

SR272 User Guide

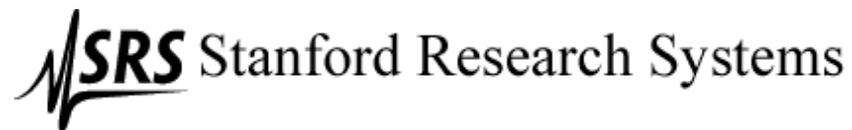


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Introduction

SR272 is a data acquisition program for the SR245 Computer Interface Module. Up to seven channels of data can be collected simultaneously on an active graph. This program allows you to copy data points from one graph to another, modify graph attributes, such as line style and title, and it allows you to save the graphs and data in different file formats, such as ASCII and bitmap. There is limited capability to send commands to other instruments at various times during a set of scans.

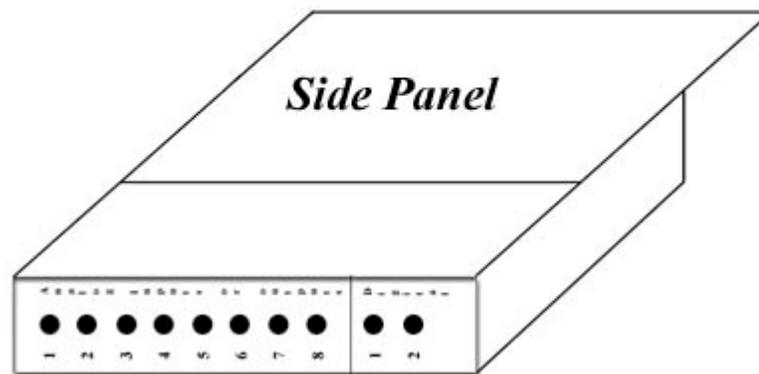
Graphs other than the active graph can be read in and created by this program, however, only the active graph can collect data. Graphs can be connected and disconnected easily. Closing an active graph and exiting the program both disconnect the program from the SR245.

To start the SR272 data acquisition program, double click on the SR272 program icon that was created during installation. You can also start the program by typing the full path name for the program into the edit box of the Start|Run command. The SR272 program runs on Windows 95/98/ME and Windows NT/2000. Only one instance of the application can be run at time.

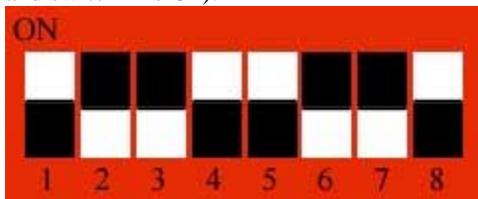
Hardware/Software Configuration

Configuring the SR245 Computer Interface

It is very important to match the configuration Switch of the SR245 with the connection setup in the SR272 program. If the two do not match, the data collection part of the program cannot run. The configuration switch is found inside the SR245. To find the switch, detach all cables and remove the SR245 from the SR280 Mainframe. Place the module on its side with the front of the SR245 facing you. Remove the screw and slide back the side panel:



The configuration switch is the red set of switches (black indicates the switch position, for example switch 1 is off and switch 2 is On):



This is the factory configuration. As you will soon see, this is configured for RS232 communication.

GPIB Operation:

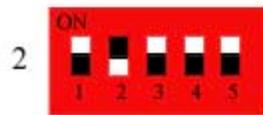
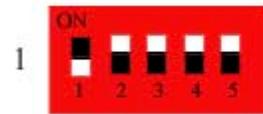
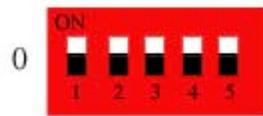
Bit 8: ON - if it is off, it expects RS232 Communication.

Bit 7: This bit controls the RS232 Echo mode for GPIB. It should only be On if there is a problem and you are conducting diagnostics. **It should NEVER be on if you are taking data with this program.**

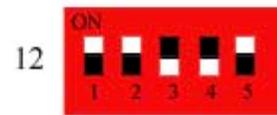
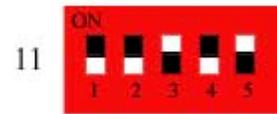
Bit 6: This bit controls the number of stop bits when the Echo mode is enabled (On) in Bit 7. For running SR272, it can be in either state.

Bits 5-1: The GPIB address for the SR245. It is very important that you know the decimal number that is associated with this setting. The SR272 program cannot communicate via GPIB if this address is incorrectly set in the program. The following demonstrates how this address is set:

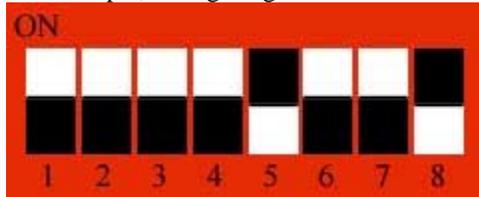
GPIB
Address



GPIB
Address



For example, configuring for GPIB with address 16:



RS232 Operation:

Bit 8: OFF - if it is on, the module will expect GPIB communication.

Bit 7: OFF - This enables/disables the echo mode (See above, GPIB communication, Bit 7).

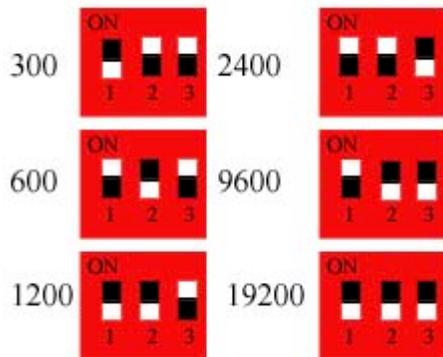
Bit 6: Sets the number of stop bits. When on the number of stop bits is 2, when off, 1.

Bit 5: Enable/Disable the parity. When on, there are 8 data bits and 1 parity bit. When off, there are 8 data bits and no parity.

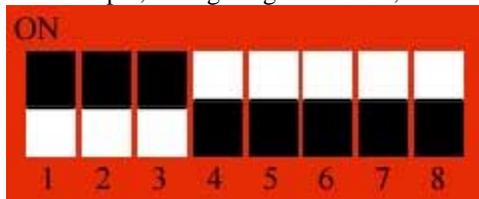
Bit 4: If the parity switch is on, this makes the parity even, when off the parity is odd.

Bits 3-1: Sets the baud rate:

Baud Rate



For example, configuring for RS232, baud rate of 19.2 Kbaud, 1 stop bit, no parity:



Connecting to a SR245 Computer Interface

At the beginning of the program, the SR272 checks to see if a SR245 is currently connected with the preset interface (GPIB or RS232). If so, the first graph is connected and data acquisition will commence after the Start Button  is pressed. If an SR245 is not connected, a message will appear saying that the SR245 is not connected. The first graph that comes up on the screen will be inactive.

In order to make a graph active, you must first make sure that the connection from the computer to the SR245 is correct. If you are connecting via GPIB, make sure that bit 8 of the Configuration Switch inside the SR245 is in the ON position and that you know the decimal address of the SR245 that you set in switches 5-1. If you are connecting via RS232, make sure that bit 8 of the Configuration Switch inside the SR245 is in the OFF position and that you know the parity, number of stop bits and baud rate that you set in switches 6-1.

Once the appropriate cable (if using RS232, **DO NOT USE A NULL MODEM CABLE**) is connected from your computer to the back of the SR245, and the configuration switches are set, make sure there is an input trigger. If you are running a time scan, make sure there is a BNC cable running from the Analog Output 8 to the External Delay input on the back of the Gated Integrator. If you made the configuration switch changes while the unit was still on, power cycle the unit to set the configuration.

If you are using a CEC GPIB interface and you are not using the default I/O address of 0x2B8, then the SR272 program will not recognize the interface card when it starts the first time. In order to set the I/O address, see the Scan|Connection, Setting the CEC GIB default I/O address section.

Tutorial and Program limitations

SR272 Tutorial

The following example is designed to introduce you to the SR272 software. In this example, you will collect 2 exponential curves off the SR245 that will be generated by the SR250. In order to perform this exercise, you will need the following:

1. SR280 Mainframe
2. SR250 Gated Integrator and Boxcar Averager
3. SR245 Computer Interface module
4. The inline BNC high-pass filter that was included with the boxcar
5. 5 BNC cables
6. 1 BNC T connector

Device Setup:

1) Set the SR245 configuration switches for either RS232 or GPIB communication. If you are connecting via GPIB, make note of the address. If you are connecting via RS232, make note of the parity, stop bits, and baud rate you have set.

2) Connect the BNC T connector to the SR245 "Sync" input. Connect a BNC cable from the SR250 "Busy" output to one end of this T.

3) Connect a BNC cable to the free end of the T and attach the other end to the high-pass filter. Connect the high-pass filter to the SR250 "Signal Input". Leave the "Signal Output" disconnected.

4) Using a BNC cable, connect the SR250 "Averaged Output" to Channel 1 of the SR245. Using a BNC cable, connect the SR250 "Last Sample" to Channel 2 of the SR245.

5) Using a BNC cable, connect Channel 8 of the SR245 to the "External Delay Control" on the back of the SR250. This sets up the hardware portion of the time scan.

6) Adjust the boxcar to the following settings:

Internal trigger=100hz

Delay Scale=1 μ s

Delay Multiplier 0-10=0 (It is a good idea to lock it at this value by pushing down on the black tab on the side of the multiplier knob).

Width Scale=30ns

Width Multiplier=3

Signal Sensitivity=0.5V

Set the Signal "Input Filter" toggle to DC

Averaging Samples=10

SR272 Setup

1) Click on the  speed button or select Scan|Connection from the main menu. Select either the GPIB or RS232 page depending on which communication method you are using.

If you are using GPIB:

- If necessary, select which type of GPIB board you are using (If you have a CEC card and no National card, the National Option may show up anyway, USE THE CEC NOT THE NATIONAL).
- Enter the address of the SR245.
- Enter the address of the computer (typically 0).
- Click on **Connect**. The graph should disappear and then reappear. The new graph will have a light bulb in the upper left hand corner.

If you are using RS232:

- Type in the com port.
- Select the stop bits, parity and baud rate.
- Click on **Connect**. The graph should disappear and then reappear. The new graph will have a light bulb in the upper left hand corner.

2) Click on the  speed button or select Scan|Set Up from the main menu. Go to the Scan Parameters page and select the following:

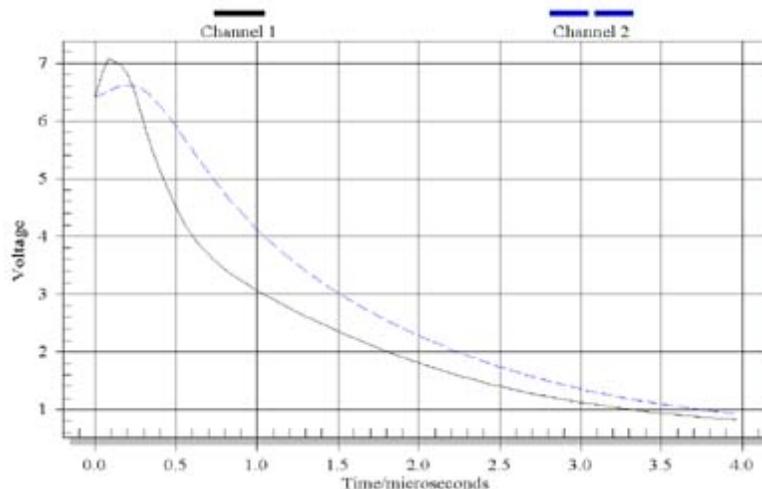
- 2 in the **Number of Channels** radio box.
- Single in the **Scan Type** radio box.
- In the **Data Points** box, type in 100 for number of points and 1 for Triggers/Point.
- Click on the **Apply** button.

3) Go to the Time Scan page. Select Yes in the **Time Scan** radio box. Click on the **Change** button. The Time Scan dialog box will appear:

- Select 1 μ s in the **Delay Scale** radio box. This must match the value of the Delay Scale on the SR250.
- Set the initial delay to 0 and the final delay to 4 μ s using the scroll bars.
- Press **OK**. The Time Scan dialog box will disappear and the initial and final delay values you have set will appear on the Time Scan page of the Set Up dialog box.
- Press **OK** in the Set Up dialog box. The Set Up dialog box will disappear.

4) Press the  speed button, select Scan|Start from the main menu or press ctrl+B to start the scan. When the scan is complete, you should get something that looks like:

Graph 1



Cryptic Error Messages

Most of the error messages generated by this program are very straight forward. If you get the message "Not a valid integer value", you were suppose to enter an integer value into the edit box. Some of the error messages are not so obvious and they are described here.

Error: "SR245 is not attached."

You may see this message when...

- You first start the program and it does not find the SR245 with the communication method (RS232 or GPIB) you used the last time you ran the program.
- You click on the connect button in the Connection dialog box and you are not attached to the SR245.

What has happened. The program has sent the ?1 command to the SR245 and has gotten no response.

Possible causes:

- The SR245 is not powered up.
- The cable is loose, not connected or the wrong type (remember DO NOT USE A NULL MODEM CABLE for RS232).
- You are using GPIB and the computer and/or SR245 address you have given is not correct.
- You are using GPIB and the RS232 Echo Mode is enabled.
- You are using RS232 and the com port you have specified is wrong
- You are using RS232 and the stop bits, parity and/or baud rate does not match that of the SR245.

Error: "SR245 Hardware Error! Aborting Scan"

You may see this message at the start of a scan.

What has happened. The program has tried to read data from the SR245 but the SR245 did not respond.

Possible causes:

- The SR245 is not powered up.
- Any other SR245 error that causes the instrument to stop the scan. For more information consult the manual that came with the SR245.

Note: If you are in the middle of a scan and the SR245 quits responding, you will not get this message. You will have to stop the scan to continue. One way to tell if the SR245 is responding is to look at its activity light. During a scan, it should be lit (green).

Error: "The total number of bytes sent during the scan must be less than 65535"

You may see this message when you are in the Scan Set Up dialog box.

What has happened. The SS command cannot send more than 65535 bytes during a scan. Therefore, the number of channels times the number of data points times the number of triggers/point times 2 must be less than 65535. You must adjust one of these parameters so that you do not exceed 65536 bytes.

Scan Limitations

The data acquisition rate of the SR272 program depends on the speed of your computer, the communication method you are using to acquire data, the number of points you are acquiring during a scan and the SR245.

When collecting more than 30,000 bytes of data, the program appears to slow down significantly. This is because it must collect data as fast as it can to prevent the SR245 internal buffer from overflowing. If you are collecting data at high scan rates (near the maximum), it is suggested that you do as little to the program as possible. For example, if you need to make changes to the x axis range, do so before or after you scan, not while you are scanning. Aborting the scan will be sluggish, it may take a few seconds before the command is actually sent. Pausing is also not recommended under these conditions. In addition, it is strongly recommended that you TURN OFF YOUR SCREEN SAVER if you are taking several scans where the number of points times the number of channels times the number of triggers/point exceeds 3000. If the screen saver comes on in the middle of a scan, it will cause data collection to slow down. If data collection slows down too much, the SR245 internal buffer will overflow, stopping the scan.

Maximum Scan Rates. These have been measured with a 166MHz Pentium. Your scan rate limits may be different.

National Instruments AT-GPIB/TNT

Number of Channels	Number of Points	Maximum Scan Rate
1	30000	1.1KHz
2	15000	500Hz
3	10000	350Hz
4	7500	270Hz
5	6000	220Hz
6	5000	170Hz
7	4286	150Hz

CEC PC488/488EX

Number of Channels	Number of Points	Maximum Scan Rate
1	30000	1.0KHz
2	15000	450Hz
3	10000	300Hz
4	7500	260Hz
5	6000	200Hz
6	5000	150Hz
7	4286	130Hz

RS232

Number of Channels	Number of Points	Maximum Scan Rate
1	30000	1.0KHz
2	15000	450Hz
3	10000	290Hz
4	7500	210Hz
5	6000	160Hz
6	5000	120Hz
7	4286	120Hz

Error Light on the SR245

The red error light on the SR245 will sometimes appear during a scan with the SR272 program. It can mean that the SR245 terminates your scan and resets itself or it may mean nothing. It depends...

When the SR245 terminates your scan and resets itself:

If the red error light comes on and then a few moments later both the green and red lights go out, the SR245 buffer has overflowed and the SR245 has reset itself. When this happens, the SR272 program will keep trying to retrieve data until you abort the scan. In this case you must first abort the scan and then either reduce the number of points you are collecting or slow the scan rate before attempting another scan.

When it means nothing:

The red light can sometimes appear at the start of a scan, especially at trigger rates greater than 500Hz. This does not indicate a buffer overflow if the green light stays on for more than a couple of seconds. The red light will stay on throughout the scan but data acquisition proceeds normally.

Menu Commands

File Menu

File|New

The New command creates a new SR272 graph. A new graph can be created at any time, including during a scan. To make a new graph, either select **New** from the file menu, press the New File button , or press ctrl N.

A new graph has the same scan, axis and scale parameters as the last active graph. Until the graph is saved, it is labeled Graph n, where n is a sequential number. The graph is not connected and therefore cannot execute the Start Command. Before data can be collected into this graph, the Connect command must be successfully executed. Only one graph can be connected at a time.

File|Open

Selecting File|Open from the main menu, clicking the **Open** speed button , or pressing Ctrl+O calls the file dialog box.

Only *.272 and *.MAT files can be opened in the SR272 program. Be very careful when importing MAT files. The program assumes that the first column is the x data and the remaining columns are y data. If the file you import is not in that form, you will not see what you expect.

Once a file is opened, the graph will show on the screen. As with the New command, the graph is inactive.

File|Save, File|Save As

To save a graph:

- a) Select the graph by clicking on the window or by choosing the graph from the **Window** menu.
- b) Choose **File|Save** from the main menu, press the  button on the speed bar or press Ctrl+S. If the graph has not been saved before, the Save As dialog box will appear.
- c) The file can be saved as:
 - **SR272 File:** This file will contain all the data as well as the scan information (number of data points, number of triggers per point, etc).
 - **ASCII File:** This file contains only data. The data is arranged in columns with the x data being the leftmost column and the channels in the remaining columns.
 - **MAT file:** This file contains only the data. The data is arranged in a number of points by number of channels+1 matrix. The x data is in the first column and the channels in the remaining columns. If you choose to save your data using this file type you will be asked to supply an array name in the MAT File Array Name dialog box. Remember that MatLab does not recognize blank spaces in filenames or array names.
 - **Bitmap or CGM files:** These are graphic files. They show the graph only.
- d) Choose the directory, the file type and the filename associated with the graph you wish to save and press **OK**.

If you have copied points into the graph, they will be included if you save the graph as a bitmap, CGM or 272 file type. They will NOT be included if you save the file as a text file or a MAT file.

If the graph has already been saved, saving again, will result in the file being saved using the format and filename that was used when the graph was first saved (in the case of the MAT file, the array name will also be the same).

Use Save As when you want to save the file using a different format, directory or filename than when the file was first saved. From this point on, anytime you save this file, the file will be saved using the format, directory, ect. you choose here.

If you save the file as a MAT file, a dialog box will appear asking for the name of the array. When you save your data as a MAT file, the file itself can be loaded into MatLab using the load command. The data can then be accessed by typing in the MAT file array name you enter in this dialog box. Remember that MatLab does not recognize blank spaces in file or array names.

File|Scan Logging

Scan logging allows you to automatically save the graphs/data in separate files while running a series of scans. Scan logging is only allowed when Continuous or n Scans is selected in the **Scan Type** box of the Set Up dialog box AND when the current graph is active.

To save graphs/data automatically:

- 1) Select either Continuous or n Scans in the Set Up dialog box.
- 2) Select File|Scan Logging from the main menu. A dialog box will appear.
- 3) Type the base file name in the **Base File Name** box.
- 4) Select a file type from the **File Type Box**. SR272, text files and MAT files can be saved during scan logging. If you choose to save the files as MAT files, the access variable name will be the same as the save file name without the *.mat extension. Remember that MatLab does NOT recognize blank spaces in filenames or variable names.
- 5) Enter a starting integer in the **Starting Number** box. This will be the number of the first file saved.
- 6) Either enter a path (including drive) into the **Directory** box or press Browse and select a **Directory** from the Directories Dialog Box. To select a directory:
 - Choose a drive from the drive box located at the top of the form. The directories in that drive will then appear in the box immediately below.
 - Choose a directory and press OK. the Directories Dialog box will close and the directory you have chosen will appear in the Directory Box of the Scan Logging Dialog Box.
- 7) Press **OK**. The name of the first file that will be saved will appear as the title of the graph.

WARNING: The program checks to see if the first few files already exist, however, it does not check for all the files. It is possible for old files to be overwritten if they have the same names as the new files.

File|Close

Close is used to close a graph. If the graph is active, the connection to the device is severed. If the graph is acquiring data, the user is prompted as to whether or not the scan should be aborted.

A graph can be closed by either clicking on the close button in the upper right hand corner of the graph form or by choosing **File|Close** from the main menu. It is not recommended to close a graph while taking data since all data acquired will be lost.

File|Print and File|Printer Setup

The print command prints the current graph using the printer chosen by the user. To Print:

- 1) Make the graph you want to print current by either clicking on the graph or by choosing the graph from the **Window** menu.
- 2) Choose **File|Print**, press the print button  or press ctrl+P. The print dialog will appear.

To select the printer, use the File|Printer Setup menu item.

File|Exit

This command terminates the program. All graphs are closed before the program exits. If a graph is currently acquiring data, the user is asked as to whether or not the scan should be aborted. The graph is disconnected and closed before exiting the program.

As with the File|Close command, it is not recommended that the program be exited while scanning since any acquired data will be lost.

Edit Menu

Edit|Copy Graph

Copy graph puts the entire current graph on the clipboard in either a graphics or text format. To copy a graph to the clipboard:

- 1) Either select **Edit|Copy Graph** or press the Copy Graph speed button . This will call the **To Clipboard** dialog box.
- 2) Select which format you want to copy to the clipboard:
 - **MetaFile**: The graph in CGM format.
 - **BitMap**: The graph in windows bitmap format.
 - **Text**: Puts the data in the graph on the clipboard as ASCII. The x axis is in the first left hand column with the channels in the remaining columns. Only acquired data will be put on the clipboard, NOT imported data.
- 3) For both MetaFile and BitMap formats, the size of the graph on the clipboard can be selected by entering values in the text areas **Height in pixels** and **Width in pixels** of the **Graph Size Box**.
- 4) Press OK and the graph will be copied to the clipboard.

Note: Empty graphs cannot be copied to the clipboard in text format.

Edit|Clear Graph

Select **Edit|Clear Graph** clears the data in the current graph. If the data in the graph has not been saved, **IT IS GONE**. It cannot be retrieved.

Edit|Select Channel

Select Channel is used to select an entire channel of data from the graph. This data can then be copied as text into the clipboard and pasted onto another graph.

To Select a Channel:

- Make sure there is data on the graph to copy.
- Select **Edit|Select Channel** from the main menu. This calls the Select Channel Dialog box. Select the channel from the box and press **OK**. All the points selected will appear on the graph as points (as opposed to lines) on the graph.

To copy these points into the clipboard, either select Edit|Copy from the main menu or press the  speed button. Unlike Copy Graph, imported data can be copied as text into the clipboard.

Edit|Select Points

Select Channel is used to select a group of points in a particular channel from the graph. This data can then be copied as text into the clipboard and pasted onto another graph.

To Select Points:

1. Make sure there is data in the graph.
2. Choose either Edit|Select Points from the main menu or press the  speed button. This calls the Select Channel Dialog Box.
3. Choose the channel the points should be copied from and press **OK**. The dialog box will disappear and the cursor will change to a cross while over the graph.
4. Press the left mouse button at the first point to be copied, and drag the mouse to the ending point. A rectangle which spans the starting and ending points will appear while dragging.
5. Release the mouse button while over the ending point. The selected points will appear as points (as opposed to lines) on the graph.

To copy these points to the clipboard, either select Edit|Copy from the main menu or press the  speed button. Like Select Channel, imported data can be copied as text on the clipboard.

Edit|Undo

Undo undoes selecting, pasting and zooming.

- **Selecting:** If you have pressed the Select Points or selected Edit|Select Points from the main menu and have not selected points, pressing Undo will change the cursor back to the arrow. If you have selected points, Undo will erase the selected points.
- **Pasting:** If you have pressed the Paste button or selected Edit|Paste from the main menu, Undo will remove the pasted points.
- **Zooming:** If you have pressed the Zoom In button or selected Zoom|Zoom In from the main menu and have not zoomed, pressing Undo will change the cursor back to the arrow (You cannot press Zoom Out in this case because it has not yet been enabled. It becomes enabled after you zoom in.)

To Undo, either select Edit|Undo from the main menu or press the Undo  speed button.

Edit|Copy

Copy copies selected points onto the Windows clipboard. These points can then be pasted into another graph. Copy can only be used after the points have been selected using either Select Channel or Select Points. To copy points:

1. Select the points to be copied. The points that are to be copied will be seen as point on the graph (as opposed to lines).
2. Select **Edit|Copy** from the main menu or press the Copy  speed button.

Once the points are copied, the Edit|Paste menu item and the paste  speed button can be used. The Copy menu item and the copy button, however, cannot be used until more points are selected.

Edit|Paste

Once points from a graph are selected and copied, selecting **Edit|Paste** from the main menu, pressing the  speed button or press ctrl+V pastes the points into the current graph. The pasted points will appear as points and the name of the channel will appear at the top of the graph along with its corresponding point style and color. The name, plotting style and color of the pasted channel can be modified using the Plot|Channel command or by clicking on one of the channel names at the top of the graph. The pasted channel will appear in the Imported Data box of the Channel dialog box.

Zoom Menu

Zooming allows the user to "blow up" a region of the graph.

Zoom|Zoom In

Zoom In is the process of using the mouse to select new parameters for the graph's grid. Zooming turns off the autoscale of both the x and y axes (if they are on) and sets the minimum and maximum values to the range selected during zooming (See X Axis Range Page or Y Axis Range Page of the Plot|Axes dialog box).

To Zoom In:

1. Either press the Zoom In  speed button or select **Zoom|Zoom In** from the main menu.
2. The cursor will change to . Press the left mouse button at the start of the range to zoom and drag the cursor to the end of the zoom range. Release the mouse button.
3. To undo the zoom, see Zoom Out.

Zoom|Zoom Out

The Zoom Out command autoscales both axes of the graph. If zoom out is not enabled, press the button  to autoscale the x axis and then press the button  to autoscale the y axis.

Scan Menu

Scan|Set Up

Selecting Scan|Set Up from the main menu or pressing the speed button  calls the Scan Set Up Dialog Box. There are three pages:

- Scan Parameters Page: This page is used to set the scan parameters.
- Delay Page: This page is used to set up a time scan or to set the delay.
- Additional Commands Page: Here you can send commands to other instruments if the command does not generate a response.

All of these pages can be viewed (but NOT modified) when the connected graph is scanning.

Scan|Setup: Parameters Page

The parameters defined on this page of the **Scan Setup** Dialog are used to set up the SS command of the SR245 (See the SR245 User's Manual). To set up the scan:

Choose a scanning mode from the **Scan Type** box:

- Single scan: only one set of data is collected.
- Continuous scan: sequential sets of data are collected until you stop the scan.
- n Scans: n sequential sets of data are collected, where n is defined in **n-scans**. If the **Average?** check box is checked, a linear average of the n scans will be calculated.

Regardless of the type of scanning mode you choose, you must enter the number of data points you wish to collect and the number of triggers per point you want collected. The data point graphed will be an arithmetic average over the triggers for a given point.

Choose the number of channels on the SR245 that will have data to be collected. The numbers in the **Number of Input Channels** radio box correspond to the numbers on the "Analog Inputs or Outputs" of the SR245. Up to seven channels can be used to collect data during one scan. Note, you cannot "skip" channels. For example, you cannot collect data from just channels 1,3, and 5. You must collect data from consecutive channels.

Press **Apply** or **OK** and the settings will be saved. Press **Reset** or **Cancel** to return to the previous settings.

Scan|Setup: Delay Page

This page allows you to control the delay of the Gated Integrator. You have two choices, you can set a fixed delay or you can set up a time scan. In a time scan, the gate on the SR250 is "moved" by a user specified amount after each complete data point is acquired.

To set a fixed delay:

1. Use a BNC cable to connect the 8th Analog port on the SR245 to the External Delay of the SR250 (located on the back).
2. Set the delay scale to the desired scale and the Multiplier to 0 (both of these are located on the front panel of the SR250).
3. Select the **No** radio button in the time scan box of the Delay Page in the Scan Setup dialog box (Setup|Scan in the main menu). Pressing Change will cause the Delay Setup dialog box to appear.
4. At the top of the Delay Setup dialog box is a group of radio buttons which have the same time values as those

seen on the Delay Scale knob of the SR250. Select the Delay Scale that matches that of the SR250.

5. Make sure the Delay Multiplier on the SR250 is set to 0.

6. Use the Initial Delay scroll bar to set the fixed delay.

7. Press OK and the Delay Setup dialog box will disappear. The fixed delay value you selected will now appear on the Delay Page. The initial delay is the fixed delay.

To set up a time scan:

1. Follow steps 1 and 2 above.

2. Select the Yes radio button in the Time Scan box of the Delay page in the Scan Setup Dialog box. Pressing change will show the Delay Setup dialog box.

3. At the top of the Delay Setup dialog box is a group of radio buttons which have the same time values as those seen on the Delay Scale knob of the SR250. Select the Delay Scale that matches that of the SR250.

4. Make sure the Delay Multiplier on the SR250 is set to 0.

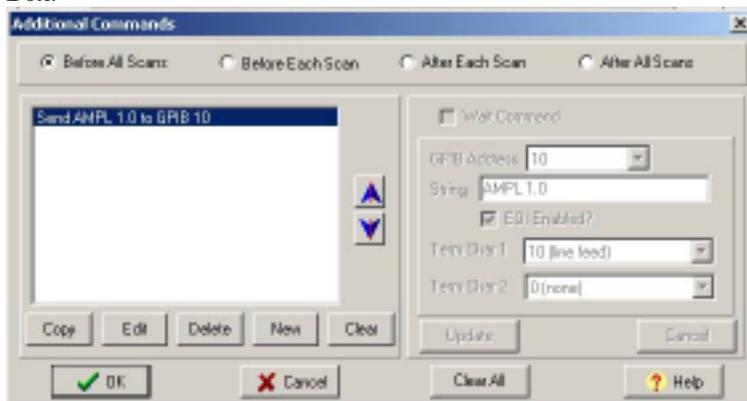
5. Use the Initial Delay scroll bar to set the initial delay and the Final Delay scroll bar to set the final delay. The values for these will appear above the corresponding scroll bar. Note that changing the Initial Delay moves the Final Delay scroll bar all the way to the left. This is because there are only certain values allowed for the final delay and those values depend on the initial delay.

6. Press OK. The Time Scan dialog box will disappear and the initial and final delay values you have selected will now appear in the Delay Page. Note that the x axis values in the current graph have also changed. The leftmost value will be the initial delay and the rightmost value will be the final delay. The x axis label will change to "Time/whatever time unit use have used".

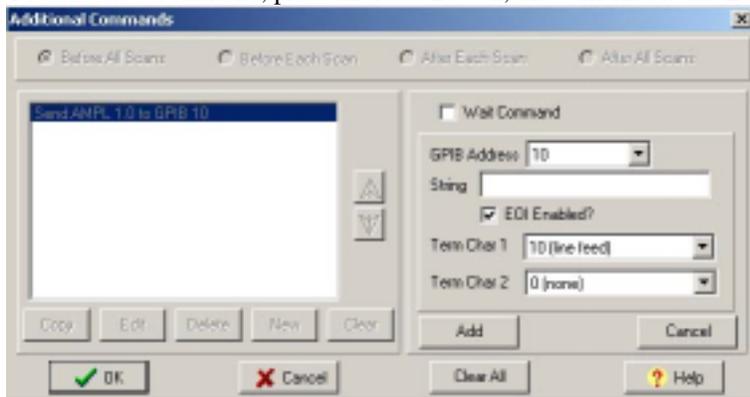
The time scan feature uses the S command to set the initial delay and the A command to set the delay after each point (see the SRS Fast Gated Integrators and Boxcar Averagers manual for details on these commands).

Scan|Setup: Additional Commands Page

The Additional Commands Page allows you to send GPIB commands to other instruments, including the SR245, at various times during the data collection process. **Only commands that do not generate a response can be sent.** If no commands have been specified, there is a banner across the center of the page saying that there are no commands. If there are commands specified, in the center of the page, there will be four checkboxes listing the times commands can be sent. If a box is checked, the command you have defined to be sent at that time will be sent. If a box is not checked, either there are no commands to be sent at that time or you have disabled the commands. To enter or change the commands, press the Add/Modify button. This will show the Additional Commands Dialog Box:



To add a new command, press the New Button, this will enable the Edit Panel:



To add a Wait command, check the **Wait Command** box and enter the amount of time, in ms, to wait. To add a command, make sure the **Wait Command** box is unchecked and:

GPIB:

1. Select the address to send the command.
2. Select the terminating characters to be sent and enter the command string.

Note: If you choose the SR245 address, the terminating characters will be set for you.

RS232:

Enter the command string. Commands can only be sent to the SR245 when using RS232.

Press **Add** to add the command.

To edit a command:

1. Select the command from the list and press the **Edit** Button.
2. Follow the directions for Add. (in this case, the label on the **Add** button will be **Update**)

To change the order of the commands in a list

Select the command you want to move. Press the up or down arrows to the right of the list to move the selected command.

Be very careful what commands you send to the SR245. The SR245 is reset between scans. Therefore, if you want to use the T command, send this before each scan, not before all scans.

Scan|Advanced Settings

Selected Scan|Advanced settings from the main menu calls the Advanced Settings Dialog box. When the **Customize Settings** radio button is selected, the user can change:

- The number of data points to be read. This number must be a positive integer greater than 0.
- The Time Out:
 - ◆ Using a CEC GPIB card/RS232: First select the time unit (milliseconds or seconds) and then move the scroll bar until the desired time out shows in the Time Out Label
 - ◆ Using a National GPIB Card: Select the timeout in the timeout radio box. the selected time out shows in the Time out Label.

If you data collection is proceeding without error, it is suggested that you do NOT change these settings.

Scan|Abort

This command stops the scan. This can be done one of three ways:

- Choose Scan|Abort from the main menu.
- Press the  button on the speed bar
- Press Ctrl+A

The Abort command can only be used while a graph is both current and is in the process of acquiring data. The Abort command sends a Master Reset command to the SR245 which immediately ends the acquisition of data (See the SR245 User Manual).

Scan|Connection

Selecting Scan|Connection from the main menu or pressing the Connect speed button  shows the Connection dialog box. This dialog box controls how the SR245 is connected to the computer. There are 2 pages:

- GPIB Page: Used to establish a link between the computer and the SR245 using GPIB.
- RS-232 Page: Used to establish a link between the computer and the SR245 using RS232.

Scan|Connection: GPIB Page

To connect using GPIB:

1. Make sure the interface board is properly installed.
2. Set the Configuration Switches in the SR245 Computer Interface Module for GPIB operation.
3. Connect a GPIB cable from the computer to the back of the SR245.
4. Select the GPIB Interface card you are using in the **GPIB Interface** radio box. The SR272 program searches for the presence of each of these boards at program startup. If one or both of the radio buttons are disabled, then SR272 could not find one or both of the interfaces.
5. Type in the GPIB address of the SR245 in the **SR245 Address** edit box.
6. Type in the address of the computer (typically 0) in the **Computer Address** edit box.
7. Press **Connect**. If the connection cannot be made, an error message will appear. To disconnect a graph, press **Disconnect**.

Scan|Connection: Setting the CEC GPIB default I/O address

If you are using a CEC GPIB Interface card and the I/O address is NOT set at the default value of 0x28B, you need to set the I/O address in the program. This is done in the **Board Parameters for Capitol GPIB Card** dialog box which can be accessed by pressing the **Advanced** button at the bottom of the GPIB Connections Page. In order to set the I/O address of the card, either select the correct address from the drop down list or enter the address (in hex) into the edit box. Then select the interface board number (this should be 0 if there is only one CEC card installed on your system) and press either **Apply** or **OK**. If the address is correct, the message "Board Recognized" will appear and the CEC option on the GPIB page of the Connection Dialog Box will become enabled and checked. This information is saved when exiting the program and therefore subsequent uses of the program do NOT require reentry of these parameters.

Scan|Connection: RS-232 Page

To connect using an RS-232 Cable:

1. Set the Configuration Switches in the SR245 Computer Interface Module for RS-232 Operation.
2. Make sure your cable is a straight through cable NOT a null-modem cable. Attach the cable from the com port on the computer to the back of the SR245.
3. Set the Serial Port Com to the com port connected to the SR245.
4. Set the parity, the stop bits and the baud rate to the values used when configuring the SR245 for RS232

operation.

5. Press Connect. If the connection cannot be made, an error message will appear.

Scan|Pause

The pause command pauses the active scan. It can be accessed in three ways:

- Choose **Scan|Pause** from the main menu.
- Press the  button in the speed bar.
- Press ctrl+Y

The Pause command can only be used while a graph is both active and is in the process of acquiring data. Pause sends a mask trigger command to the SR245, which results in the SR245 ignoring all triggers (See the SR245 User Manual for details). Once the scan is paused, several things happen:

- The Pause caption in the scan menu changes to Resume.
- The  button changes to .
- In the Status bar, the phrase: "Paused:n " appears where n is the number of seconds the scan has been paused.

To resume the scan:

- Choose Scan|Resume from the main menu.
- Press the  button on the speed bar.

Scan|Start

The start command starts the scan. It can be accessed in three ways:

- Choose **Scan|Start** from the main menu.
- Press the  button on speed bar.
- Press Ctrl+B.

A graph will only acquire data if it is connected to the SR245.

Scan|Stop Scrolling

If the SR272 is scanning and the scroll bars are showing, this menu item and the corresponding speed button will become active. By default, the scroll bars move with the acquisition of data. To stop this action, select Scan|Stop

Scrolling from the main menu or press the  button. To resume scrolling, select the Scan|Scrolling menu item from the main menu or press the  button.

Plot Menu

Plot|Graph

Selecting Plot|Graph from the main menu or clicking on the graph title, shows the Graph Parameters dialog box. This dialog box allows you to change the appearance of the graph. There are three pages:

- **General Page:** Use this page to change the title, sub-title and other general parameters of the graph's appearance.
- **Fonts Page:** Use this page to change the fonts used in the graph.
- **Colors Page:** Use this page to change the colors used in the graph.

Plot|Graph: General Page

There are several sections to this page:

Title Edit Box: Enter the title of the graph in this box. The title cannot be longer than 48 characters.

Sub-Title Edit Box: Enter the sub-title of the graph in this box. The sub-title can be no longer than 100 characters.

Viewing Style Radio Box: Here you can choose between a monochrome and color view of the graph. If you choose monochrome, changing the color of a channel will result in the shade of gray changing.

Point Size Radio Box: The point size refers to the size of the points seen when you graph your data using either points or lines+points **Plot Style** in the Channel dialog box.

Grid Box: You can select the type of grid lines for your graph in the **Grid Line** radio box. If you want the grid to appear in front of your data, check the **Grid In Front of Data?** checkbox.

Cursor Checkbox: When you have data in your graph and you are not scanning, checking this box will result in a cursor appearing on the graph. The cursor can be moved within a channel using the left and right arrow keys. To change channels, use the up and down arrow keys. The data point and the channel that the cursor is on will appear in the upper left hand corner of the graph. Unchecking this box will cause the cursor and the text in the upper left corner of the graph to disappear. The appearance and disappearance of this cursor can also be controlled on the graph. The cursor automatically appears when a scan is completed or aborted. Clicking on the channel name that appears in the left corner of the graph will make the cursor disappear. Clicking on any data point in the graph will make the cursor reappear.

To apply any of these changes to your graph, press either the **OK** or **Apply** button.

Plot|Graph: Fonts Page

The Fonts Page allows you to change the fonts used in the graph. There are three changes you can make:

Title Box: Changes here affect only the title.

Sub-title Box: Changes here affect only the sub-title.

Channels/Axis Box: Changes here affect the channel labels, the axes labels and the axes titles.

The fonts available are dependent on your system. The **Font Size** radio box changes the size of the font.

Remember to press either **Apply** or **OK** to apply your changes to the graph.

Plot|Graph: Colors Page

There are five areas whose color you have independent control over:

Desk Foreground: This encompasses the area around the graph (behind the title, sub-title, ect.).

Desk Background: This changes the color of the title, sub-title and channel text.

Graph Shadow: This changes the color of the shadow behind the graph.

Graph Foreground: This changes the color of the grid and axis ticks.

Graph Background: This changes the color of the graph itself (except for the grid, axis ticks, and data).

To change one of the colors, press the **Modify** button next to the label of the area you wish to change. This will show a color dialog box. Select the color and press **OK**.

The **Data Shadows** checkbox allows you to remove/place shadows behind data points in your graph. This only has meaning when you are plotting using lines+points or points. The shadows are black (sorry, you can't change this).

If you make a change to any of the colors, remember to press either **OK** or **Apply** to make the changes on the graph.

Plot|Axes

Selecting Plot|Axes from the main menu or clicking on the x axis label shows the Axes dialog box. This dialog box allows you to customize the graph axes and scale the data. There are 4 pages:

- X Axis is used to change the appearance of the X Axis.
- X Axis Range is used to change the X Axis range.
- Y Axis is used to change the appearance of the Y Axis.
- Y Axis Range is used to change the Y Axis range.

In addition to these modifications there are changes the program makes automatically. When a scan begins, the graph's x axis range changes to match the x axis range of the data that will be collected. For example, if you are reading in 100 data points and you are using the default unit of "Bins", the x axis range of the graph will be from 0 to 100. If you have copied data in the graph that contain x values greater than 100, that data is not displayed. It has not been erased, it is just not displayed. You can change this during the scan (see warning in Scan Rates) by accessing the X Axis Range page of the Axes dialog box, unchecking the **Autoscale** checkbox and changing the range of the x axis. However, if you wish to scroll the data (i.e., have a scrollbar on the bottom of the graph and have the scrollbar move with the data), the data **MUST** be autoscaled. You cannot change the units of either the x or y data while you are scanning. You can change the unit label, but not the A and B values.

Plot|Axes: X Axis Page

The X Axis page controls the appearance of the X Axis of the active graph. To apply changes, remember to press the **Apply** or **OK** buttons while you are on this page. If you do not, the changes will not be set.

The following changes can be made:

- Ticks are used to change the intervals between consecutive major and minor ticks.

To change the Major tick interval:

1. Check the **Set Major Tick** check box.
2. Put the interval between consecutive major ticks in the **Steps** edit box.

To change the Minor tick interval:

1. Check the **Set Minor Tick** check box.
2. Put the interval between consecutive minor ticks in the **Steps** edit box.

Make sure that the interval given for major ticks is evenly divisible by the interval given for minor ticks. For example, if the interval for major ticks is 15, the interval for minor ticks can be 5 ($25/5=5$ no remainder) but it cannot be 10 ($25/10=2$ remainder 5, no good). To remove all the x axis ticks and labels, set the major and minor tick intervals to numbers greater than the maximum value on the x axis. The only value that will appear on the x axis is the minimum x value.

- Show Ticks is used to place the labels and ticks of the x axis on the top or bottom of the graph. Select one or the other from the radio box.
- Axis Color is used to change the color of the x axis. To change the color of the x-axis, press the **Color** button and the color dialog will appear. Select a color and press **OK**. That color will now appear next to the **Color** button.
- Axis Title is used to change the title of the x axis. To change the x-axis title, type in the new title in the edit box. The title of an axes cannot be more than 48 characters in length (including blank spaces).

Plot/Axes: X Axis Range Page

The X Axis Range page of the Axes Dialog box is used to change the X Axis range. There are three ways to change the X axis range:

- Graph Scaling: changes the minimum and maximum values of the x axis. When **Auto Scale** is checked, the range of the x axis is the same as the of the x data (this does not include imported data, only acquired data). To change the range of the x axis, uncheck **Auto Scale**, if necessary, and then enter the minimum and maximum values for the x axis in the edit boxes. Then press either **Apply** or **OK** to apply your changes to the x axis of the graph. If you have zoomed in on a particular area of the graph, the Auto Scale for both the x and y axes is turned off. The minimum and maximum X values you see on the graph become the minimum and maximum values seen in the edit boxes of this page. If you have turned off Auto Scale in this dialog box, you can turn it back on in the main window by press the  button.
- Scrolling: places a scroll bar at the bottom of the graph. The range of the x axis shown is the value given in the interval box. Another way to enable scrolling is by pressing the  button in the speed bar. If this button is pressed, the Axes dialog box does NOT appear, although the scroll bar does appear with whatever interval is set in the **Interval** box of the X Axis page of the Axes dialog box. When the scroll bar is visible, the  button changes to . Now when the speed button is pressed, the scroll bar disappears and the entire range of the x axis is shown. When in Zoom mode with the scroll bar visible, the scroll bar becomes inactive.
- Units: changes the X axis values. The **Units** box of the X Axis scaling page controls the x values and puts units on the X Axis title. If you enter a string in the **Units Label** edit box, this string will be added to the X Axis title preceded by a "/". For example, if the X Axis title is Time and the units are seconds, then the X Axis title will become "Time/Seconds".

Below the **Units Label** edit box is the expression:
 $X=A*X_{Raw}+B$

where X is the value shown on the X axis, X_{RAW} is the original X value, and A and B are user defined factors. For example, suppose you define $A=2.0$ and $B=10.0$ then
if $datapoint=0$, then $x=10.0$
if $datapoint=100$, then $x=210.0$

The A and B edit boxes are disabled for an actively scanning graph.

If you enter values for A and B , remember that this changes the x values. Therefore, if you choose not to autoscale the graph, the minimum and maximum x values you choose must correspond to these x values, not the *datapoints*. The same holds true for the ticks and scrolling.

If you choose to run a Time Scan (see Delay Page) the **Title**, **Unit**, **A** and **B** will automatically be filled in. For example, if the Delay Scale is 1 ms, the initial delay is 0, the number of points is 100, and the final delay is 4 microseconds, the X Axis range will now span from 0 to 4 microseconds, the X Axis title will read Time/microsecond, A will be 0.400 and B will be zero.

Plot|Axes: Y Axis Page

The Y Axis page controls the appearance of the Y Axis of the active graph. To apply changes, remember to press the **Apply** or **OK** buttons while you are on this page. If you do not, the changes will not be set.

The following changes can be made:

- Ticks are used to change the intervals between consecutive major and minor ticks.

To change the Major tick interval:

1. Check the **Set Major Tick** check box.
2. Put the interval between consecutive major ticks in the **Steps** edit box.

To change the Minor tick interval:

1. Check the **Set Minor Tick** check box.
2. Put the interval between consecutive minor ticks in the **Steps** edit box.

Make sure that the interval given for major ticks is evenly divisible by the interval given for minor ticks. For example, if the interval for major ticks is 15, the interval for minor ticks can be 5 ($25/5=5$ no remainder) but it cannot be 10 ($25/10=2$ remainder 5, no good). To remove all the y axis ticks and labels, set the major and minor tick intervals to numbers greater than the maximum value on the x axis. The only value that will appear on the y axis is the minimum x value.

- Show Ticks is used to place the labels and ticks of the y axis on the top or bottom of the graph. Select one or the other from the radio box.
- Axis Color is used to change the color of the y axis. To change the color of the y axis, press the **Color** button and the color dialog will appear. Select a color and press **OK**. That color will now appear next to the **Color** button.
- Axis Title is used to change the title of the y axis. To change the y axis title, type in the new title in the edit box. The title of an axes cannot be more than 48 characters in length (including blank spaces).

Plot|Axes:Y Axis Range Page

The Y Axis Range page of the Axes Dialog box is used to change the y axis range. There are two ways to change the y axis range:

- **Graph Scaling:** changes the minimum and maximum values of the y axis. When **Auto Scale** is checked, the range of the y axis is the same as the of the y data (this does not include imported data, only acquired data). To change the range of the y axis, uncheck **Auto Scale**, if necessary, and then enter the minimum and maximum values for the y axis in the edit boxes. Then press either **Apply** or **OK** to apply your changes to the y axis of the graph. If you have zoomed in on a particular area of the graph, the Auto Scale for both the x and y axes is turned off. The minimum and maximum y values you see on the graph become the minimum and maximum values seen in the edit boxes of this page. If you have turned off Auto Scale in this dialog box, you can turn it back on in the main window by press the  button.
- **Units:** changes the y axis values. The **Units** box of the Y Axis scaling page controls the y values and puts units on the y axis title. If you enter a string in the **Units Label** edit box, this string will be added to the Y Axis title preceded by a "/". For example, if the Y Axis title is Voltage and the units are volts, then the Y Axis title will become "Voltage/Volts".

Below the **Units Label** edit box is the expression:

$$Y=A*Y_{Raw}+B$$

where Y is the value shown on the y axis, YRAW is the voltage read off the SR245, and A and B are user defined factors. For example, suppose you define A=2.0 and B=10.0 then

if YRaw=0.5V, then y=11.0V

if YRaw=-1.0V, then y=8

The A and B edit boxes are disabled for an actively scanning graph.

If you enter values for A and B, remember that this changes the y values. Therefore, if you choose not to autoscale the graph, the minimum and maximum y values you choose must correspond to these y values. The same holds true for the ticks.

Plot|Channel

Selecting Plot|Channel from the main menu or clicking on one of the channels listed at the top of the graph shows the Channel Dialog box. This dialog box controls the appearance of all the traces (channels). There are 2 pages in the Channels Dialog box:

- 1) Acquired Data: This page is for data that has been or will be acquired into this graph.
- 2) Imported Data: This page is for data that has been copied into this graph from another graph.

The **Hide the Channel Labels** check box at the top of the page that allows you to hide the channel labels at the top of the graph.

Plot|Channel: Acquired Data Page

The plot style of all acquired data must be the same (sorry, you can't mix styles). Choose either lines, points or lines+points from the **Plot Style** radio box at the top of the page. You can change the caption, color, linestyle and point style of an individual channel. Just select the channel in the list and choose the values in the box on the right. Remember to press **OK** or **Apply** to make your changes appear on the graph.

Plot|Channel: Imported Data Page

The plot style of all imported data must be the same (sorry, you can't mix styles). Choose either lines, points or lines+points from the **Plot Style** radio box at the top of the page. You can change the caption, color, linestyle and point style of an individual channel. Just select the channel in the list and choose the values in the box on the right. Remember to press **OK** or **Apply** to make your changes appear on the graph.

To remove an Imported Data Channel from the graph select the channel you wish to delete from the list and press the **Delete** button. A message box will appear asking if you really want to remove this copied data. If you choose yes, the data will be deleted. Pressing **Reset** will **NOT** restore the copied data.

Plot|Scale

Use Scale to choose between a linear or log scale on the y axis. If any y values are less than 0 or the graph does not contain acquired data, the log scale cannot be used. It is suggested that you **NOT** use the log scale while scanning. If values drop below zero, the graph will automatically change back to a linear scale.

Window

The window menu allows you to control the graphs.

Window|Cascade

Cascade arranges the graphs so that they overlap.

Window|Graph Names

When graphs are opened using the Open command or created using New, the name of the graph appears in the Window Menu. Selecting a particular graph causes that graph to become active. If the graphs are stacked on top of one another, that graph comes to the front.

Window|Refresh

Refresh redraws the current graph.

Window|Show

Show controls which graph is current when several graphs are open. By pressing Next Graph (or F4) the next graph in the series becomes current. By pressing Previous Graph (or F5) the previous graph in the series becomes current. Show is not active when only one graph is open.

Window|Tile

Tile arranges the graphs so they are all the same size. They are arranged horizontally. For example, if there are 2 graphs and Window|Tile is selected from the main menu, the two graphs will appear side by side.

Glossary

Active Graph: An active graph is a graph connected to a specific SR245 module via either GPIB or RS232. Only active graphs can acquire data.

Base File Name: A base file name is the general name for files which will be automatically created when using Scan Logging. Numbers will appear before the "." in the filename. For example, if the base file name is myscan, and the file format is *.272, then the first file saved will be myscan000.272, the second file myscan001.272, and so on. If the starting integer is not 0 but, for example 10, the first file will be myscan010.272.

Channel: A channel corresponds to an analog output on the SR245.

Data Set: A set of data consists of all the channels being scanned for all the data points. Each data point can consist of one or more points averaged together.

Imported data: Imported data is data that has been copied into the current graph from another graph.

Scan: A scan consists of all the channels being scanned for all the data points. Each data point can consist of one or more points averaged together.

Time Scan: In a time scan the gate of the gated integrator is moved by a user defined interval after each set of data is collected.