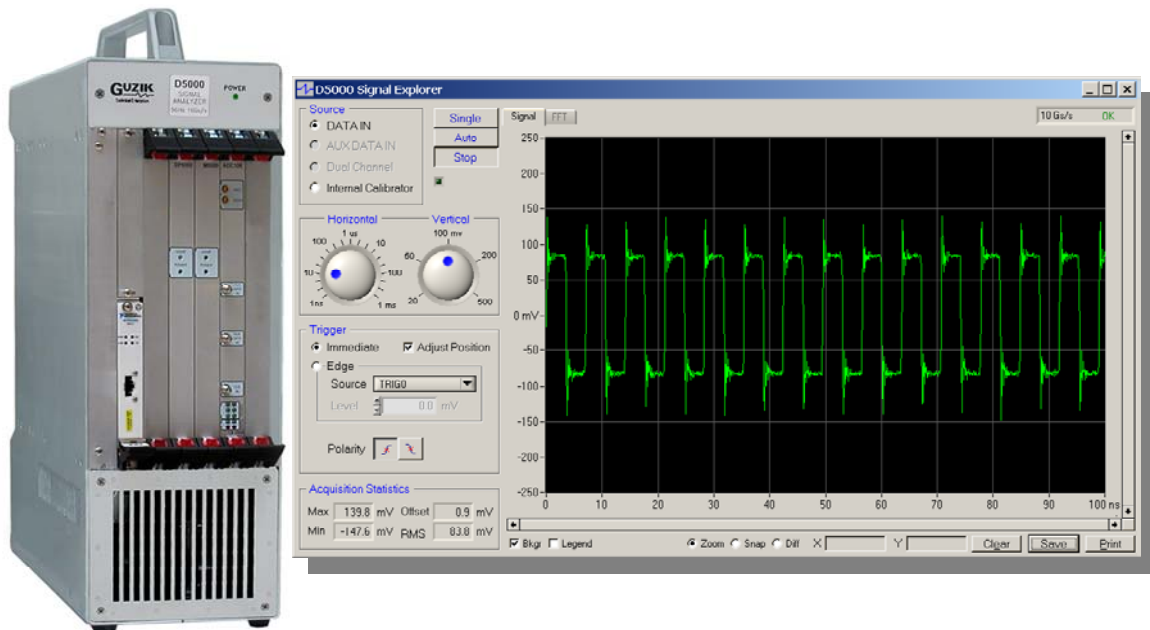




D5000 Signal Explorer and Software Development Kit User's Guide



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U.S. Patent Pending



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CHAPTER 1

ABOUT THIS DOCUMENT

1.1 Scope

This user's guide covers the description, installation, setup, and operation of the Guzik D5000 Signal Explorer software and the Software Development Kit.

1.2 Audience

Engineers responsible for installing and setting up D5000 Signal Explorer software, and for engineers responsible for operating the D5000 Signal Explorer.

1.3 Revision History

Revision 01 – initial release.

Revision 02 – includes the following updates:

- added Chapter 5, Software Development Kit,
- removed references to multi-module configurations, such as multiple DP and multiple ADC configurations. These options are not supported.

1.4 Technical Support

If you have a question about your Guzik product, first look in the printed product documentation, consult the online help provided within the software, or check the Guzik Knowledge Base at the following online location: <http://kb.guzik.com/docs>.

Note: To access the Guzik Knowledge Base, you need to provide a username and a password. Please contact support@guzik.com to obtain this information.

If you cannot find the answer, please contact the Guzik Product Support Services:

Voice	(650) 625-8000	From 9 A.M. to 6:00 P.M. Pacific time, Monday through Friday excluding holidays.
Fax	(650) 625-9325	
Email	support@Guzik.com	

When you call, you should be at your computer, and have the appropriate product documentation at hand. Be prepared to give the following information:

- The version of Guzik software product you are using.
- The model and the serial number for the D5000 signal analyzer you are using.
- The exact wording of the error messages that has appeared on your computer screen.
- What exactly happened and what you were doing when the problem occurred.
- How you are trying to solve the problem.

CHAPTER 2

INTRODUCTION

The D5000 Signal Explorer is a software application designed for use with Guzik D5000 Digital Signal Analyzer. This application provides the following functionality:

- Acquired signal display (time domain)
- FFT display (frequency domain)
- Vertical and horizontal resolution control
- Acquisition triggering control
- Basic acquisition statistics (min, max, DC offset, RMS)
- Acquisition results printing and exporting

CHAPTER 3

INSTALLATION AND STARTUP



CAUTION: The software installation must be performed before the hardware installation of D5000 hardware to avoid problems with the installation of PCI drivers.

3.1 Software Installation and License

The D5000 Signal Explorer application software is distributed on an installation CD. The driver for the D5000 Signal Analyzer hardware is installed together with the software installation. No special installation steps are required to install the driver. However, to facilitate automatic plug-and-play driver installation, the software installation must be performed before the hardware installation and connection of D5000. Please also refer to Section 3.3 about important details of the system startup.

You need a D5000 license to operate the D5000 Signal Explorer. Place the license file (it can be either *D5000.lcn* or *Guzik.lcn*) in the D5000 Signal Explorer installation directory. The license refers to the ADC10K board. If you purchase a new system, the license is typically pre-installed by Guzik Technical Enterprises into WITE32 installation directory. If the license is not installed, contact sales@guzik.com.

To install the application software:

- 1) Insert the software installation CD
- 2) Locate the file `SETUP.EXE` and execute it, either by double-clicking on the icon, or by typing the file name in a Command Prompt window. An installation wizard appears on the screen. Follow the on-screen instructions of the installation wizard.

After software installation the following files and shortcuts will be created on your computer:

- A shortcut, labeled *D5000 Signal Explorer*, will appear on your computer Desktop
- A program group D5000 Signal Explorer containing *D5000 Signal Explorer* shortcut will be created under the Start → Programs menu
- All D5000 Signal Explorer files will be transferred to the *C:\Program Files\D5000 Signal Explorer* folder

Note: The generic PCI device driver (used to control all Guzik D5000 cPCI boards) is installed with the software. All the hardware installation files (INF files) needed to detect the Guzik cPCI boards and driver installation are installed into the Windows INF folder as well.

After software installation, connect and power up the D5000, then restart the computer. With most configurations, the Windows Hardware Wizard does not appear, and software is ready to launch. If the Windows Hardware Wizard does appear, follow these steps:

1. If you correctly installed the software before connecting the D5000 hardware, go to step 7

2. In the Hardware Wizard, click *Cancel*
3. You need to install the software. If you plan to install it to a directory containing a previous version of software, first uninstall the previous version
4. Install the software
5. Reboot the computer
6. If the Hardware wizard does not appear, go to step 10
7. In the Hardware wizard, select “No, not this time” and click *Next* (this step appears in Windows XP, but not in Windows 2000)
8. In the Hardware wizard, select “Install the software automatically (Recommended)” and click *Next*
9. In the Hardware wizard, click *Finish*
10. The software is now installed and ready to launch

3.2 Hardware Installation and Connection

Please refer to “D5000 Signal Analyzer Hardware Description” user manual (Guzik P/N 02-107344-03) for details about D5000 hardware installation.

Connect analog signal to be acquired and displayed to the DATA IN SMA input of the ADC10K board (see Figure 1).

If external triggering is needed, connect external trigger signal to the TRIG0 MCX input of the ADC10K board (see Figure 1).

External trigger input TRIG1 is reserved for future use.

Auxiliary data input AUX DATA IN is reserved for future use.

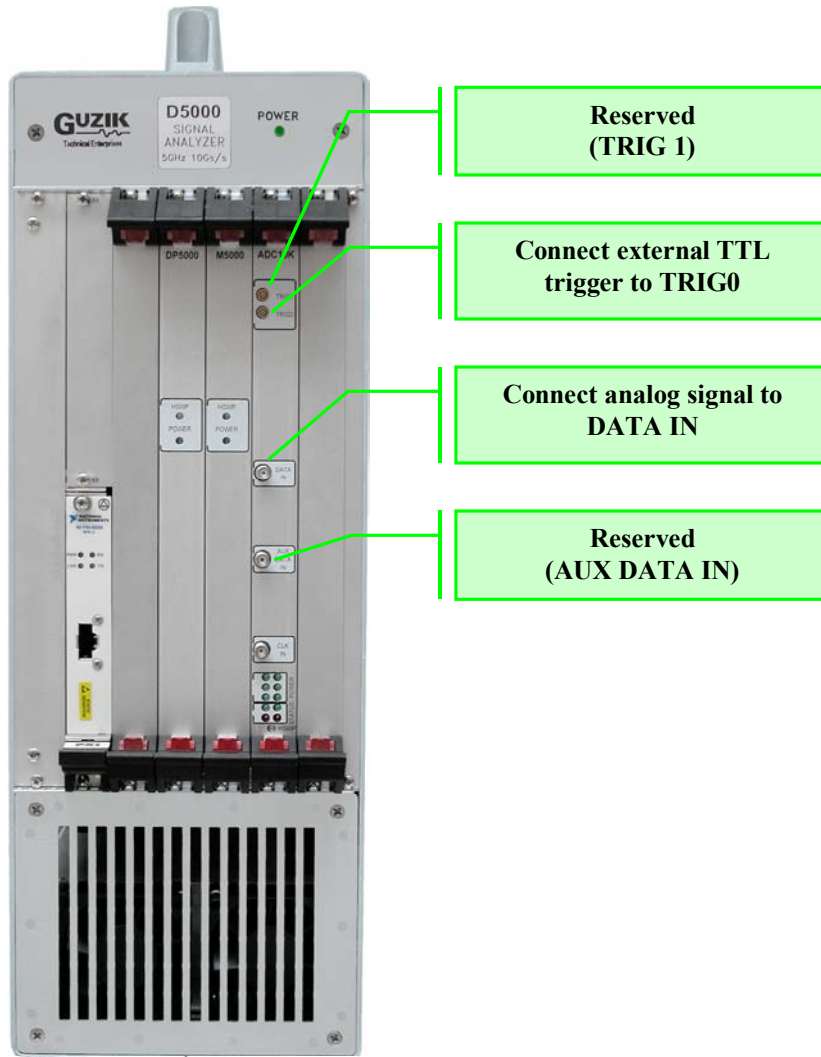


Figure 1: D5000 front panel connections

3.3 Starting D5000 Signal Analyzer

The cPCI bus of the cPCI chassis is the extension of the host computer PCI bus. Because of this, the operating system and the host computer BIOS treat the D5000 Signal Analyzer cPCI boards as regular PCI cards installed in the host computer. Therefore it is important to follow the exact sequence of powering on and powering off the cPCI chassis and the host computer in order to ensure proper PCI bus operation.

To start the D5000 Signal Analyzer, follow these steps:

- 1) Power on the Compact PCI chassis
- 2) Power on and boot the host PC



CAUTION: Always power on the Compact PCI chassis *before* powering on the host PC. Otherwise, the Compact-PCI bus may reset improperly and can cause the host PC to not recognize the cards installed inside the Compact PCI chassis.

- 3) When the host computer is booted the first time after the PCI-to-cPCI bridge installation, or after the installation of additional cPCI boards, reboot the host computer one more time to ensure, that the PCI-to-cPCI bridge driver and cPCI boards drivers are installed properly.
- 4) Start the application software



CAUTION: Do not power off the Compact-PCI-Chassis when the application is running. It may lead to system instability and unpredictable behavior.

3.4 Powering-off D5000 Signal Analyzer

To power-off the D5000 Signal Analyzer, follow these steps:

- 1) Exit from application software. Close all other applications.
- 2) Shut down and power-off the host computer.
- 3) Power-off the cPCI chassis.



CAUTION: Do not power-off the Compact PCI chassis before powering off the host computer. It may lead to system instability and unpredictable behavior.

CHAPTER 4

SOFTWARE OPERATION

4.1 Main Application Screen

The Figure 2 shows the main screen of D5000 Signal Explorer application.

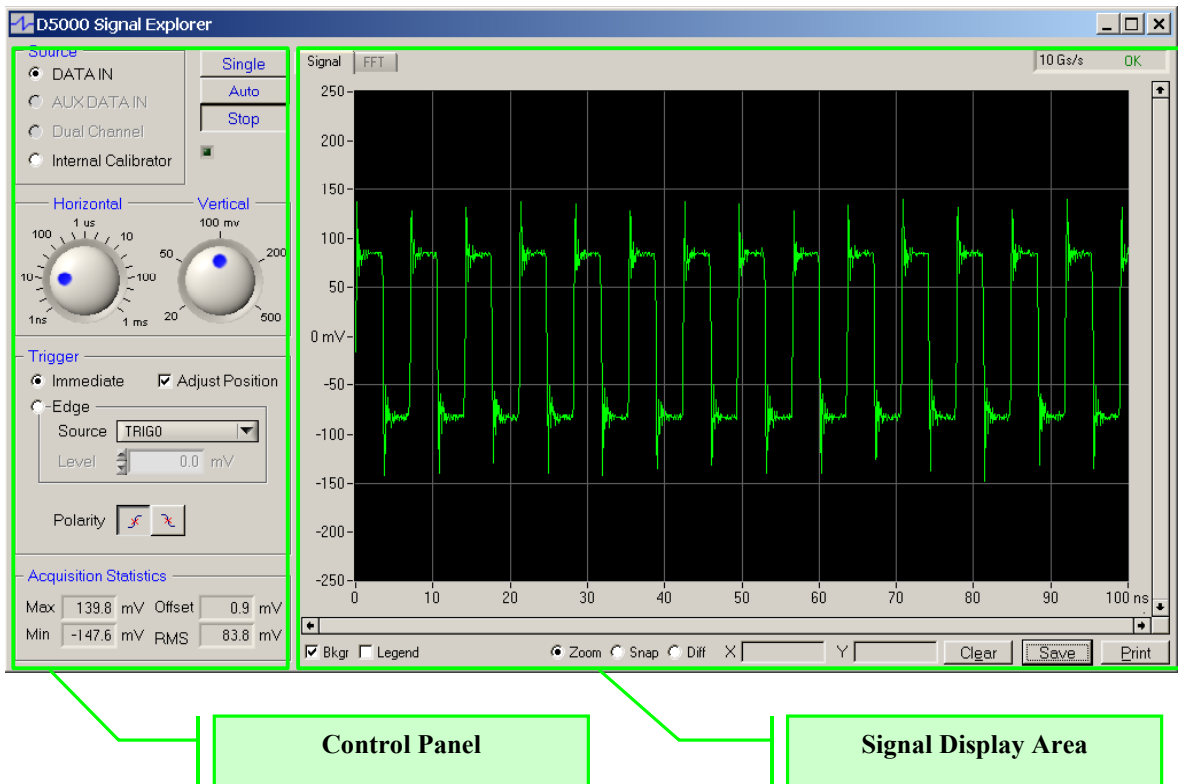


Figure 2: D5000 Signal Explorer main screen

The main screen consists of two major parts:

- Control Panel
- Signal Display Area

4.2 Control Panel

The Control Panel contains user interface control elements, which drive various aspects of digital acquisition. It has the following frames:

- *Source* frame to select data acquisition source
- *Horizontal/Vertical* frame to control horizontal and vertical resolution of the display
- *Trigger* frame to setup acquisition triggering
- *Acquisition Statistics* frame to display basic acquisition statistical results

The *Source* frame has the following controls:

<i>DATA IN</i>	Check this radio button to switch the acquisition source to DATA IN connector of D5000 ADC10K board.
<i>AUX DATA IN</i>	Reserved for future use. Disabled in this version.
<i>Dual Channel</i>	Reserved for future use. Disabled in this version.
<i>Internal Calibrator</i>	Check this radio button to switch the acquisition source to internal generator of the test square wave signal on the ADC10K board.

There are three buttons on the left of the *Source* frame, which control the acquisition:

<i>Single</i>	Press this button to perform one single acquisition. When the acquisition finishes, the acquired data is displayed in the Signal Display Area.
<i>Auto</i>	Press this button to perform many sequential acquisitions. As soon as one acquisition finishes, the acquired data is displayed in the Signal Display Area, and the next acquisition starts. This process continues until you press the <i>Stop</i> button.
<i>Stop</i>	Press this button to stop an acquisition. If an acquisition waits for trigger, it will be terminated. If acquisitions are running continuously (the <i>Auto</i> button is pressed), then this process stops after currently running acquisition finishes.
Small LED indicator under the <i>Stop</i> button	<p>This LED shows the current acquisition status.</p> <ul style="list-style-type: none"> • It is dark, when no acquisition is running • It is green, when an acquisition is running • It is blinking red, when an acquisition waits for trigger.

The *Horizontal/Vertical* frame has the following controls:

Horizontal knob

This knob changes the horizontal resolution of the acquisition. It controls how many seconds are per one horizontal division on the display screen. It changes from 1 nSec/div up to 1 mSec/div. When you change the horizontal resolution, the acquisition duration changes so that the whole acquisition data fits on the display screen.

The maximum acquisition duration is limited to approximately 65 mSec.

Note: The actual size of the acquisition is always 64 MSamples. But only the portion of the acquisition, specified by the *Horizontal knob* is retrieved and displayed. This way of performing acquisitions affects on the acquisition statistics calculation: acquisition statistics are always computed on the whole 64 MSamples acquisition.

Vertical knob

This knob changes the vertical resolution of the acquisition. It controls how many volts are per one vertical division on the display screen. It changes from 20 mV/div up to 500 mV/div. When you change the vertical resolution, the input gain of the D5000 ADC changes, so you adjust the ADC gain to fit the signal on a screen.

Note: When the input focus is on the knob, then the cursor movement keys may be used to change the value of the knob. The Up key increases the value of the knob; the Down key decreases it.

The *Trigger* frame has the following controls:

Immediate

Check this radio button to perform acquisitions with no trigger at all (immediate mode). In this mode an acquisition starts as soon as you press the *Single* button, or, in *Auto* mode, as soon as the previous acquisition is finished, and its results are displayed. In this mode acquisition starts at arbitrary moment of time, so the picture on a screen will jump from acquisition to acquisition.

Edge

Check this radio button to perform acquisitions with real hardware trigger by edge. The signal used for edge detection is selected in the *Source* combo box.

When *Edge* trigger mode is selected, the acquisition starts only when the trigger edge is detected. If no trigger edges are coming, the acquisition waits for trigger, and this waiting is reflected by the LED status indicator, which blinks yellow. You can terminate the waiting acquisition any time by pressing the *Stop* button.

Adjust Position

When this check box is checked, the software finds the position of the first edge in the acquisition and aligns the acquisition display with this edge. So if you have repetitive signal, the picture on a screen will look stable from acquisition to acquisition without jumps caused by asynchronous acquisition starts or trigger jitter.

The *Polarity* control selects which edge to use for adjustment.

<i>Source</i>	Select trigger source for the edge trigger in this combo box. The choices are: <ul style="list-style-type: none">• TRIG0 – select this item to trigger from the external TTL trigger signal supplied to the TRIG0 connector of the ADC10K board.• DATA IN – select this item to trigger from the analog signal itself. In this mode, the trigger <i>Level</i> text box becomes enabled, and you may specify the trigger level there.
<i>Level</i>	Specifies the trigger level in mV for the edge trigger from the DATA IN trigger source. The trigger event happens, when either rising or falling edge of the analog signal intersects this threshold. The <i>Polarity</i> control selects which edge to use.
<i>Polarity</i>	Use this control to select trigger polarity. It affects both Internal (Software) and Edge trigger modes.

The *Acquisition Statistics* frame has the following controls:

<i>Min and Max</i>	These read-only fields display the minimum and the maximum values of the acquired signal in mV.
<i>Offset</i>	This read-only field displays the acquired signal average DC offset in mV.
<i>RMS</i>	This read-only field displays the acquired signal effective (RMS) voltage.

Note: The actual size of the acquisition is fixed to 64 MSamples. Depending on your horizontal scale and zoom level, you may see only a part of the acquired data. However, the acquisition statistics are always computed for the whole 64 MSamples of acquired data.

4.3 Signal Display Area

The Signal Display Area contains the graph control, which displays the acquisition results.

There are two tabs on the top of the Signal Display Area:

- *Signal* tab
- *FFT* tab

When you select the *Signal* tab, then the signal display is shown. The signal display shows the acquired signal in the time domain.

When you select the *FFT* tab, then the spectral display is shown (see Figure 3). The spectral display shows the acquired signal in the frequency domain. In this mode the Fast Fourier Transform computed for the acquired data, and the resulting power spectrum is displayed.

Note: In this version, the FFT computations are performed in software without D5000 hardware acceleration, so the FFT mode can slow-down the application, when too long acquisition duration is specified.

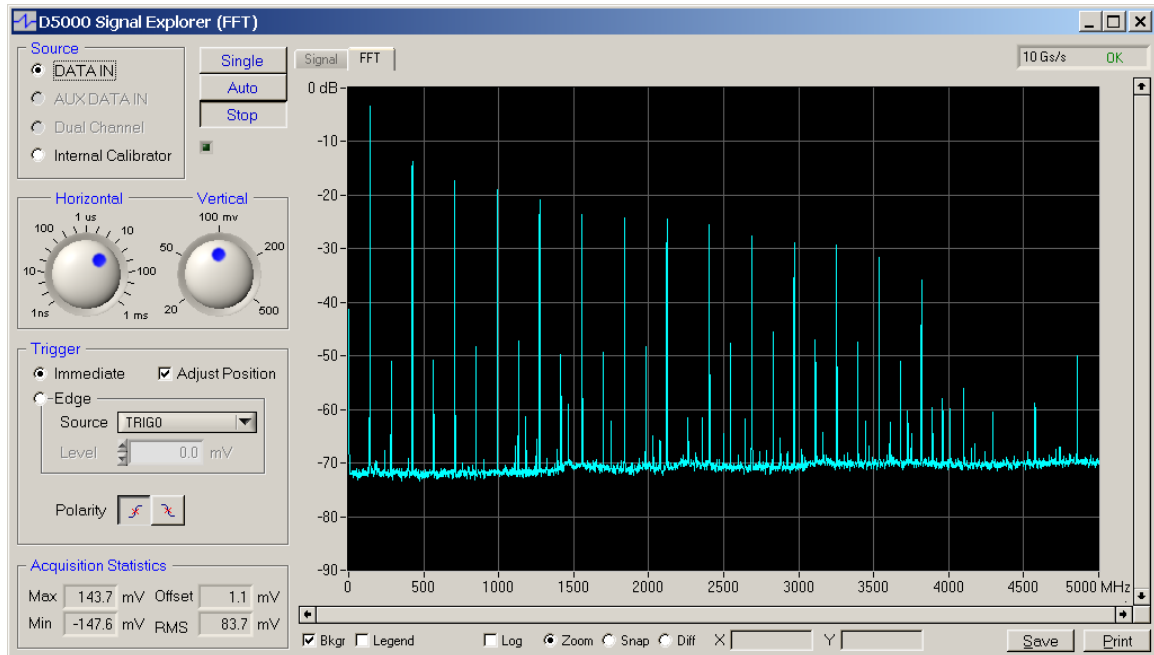


Figure 3: Signal Display Area: FFT display selected

There is the status indicator in the top right corner of the Signal Display Area. This status indicator shows the current acquisition speed in Gs/s and current state of the hardware. Green *OK* indicator shows that the hardware operates normally. In the case of failure, the error message would be shown in a separate dialog box, and the red *Fail* indicator would be displayed.

4.4 Operating with Graph

The graph control in the Signal Display Area supports the following functionality:

- Printing the graph contents
- Saving the graph contents into the file
- Operating with cursors
- Graph zooming

It has the following control elements:

Bkgr Check this box to have black graph background. Uncheck it to change background color to white.

Legend Check this box to show the graph legend. Uncheck it to hide legend.

The legend shows the acquisition ordinal number since the application start.

<i>Zoom</i>	<p>Check this radio button to switch the graph into mouse zooming mode. In this mode the graph contents can be zoomed-in.</p> <p>When you left-click into the graph area and drag the mouse, the dashed rectangular contour appears. This contour outlines the region for zooming. By dragging the mouse with left button pressed select the desired zoom region. When you release the left mouse button the zoom happens.</p> <p>You can zoom-in deeper and deeper by selecting new zoom regions. Each zoom level is remembered, so that you can return to the previous zoom level by right-clicking the mouse into the graph area.</p> <p>Note: In the current version, when software needs to display a large amount of data, it performs the <i>data rendering</i> in order to reduce the amount of data to draw on a graph. It divides the whole signal by equally sized <i>rendering intervals</i> so the number of intervals is equal to the number of pixels to display. Then for each rendering interval it computes minimum and maximum sample values. Only these values are displayed instead of all points in the rendering interval, thus significantly reducing the amount of data to draw. It has the implication when you do deep zooming: you may not see the fine details of acquired signal, because they are rendered-out. To see the signal with most resolution, decrease the horizontal scale.</p>
<i>Snap</i>	<p>Check this radio button to switch the graph into the snapping cursor mode. In this mode one short cross-hair cursor appears. This cursor is always glued to the plot on the graph. The cursor coordinates are displayed in the <i>X</i> and <i>Y</i> fields. In this mode you can measure the offset and amplitude of the particular point in the acquisition.</p>
<i>Diff</i>	<p>Check this radio button to switch the graph into the difference cursor mode. In this mode two long cross-hair cursors appear. Using these cursors you can measure the <i>X</i> and <i>Y</i> difference between any two points on the graph. To do so, position each cursor to the desired point. The <i>X</i> and <i>Y</i> fields will show the difference.</p>
<i>X</i> and <i>Y</i>	<p>These fields show the coordinates of the short cross-hair cursor in <i>Snap</i> mode. They show the long cross-hair cursors difference in <i>Diff</i> mode.</p>
<i>Clear</i>	<p>Press this button to clear the graph.</p>
<i>Save</i>	<p>Press this button to save the graph contents into the file. Various graphical formats are supported including .bmp, .jpg, .gif, .tif, and .png. You choose the format in the <i>Save As</i> dialog box, which appears when you press the <i>Save</i> button.</p>
<i>Print</i>	<p>Press this button to print the graph contents.</p>

CHAPTER 5

SOFTWARE DEVELOPMENT KIT

The D5000 Signal Explorer installation includes an API (Application Programming Interface) for programmatic control over D5000 Signal Analyzer from a custom application. This API is implemented by the GSA SDK software package (Guzik Signal Analyzer Software Development Kit).

5.1 GSA SDK Installation

GSA SDK software is installed by default with the D5000 Signal Explorer application.

GSA SDK software is installed into the `GSA_SDK` subfolder of the D5000 Signal Explorer installation folder and consists of the following files:

- The import library to be linked into every C/C++ application that uses GSA SDK:
`GSA_SDK\lib\GSA_SDK.lib`
- The C/C++ header file to be included into a custom application written in C or C++:
`GSA_SDK\include\GSA_SDK_BASE.h`
- The type library to include into Visual Basic (or Visual Basic for Applications) project references in order to gain access to definitions of GSA SDK types and functions:
`GSA_SDK\lib\GSA_SDK_BASE.tlb`
- IDL files used by Guzik Technical Enterprises to build `GSA_SDK_BASE.tlb` and `GSA_SDK_BASE.h`. They are not directly usable in custom applications and are included into the GSA SDK installation for information purposes only.
`GSA_SDK\include\GSA_SDK_CONF.idl`
`GSA_SDK\include\GSA_SDK_DP.idl`
`GSA_SDK\include\GSA_SDK_DP_DATA.idl`
`GSA_SDK\include\GSA_SDK_FFT.idl`
`GSA_SDK\include\GSA_SDK_HARM.idl`
`GSA_SDK\include\GSA_SDK_PARAM.idl`
`GSA_SDK\include\GSA_SDK_RC.idl`
- Source code for a sample application. Used to build a simple console application `gsa_d5000`, which can perform basic measurements and is controlled using command-line parameters.
`GSA_SDK\samples\d5000_c_sample\gsa_d5000.cpp`
`GSA_SDK\samples\d5000_c_sample\gsa_cl_helper.cpp`
`GSA_SDK\samples\d5000_c_sample\gsa_cl_helper.h`
- The project files to build `gsa_d5000` in Visual Studio 2005 and Visual Studio 6.0:
`GSA_SDK\samples\d5000_c_sample\gsa_d5000.vcproj`
`GSA_SDK\samples\d5000_c_sample\vc60\gsa_d5000.dsp`

5.2 Sample Application

The `gsa_d5000` is a simple console application, which can perform basic measurements and is controlled using command-line parameters.

By default, the `gsa_d5000.exe` executable file is placed into `Debug` or `Release` subfolder under the folder containing the `gsa_d5000.vcproj` project file.

Please compile and copy the `gsa_d5000.exe` file into the D5000 Signal Explorer installation folder. This is to provide access to D5000 driver DLLs.

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