprocessed
1997/08/25	21:15:35.000000	612111.299764	4829521.263721	61.651161	unprocessed	unprocessed	unprocessed
1997/08/25	21:21:32.000000	612066.565907	4829436.656767	90.263775	unprocessed	unprocessed	unprocessed
1997/08/25	21:21:33.000000	612066.629108	4829436.905929	89.379869	unprocessed	unprocessed	unprocessed
1997/08/25	21:21:34.000000	612066.694244	4829437.215801	88.301776	unprocessed	unprocessed	unprocessed
1997/08/25	21:21:35.000000	612066.730220	4829437.495249	87.342102	unprocessed	unprocessed	unprocessed

Generic Line

line2, 1

95.952555

1997/08/25	21:21:53.000000	612068.310614	4829444.407892	65.730179	unprocessed	unprocessed	unprocessed
1997/08/25	21:21:54.000000	612068.477983	4829444.887349	64.403350	unprocessed	unprocessed	unprocessed
1997/08/25	21:21:55.000000	612068.625369	4829445.395387	62.944675	unprocessed	unprocessed	unprocessed
1997/08/25	21:21:56.000000	612068.780031	4829445.889774	61.572952	unprocessed	unprocessed	unprocessed
1997/08/25	21:21:57.000000	612068.881288	4829446.431306	60.107300	unprocessed	unprocessed	unprocessed
1997/08/25	21:21:58.000000	612069.055015	4829446.971672	58.629647	unprocessed	unprocessed	unprocessed
1997/08/25	21:21:59.000000	612069.175979	4829447.511047	57.166607	unprocessed	unprocessed	unprocessed
1997/08/25	21:22: 0.000000	612069.353366	4829448.106987	55.630673	unprocessed	unprocessed	unprocessed
1997/08/25	21:22: 1.000000	612069.541893	4829448.673948	54.139858	unprocessed	unprocessed	unprocessed
1997/08/25	21:22: 2.000000	612069.693862	4829449.231375	52.687407	unprocessed	unprocessed	unprocessed
1997/08/25	21:22: 3.000000	612069.904829	4829449.789566	51.249689	unprocessed	unprocessed	unprocessed
1997/08/25	21:22: 4.000000	612070.082741	4829450.412981	49.655923	unprocessed	unprocessed	unprocessed
1997/08/25	21:22: 5.000000	612070.265196	4829451.029358	48.098624	unprocessed	unprocessed	unprocessed
1997/08/25	21:22: 6.000000	612070.423399	4829451.586558	46.675519	unprocessed	unprocessed	unprocessed
1997/08/25	21:22: 7.000000	612070.582568	4829452.262370	45.113405	unprocessed	unprocessed	unprocessed
1997/08/25	21:22: 8.000000	612070.754889	4829452.837877	43.598837	unprocessed	unprocessed	unprocessed
1997/08/25	21:22: 9.000000	612070.899985	4829453.443669	42.008502	unprocessed	unprocessed	unprocessed
1997/08/25	21:22:10.000000	612071.070902	4829454.122689	40.283749	unprocessed	unprocessed	unprocessed
1997/08/25	21:22:11.000000	612071.284082	4829454.715168	38.781077	unprocessed	unprocessed	unprocessed
1997/08/25	21:22:12.000000	612071.483269	4829455.350478	37.189699	unprocessed	unprocessed	unprocessed
1997/08/25	21:22:13.000000	612071.680525	4829455.993451	35.619238	unprocessed	unprocessed	unprocessed

