

SC3-DAC / 3.1

User's Reference Manual



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1.0 Program Structure

1.1 Main Menu

SC3-DAC is a Windows® program which facilitates the data acquisition of triaxial seismic cone (SC) time series data. The main menu of *SC3-DAC* is illustrated in Figure 1. The main menu in Figure 1 displays the two options of File and Help.

The desired submenu is chosen either by moving the mouse over the desired option and pressing the left hand mouse button, or by pressing function <F10> on the keyboard and selecting the desired highlighted option. To carry out SC data acquisition the user selects the *File*→*Data Acquisition* option. The *Data Acquisition* submenu will appear as shown in Figure 2.

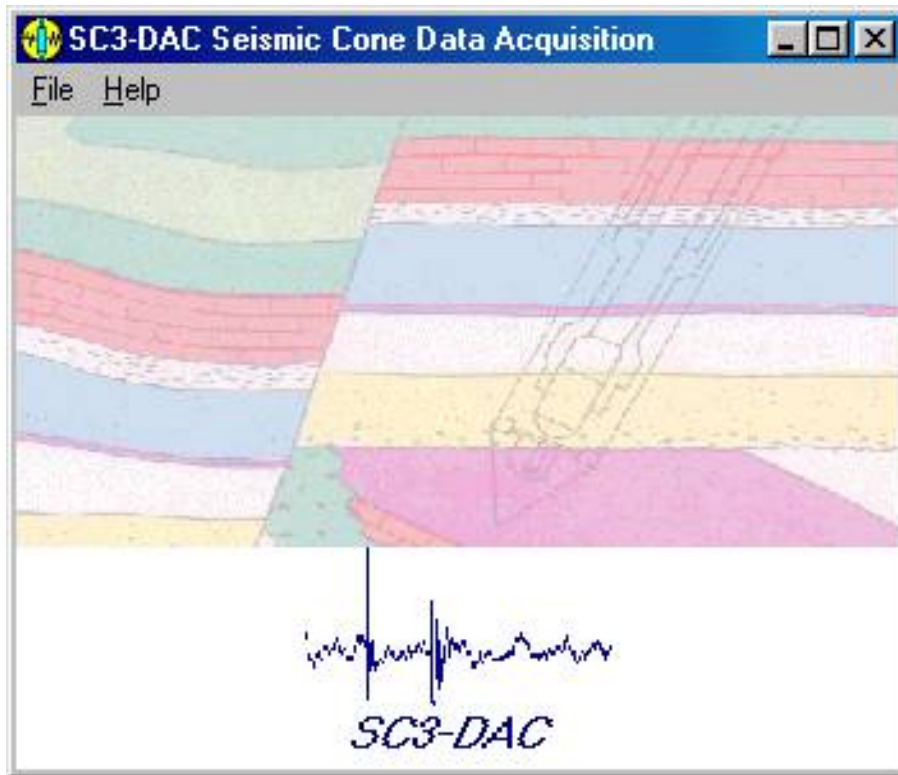


Figure 1. Main menu in *SC3-DAC*.

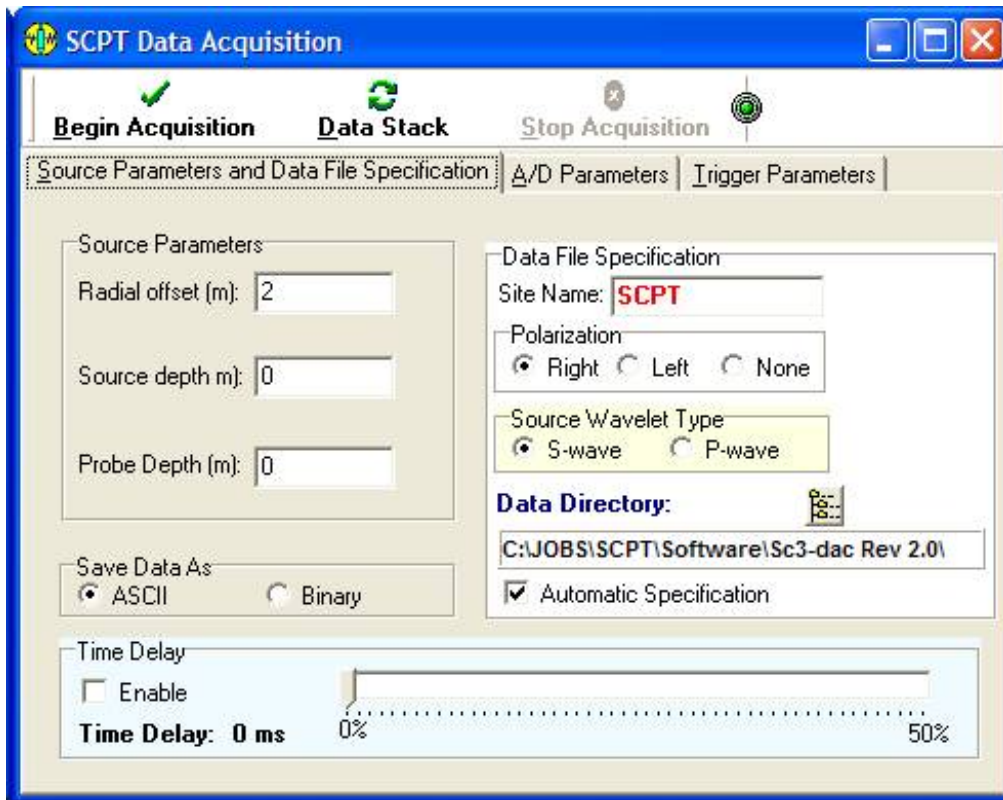


Figure 2. The seismic cone main data acquisition graphical interface.

1.2 Seismic Cone Data Acquisition

The *Data Acquisition* option allows the user to communicate with the signal conditioning box and the analog/digital (ie., A/D) conversion board. In this menu the user specifies the *Source Parameters and Data File Specification*, *A/D Parameters*, and *Trigger Parameters* by selecting the appropriate graphical tabs.

1.2.1 Source Parameters and Data File Specification

The *Source Parameters and Data File Specification* tab is illustrated in figure 2 and the input parameters required for specification are described as follows:

- (1) Radial offset - radial offset (m) of the source from the penetration cone.
- (2) Source depth - depth (m) of the source into the ground.
- (3) Probe depth - cone depth (m) from ground level.
- (4) Store Data As - The user has the option to store seismic data in either ascii or binary file formats by selecting the appropriate radio button. The default filename extensions are *.aci for ASCII file formats and *.bin for binary file formats. Binary file formats are desirable because they typically require less memory storage, while ASCII data files can easily be read into other programs.

(5) Data File Specification - The user can automate the seismic data file naming and saving process. A typical file name for a seismic file saved with the *Automatic Specification* check box enabled is outlined and defined as follows:

SCPTS0_0R05_07_00 10-12-52 PM.aci

SCPT	-	specified by the user in the <i>Site Name</i> edit box,
S	-	S-wave (S) or P-wave (P) - dominant source wavelet type,
0_0	-	previous depth specification (eg., 10.2m -> 10_2 - item 8),
R	-	right (R), left (L), or no (N) source polarization radio buttons,
05_07_00	-	day data acquired (i.e., day_month_year)
10-12-52 PM	-	time data acquired (i.e., hour-minute-second), and
.aci	-	user specified data type (i.e., see item 11),

The default data file storage directory is selected by pressing the directory list icon. Figure 3 illustrates the dialogue box which appears when the directory list icon is selected. The user browses the available drives and directories and selects the one most appropriate for seismic data file storage.



Figure 3. Specifying the default data directory.

6) Time Delay - the user may not want to store early information within the seismic time series when conducting deep SC investigations. This is due to the fact that the source wavelet arrives much later in the time series and the early portion of the data contains no useful information. In this situation, the investigator should check the box entitled *Enable* and select the appropriate *Time Delay* with the accompanying slide bar. The *Time Delay* is specified as a percentage of the *Sampling Time* (subsequently outlined). If the *Time Delay* is Enabled, *SC3-DAC* will display the full seismic time series, but only store data which exceeds the user specified *Time Delay*. This saves significant data storage space on the computer hard drive. When working with data which has been time delayed, the user must select option *Utilities->Enable Time Delay* within *SC3-RAV*.

1.2.2 A/D Parameters

The *A/D Parameters* tab is illustrated in figure 4 and the input parameters required for specification are described as follows:

(1) Data gain - The data gain corresponds to the amplitude gain on the recorded data. The Data Gain can be set from 0 to 84dB in increments of 6dB.

(2) Sampling rate - The sampling rate is specified in KHz and it ranges in values from 1KHz to 80 KHz as follows:

(1, 2, 3, 4, 5, 7, 8, 9, 10, 20, 40, 70, 80)

Due to the fact that a digital trigger is implemented, a maximum sampling rate is firstly implemented, and then the captured data is extracted based upon the user specified sampling rate. For example, if the user specifies a sampling rate of 40 KHz, the seismic and trigger data is initially captured at 80 KHz and the displayed and stored data is obtain by skipping every second point of the captured data (i.e., 80 KHz -> 40 KHz). A 80 KHz sampling rate results in a trigger accuracy of 0.0125 ms or a possible 0.25% associated maximum possible error for an interval velocity of 200 m/s over 1m. For the previously outlined sampling rates, the following maximum sampling rates (KHz) are utilized to ensure high digital trigger accuracy:

(80, 80, 81, 80, 80, 70, 80, 81, 80, 80, 80, 70, 80)

The analogue anti-aliasing filter is set automatically based upon the specified sampling rate ($\approx 1/3$ sampling frequency). For high signal resolution a sampling rate of ≥ 40 KHz is recommended.

(3) Sampling time - The sampling time is specified in ms and it corresponds to the total data acquisition time. To minimize data storage and processing, the sampling time should not be greater than required to capture the P-wave and S-wave.

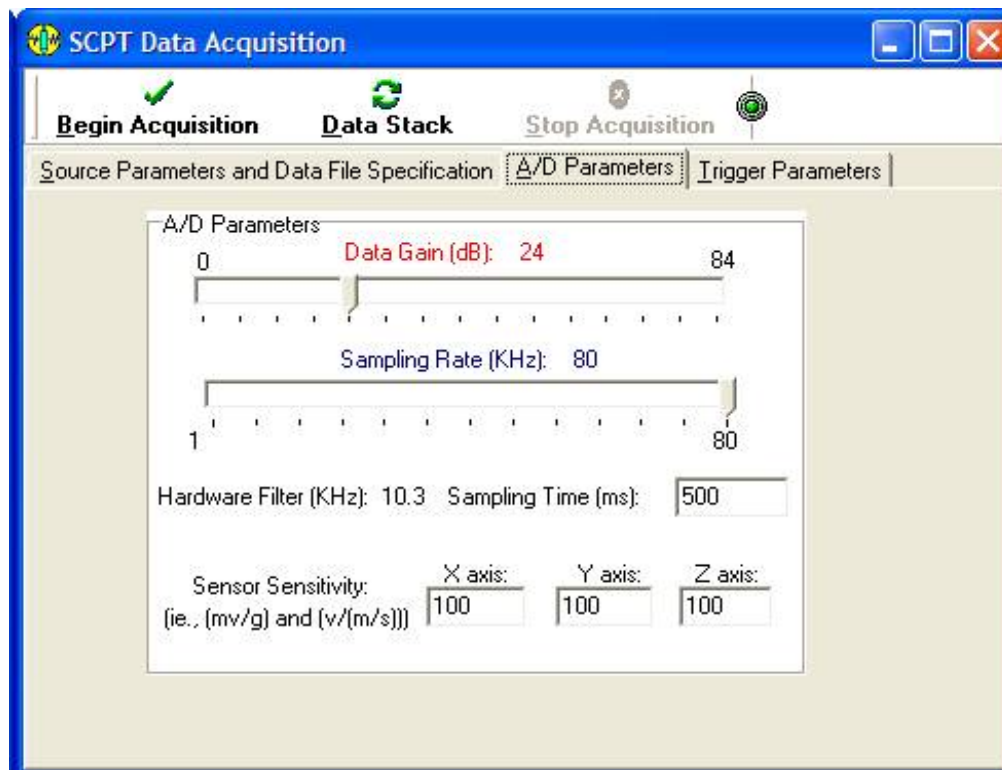


Figure 4. A/D Parameters graphical interface.

(4) Sensor Sensitivity - The user inputs the X, Y, and Z component sensitivities allowing for the recording of the particle accelerations in the true units of m/s^2 . These values are provided by your SCPT system supplier.

1.2.3 Trigger Parameters

The *Trigger Parameters* tab is illustrated in Figure 5 and the input parameters required for specification are described as follows:

(1) Trigger Type - There are two types of triggers: Contact Switch or Sensor. The *Contact* switch is triggered when there is contact (i.e., ground) made between source and receiver (e.g., when the source hammer strikes the truck pads). The *Sensor* option reflects a transducer type triggering mechanism (e.g., Accelerometer/Geophone).

(2) Trigger Gain - The gain on the trigger channel has the four possible settings 0 dB (1x), 20 dB (10x), 40 dB (100x) and 60 dB (1000x). The trigger gain settings are only applicable to the *Sensor* trigger. The *Contact* trigger has zero gain applied.

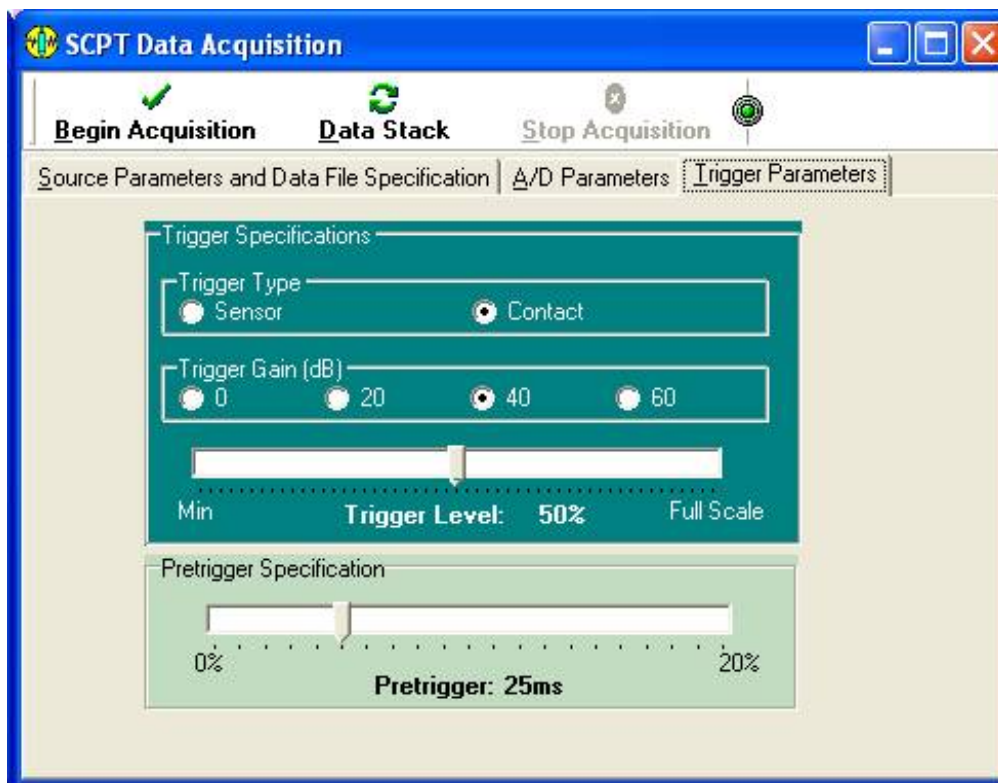


Figure 5. Trigger Parameters graphical interface.

(2) Trigger level (or sensitivity) - This value, if exceeded, specifies the percentage of full scale trigger amplitude that signifies a trigger event.

(3) Pretrigger - The *Pretrigger* slide bar allows the user to specify the amount of information to be stored prior to triggering. The pretrigger is specified as a percentage of the total sampling time (see

item (6)). For example, if the total sampling time is 500ms and the *Pretrigger* slide bar is set to 5% then the pretrigger is $(500 \times 0.05) = 25\text{ms}$. The maximum allowable pretrigger is 30% of the total sampling time specified.

1.2.4 Begin Acquisition, Stack Data, and Stop Acquisition Tool Bar

Once the user has specified the necessary data acquisition parameters, seismic cone data acquisition can commence. The *SC3-DAC* tool bar options are outlined as follows

(1) Begin Acquisition - The *Begin Acquisition* option is chosen once the data acquisition parameters have been specified. The user may abort the operation by pressing the *Stop Acquisition* push button. *SC3-DAC* stores the current data acquisition parameters in the *SC3dac.ini* file and these values become the default parameters. The captured seismic data appears as illustrated in Figure 6.

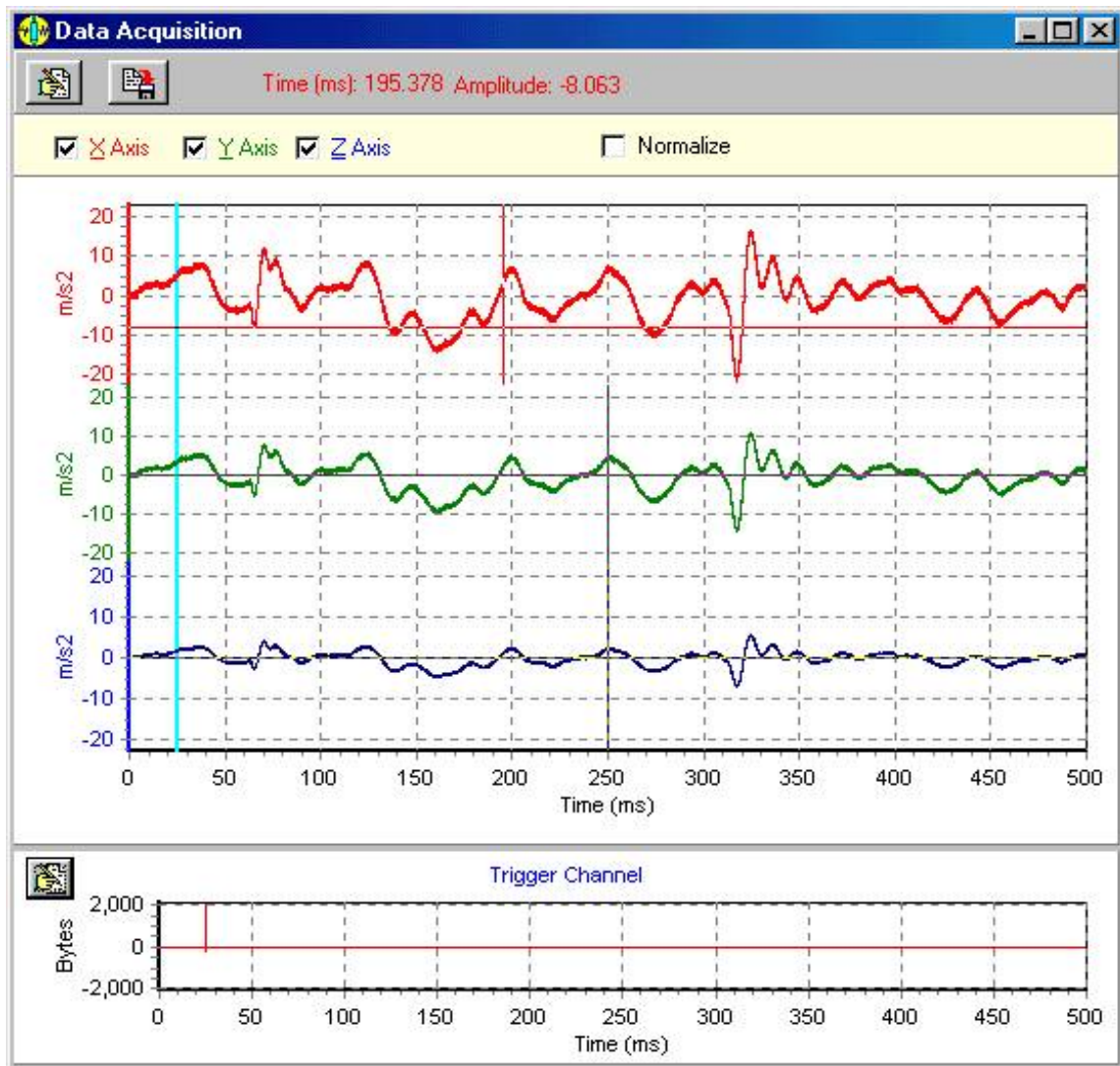


Figure 6. Example of seismic data acquired in the Data Acquisition menu.

When enabled, the *Normalize* check box allows the user to display the X, Y, and Z component time series relative to the maximum amplitude recorded for each respective axis.

The trigger channel is displayed in the bottom chart of Figure 6. The trigger channel displayed contains both pre trigger and post trigger information. The top chart of Figure 6 contains the acquired seismic time. The light blue line illustrated in Figure 6 signifies the trigger time.

The user may then print the captured seismic data to the currently selected printer and/or save the recorded trace by selecting the save button. If the user has selected that *Automatic Specification* check box then the seismic data file is automatically save, otherwise the dialogue box for saving captured seismic traces illustrated in Figure 7 appears.

The saved data has the following header information:

sample rate (ms), time delay (ms), probe depth, source radial offset, and source depth.

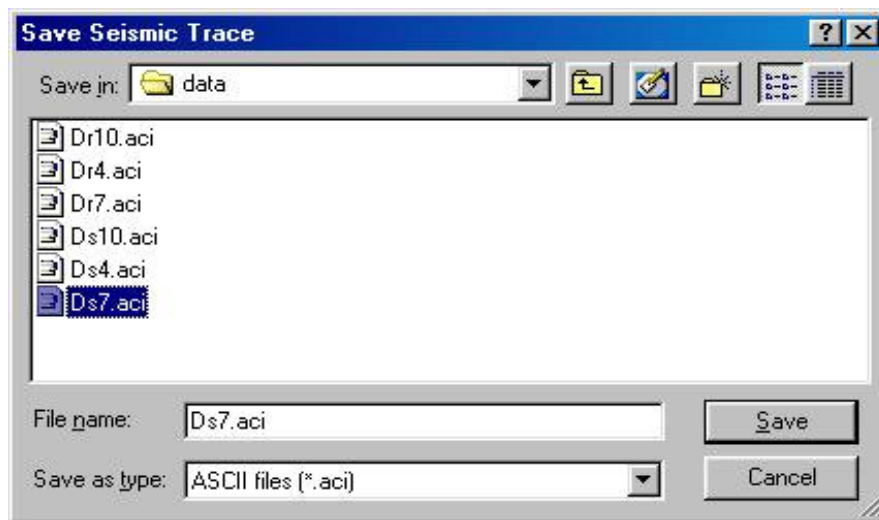


Figure 7. File Save dialogue box.

(2) Stack - The stack data option allows the user to stack seismic traces at a depth by implementing repeated sources. This option is only applicable if there is little coherency in the background noise. The user may abort the *Stack* operation by pressing the *Stop Acquisition* push button

The graphical LEDs illustrated at the right of the *Stop Acquisition* button are defined as follows:

- Green** - ready to commence data acquisition
- Yellow** - waiting for trigger
- Red** - trigger occurred

1.3 Chart Formatting, Exporting, and Printing

The graphical edit button displayed at the top left hand corner of the previously illustrated graphs allows for chart formatting, printing, and exporting. Figure 8 illustrates the graphical interface that appears when the edit button is selected. The edit chart dialogue box allows for extensive modification of the displayed data and chart attributes. Figure 9 shows the chart print tab where the user specifies printer and printing parameters. The help button is selected to obtain detail information on available functionality.

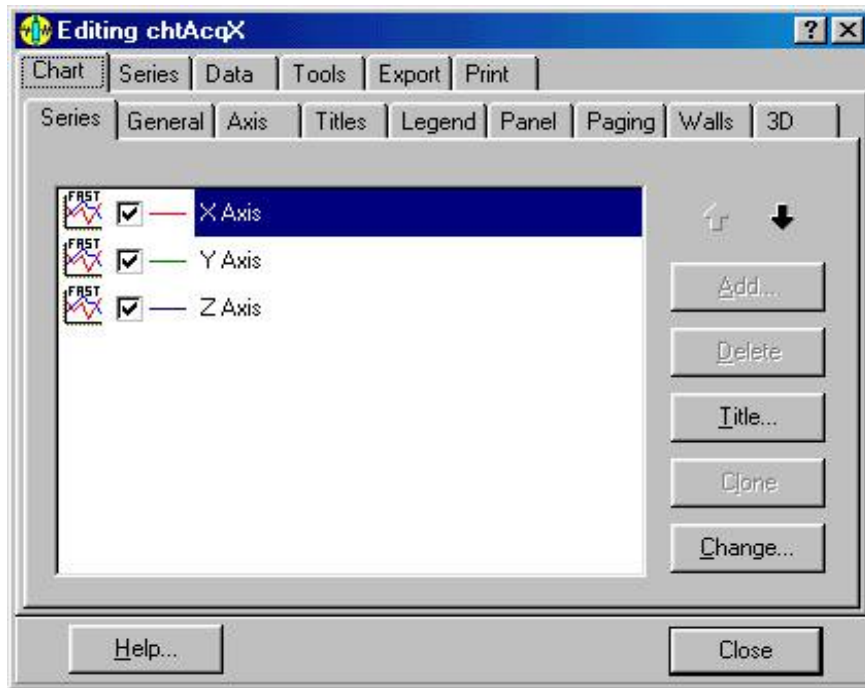


Figure 8. Chart editing dialogue box.

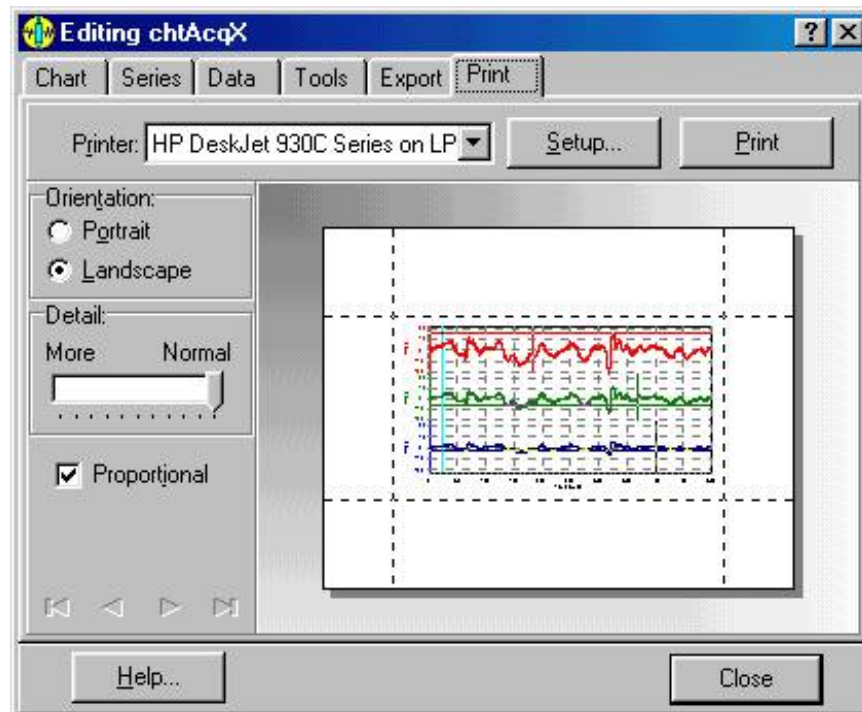


Figure 9. Chart printing dialogue box.

1.4 Help Menu

The options associated with the Help Menu selection are as outlined as follows:

- About - provides software version information on *SC3-DAC*.
- User's Manual - will output the *SC3-DAC* user's manual in a default pdf browser.
- Link to BCE - makes a link to *Baziw Consulting Engineers*' web page.