

INTRODUCTION

The AD6624/AD6624A Evaluation Software Version 1.84 is a Microsoft® Windows® based program that allows convenient control of the AD6624/AD6624A Evaluation Board, including AD6624/AD6624A register programming. The program is compatible with Windows 95, 98, NT® (Service Pack 3 or greater), and 2000. For practicality, the AD6624 and AD6624A are identical in functionality aside from the AD6624A's inability to operate in compact mode (reference the AD6624A Data Sheet for more details); in this document, any subsequent references to the AD6624A are also referencing the AD6624.

The software allows each of the four channels of the AD6624A to be configured independently. Most of the channel configuration options are contained on separate tab controls for easy access. Soft Sync and Pin Sync operations for all channels are fully supported. Data capture, analysis, and display capabilities for FFT, time domain, I/Q, I/Q phase, and impulse response are provided.

RECOMMENDED SYSTEM SPECIFICATIONS

- Pentium® 233 MHz or greater computer running Windows 95, 98, NT (Service Pack 3 or greater), or 2000
- 10 MB hard drive space
- 32 MB memory
- 1 available SPP compatible parallel port (for PC/evaluation board communication)

INSTALLATION

To install the AD6624/AD6624A Evaluation Software, simply run the AD6624Setup184.exe program and follow the prompts. The software will be installed in the chosen directory.

Please note that you may be prompted to restart your computer several times during the installation process.

You will be given the option of creating backups of any system files that the installation program will replace. It is recommended that you create these backups. In the unlikely event of system problems due to the replaced files, simply copy the files in the AD6624 Backup directory back into

your Windows system directory. Alternately, you can uninstall the AD6624/AD6624A software. During the uninstall procedure, you can choose to restore backed-up files. To prevent system file incompatibilities, this second option should be used only if you have NOT installed any additional software since installing the AD6624/AD6624A Evaluation Software.

MENU COMMANDS

Descriptions of the menu commands follow. Vertical bars separate "nested" menu items. For example, "File | Open" specifies the Open menu item under the File main menu item.

File | Open: Selects and opens an existing AD6624A configuration file. If a file is selected and opened, the configuration data contained in the file overwrites the corresponding current information. If the new configuration file does not contain information for a particular channel, that channel's information will remain unchanged.

File | Save As: Saves the current AD6624A configuration data to a user-selected file. If an existing file is selected, that file will be overwritten with the current configuration data.

File | Program: Uses the current configuration data to initialize the AD6624A. Note that all four AD6624A channels are left in sleep mode after initialization is complete unless an autosync option is used (see the discussion of sync menu commands for more information). When this command is selected, all of the configuration commands written to the AD6624A are stored in a script file that can be imported directly into C-language dsp code if desired (see the Script Files section for a discussion of script files). The generated script may also be executed directly using the File | Run Script menu command. This menu item provides the same functionality as the Program button on the Global tab page. The hot-key combination Alt+P provides quick access to this command, as does the Program command button in the lower right hand corner of the window.

File | Assign Script File Name: Selects the name of the file used to record the initialization commands when the Program command is selected. The default file name is "AD6624 script.svr." See the Script Files section.

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AD6624/AD6624A

File | Run Script: Displays a dialog that allows an existing script file, including script files generated by the Program command, to be selected and executed. The dialog displayed when this command is selected contains three buttons: Pick & Configure, Configure Now, and Close. Pick & Configure allows the user to select a script file, which is automatically executed when the file is opened. Once a script file has been selected and executed, the Configure Now button may be used to execute the script again. The Close button closes the dialog; the last script file name used is preserved.

File | Exit: Closes the program. Before the program shuts down, configuration data is written to the AD6624.INI file. Data from this file is reloaded when the program is run again.

Sync | Soft Sync: Displays the Soft Sync dialog for configuring the AD6624A Soft Sync register.

Soft Sync options include channel selection, Start, Hop, and the option to use the AD6624A's internal test signals (negative full-scale dc or pseudorandom). When the Sync Now button is selected, the AD6624A's Soft Sync register is programmed with the selected options. The Close button closes the dialog; all dialog settings are retained.

The Use AutoSync button displays the AutoSync dialog. AutoSync can be used to start AD6624A channels automatically after programming. For more details, see the Sync | AutoSync menu command description.

Sync | Pin Sync: Displays a dialog for selecting external hardware pins to use with the AD6624A Pin Sync functions.

The Sync Now button toggles the logic value on the AD6624A SYNC pins to apply the associated Pin Sync function. The Close button closes the dialog; all dialog settings are retained.

The Use AutoSync button displays the AutoSync dialog. AutoSync can be used to automatically start AD6624A channels after programming. (See the Sync | AutoSync menu command description for details.)

Sync | AutoSync: Displays a dialog with options that enable either Soft Sync or Pin Sync after AD6624A programming.

By default, all AD6624A channels remain in Sleep mode after the Program command is executed. The Soft Sync and Pin Sync options selected here cause the respective Soft Sync and Pin Sync dialog options to be applied to the AD6624 at the end of

the programming sequence so that the specified channels start automatically. If neither option is selected, no sync is applied, and the channels remain in Sleep mode after programming.

If the Soft Sync or Pin Sync checkbox is selected, selecting the Options button displays either the Soft Sync or Pin Sync dialog, whichever is appropriate.

Configuration | Copy Channel Settings: Displays a dialog that enables copying configuration settings from one channel to other channels.

Configuration settings will be copied from the channel selected in the "From" group. Only one channel may be selected as a source. If the active tab page is a channel page, that channel is selected as the default source. The channels to be programmed are selected in the "To" group. Clicking the Copy button copies the configuration data from the source channel to the selected destination channels. The Cancel button closes the dialog.

Configuration | Parallel Port Address: Displays a dialog for specifying the I/O address of the parallel port used with the evaluation board. The Address text edit control is used to manually enter a port address using hexadecimal number format. The Set button assigns the specified address as the parallel port address to use. The Revert button changes the address back to the original value. The Auto Detect button uses port addresses 0x378 and 0x278 (in that order) to detect the evaluation board; a dialog is displayed with the results of the test. The Close button closes the dialog.

Configuration | PROM Selection: A list of possible data capture PROMs is displayed. The PROM that comes with the AD6624 and AD6624A is the standard mux PROM (labeled with an M). Currently, the AD6624A Evaluation Boards do not support compact mode. If desired, the AD6624A can be made to operate in compact mode; however, a special PROM is necessary, as is a board tweak. Contact your vendor if you desire compact mode operation.

Configuration | Self Test: Executes a self-test of the evaluation board. Proper operation is indicated when all boxes are checked and the Close button is highlighted in green. If there is a problem with the board, the Close button is highlighted in red. Board ID and firmware revision data are also displayed.

Help | About: Displays a dialog with information concerning this version of AD6624/AD6624A Evaluation Software.

CHANNEL 0–3 CONFIGURATION TABS

The AD6624/AD6624A Evaluation Software provides a separate tab page for each AD6624A channel. Using these pages, the user may configure each channel independently. Each page consists of three major sections: NCO Control, Serial Port Control, and Filter Control.

The Filter Control section contains subsections for the rCIC2, CIC5, and RCF filters. Most of the options available on these pages are discussed in the AD6624 Data Sheet.

The following sections provide details on particular options on the Channel tab pages.

Pin Sync Button (NCO Section)

Selecting this button displays a dialog containing Pin Sync enable options for the selected channel, including Start Enable, Hop Enable, and First Sync Only. The options only enable Pin Sync functions; to activate the Pin Sync functions, see the discussion of Sync menu items.

Channel 0 Serial Divisor (SDIV) (Serial Port Section)

The text edit control for Channel 0 SDIV is disabled since the serial divisor for this channel is configured externally via hardware jumpers on the evaluation board.

AutoCalculate rCIC2 and CIC5 Scaling (Filter Section)

Selecting this checkbox calculates the rCIC2 and CIC5 scale factors according to the equations described in the AD6624 Data Sheet. When checked, the scale factor text edit controls are disabled; they still show the calculated value. Invalid/missing interpolation and decimation values cause the text edit controls to turn red, indicating an invalid value. When unchecked, the text edit controls are enabled and may be modified.

Coefficient Scaling (Filter Section, RCF Subsection)

The Max radio button determines the scale factor required to force the FIR filter coefficient with the largest magnitude to be equal to full scale; this scale factor is then applied to all coefficients. The Delta radio button, in conjunction with the associated text edit control, applies a user-specified scale factor (in dB) to all FIR filter coefficients.

Coefficient File Name (Filter Section)

To select a FIR filter (which includes rCIC2, CIC5, and RCF decimation factors, rCIC2 interpolation factor, chip clock rate, and a set of FIR filter coefficients), enter a coefficient file name in the edit control. The button next to the edit control displays directory navigation and file selection dialogs. The chip clock rate specified in a selected coefficient file replaces the value listed on the Global tab page. Coefficient file format is

rCIC2 decimation value

rCIC2 interpolation value

CIC5 decimation value

RCF decimation value

Chip clock rate (Hz)

RCF FIR filter coefficient 1

RCF FIR filter coefficient 2

-
-
-

RCF FIR filter coefficient N – 1

RCF FIR filter coefficient N

GLOBAL TAB

The Global tab contains the following:

- BIST options for each channel.
- A text-edit control to enter the AD6624A chip clock rate. Note that this chip clock rate value is not programmed into the part, and is only used for accurate graphing of the part's data. If a FIR filter coefficient file is loaded and there is a chip clock rate discrepancy between what is in the coefficient file and what is listed on the Global tab, the Global tab value will be updated.
- A button to configure input port parameters, including lower and upper thresholds, dwell time, linearization holdoff, output polarity, and interleaved channel options.
- A Program button to initialize the AD6624A with the current configuration data. The Program button provides the same functionality as the File | Program menu item and the command button located in the lower right of the form. Hot-key combination Alt+P provides quick access to this command.

ANALYSIS TAB

The Analysis tab is used for data capture and display. Descriptions of the features provided on this page follow.

IMPORTANT: Proper data capture and analysis operation for Channels 0–3 require the selection of each desired channel's "Separate single SDFS for I and Q." Also, SOWL is limited to either 12-bit or 16-bit mode (24-bit mode is not supported).

Zoom Functions

When data is displayed in the graph area, the H-Zoom and V-Zoom provide horizontal and vertical zoom, respectively. To use these features, click and drag a selection box around the area of interest in the graph area and select the desired zoom button(s). Though the selection box disappears after one zoom function is selected, selecting the other zoom function is still valid.

Selecting the Un-zoom button cancels the zoom function and returns the display to its original full-scale limits.

Gridlines, Harmonics, Bin Boundaries, Average Noise

The Gridlines checkbox is used to show or hide the graph's gridlines. The Harmonics, Bin Boundaries, and Average Noise options are not implemented in this version.

Source List Box

The Source control selects the source of data. Available options are Channels 0–3, Input Port A, and File. Input Port A data refers to data taken directly from the ADC connected to Input Port A. Although the AD6624A can accept data via Input Port B, direct data capture from this port is not supported.

Selecting Channel 0, 1, 2, or 3 forces the use of complex (I/Q) data; selecting Input Port A forces the use of real data. When File is selected, a dialog is displayed that requires the user to select an input file. After a file is selected, the Buffer Size list box is replaced by a Complex checkbox to indicate whether the file contains real or complex data, which the user must specify. If the loaded file contains two or more columns of data separated by spaces, the data is assumed to be complex and the checkbox will initially be selected; otherwise, it will not be selected.

Buffer Size List Box

The Buffer Size list box selects the number of real samples to collect when the Capture Now button is selected. If the source is Input Port A, this list box indicates the number of real samples to collect and use. If the source is Channel 0–3, the actual number of complex samples collected is half the number given in the list box since each complex sample consists of two values. If the source is a file, the list box is replaced by a checkbox as described in the Source List Box section.

View Type List Box

The View Type list box selects between FFT, time domain, I/Q, and I/Q phase display. Single or Continuous mode is available for each type. Selecting Single mode collects a single set of samples, performs any necessary processing, displays the data, and stops. Selecting Continuous mode performs the Single option repeatedly. No action is performed until the Capture Now button is selected.

I/Q and I/Q phase cannot be displayed if the Source selection is Input Port A since Port A only provides real (ADC) data.

Window Type List Box

If an FFT view type is selected, a Window Type list box is displayed. This list box allows the user to select a Hanning window, Blackman/Harris window, or no window.

DataRate Text Edit Control

This modifiable text edit control contains the data rate of the selected source. When the AD6624A is programmed (using either the File | Program menu, the Global tab's Program button, or the Program command button located in the lower right part of the form), data rate information is stored for that configuration. Appropriate information is written to the DataRate text edit control depending on the selected source.

If File is selected as the source, the DataRate text edit control is written blank, indicating that the user must supply the value. If the DataRate text edit control is left blank, a value of 1 is used as the data rate.

Capture Now Button

The Capture Now button begins data collection. If Continuous mode was selected, the button caption changes to "STOP," indicating that the user should select the button again to stop data capture.

Save Button

Selecting the Save button displays a dialog that allows the user to save the raw data to a file.

IMPULSE RESPONSE TAB

The Impulse Response tab displays graphs of FIR filter impulse responses. No graph is displayed if no coefficient file has been specified, or if fewer than two taps exist. These graphs are not directly editable, and no zoom function is available.

SCRIPT FILES

A script file is a text file that contains register configuration instructions and various control commands. Whenever the Program command is selected, the AD6624/AD6624A Evaluation Software generates a script file that contains all necessary instructions to initialize the device as specified by the current configuration. See File | Program and File | Assign Script File Name sections for more information.

Script files generated by the evaluation software contain C language type function calls and comments that can be imported directly in C code.

Script Commands

There are several script commands. The `micro_write()` and `micro_read()` commands follow the C language convention while the remaining commands do not. The File | Run Script menu command may be used to select and run a script command file.

Table 1 describes script commands and syntax.

Table 1. Script Commands and Syntax

Command	Syntax
<code>micro_write(address, data);</code>	address (decimal or hexadecimal); data (decimal or hexadecimal). Writes "data" to the AD6624A external address specified by "address."
<code>micro_read(address);</code>	address (decimal or hexadecimal). Reads from the AD6624A external address specified by "address" and stores the returned value in the log file.
FLUSH	Clears the log file.
WRITE address data	address (decimal); data (binary). Writes "data" to the AD6624A external address specified by "address."
READ address	address (decimal). Reads from the AD6624A external address specified by "address" and stores it in the log file.
COMPARE address value	address (decimal), value (decimal). Reads the AD6624A register at "address," and writes the return value and the supplied "value" to the log file.
LOGFILE filename	Sets "filename" as the new log file name.
COMMENT, //, /*	Signifies a single-line comment. Note that although the /* symbol is the start of a C language comment, no search is performed for a closing */ symbol.
SYNC A/B/C/D	Initiates a Pin Sync on the specified sync lines. Any combination of syncs may be used.
WAIT time	time (floating point). Pauses for "time" seconds.
CHANNEL id	id (0, 1, 2, 3, or A). Selects the channel from which data is captured.
MESSAGE msg	msg (text). Records the "msg" string in the log file.
DUMPFILe n filename	n (decimal integer). Collects 2 ⁿ data samples and stores them in the file named "filename."

TROUBLESHOOTING

Problem 1: A dialog is displayed stating that no evaluation board was detected.

Possible causes and solutions:

1. The evaluation board is not powered. Ensure that the 9 V wall transformer's dc power plug is connected to the evaluation board, and that the wall transformer is plugged into a powered 120 V ac outlet.
2. The parallel port cable is not connected or has faulty connections. Check the cable connections and/or try a different cable.
3. The parallel port is not configured for bidirectional mode, is disabled, or does not support bidirectional mode. Have qualified personnel check the BIOS and/or Windows settings to enable bidirectional mode.

Problem 2: The self-test does not pass, and/or the board stops working while in use.

Possible causes and solutions:

1. The evaluation board was not properly detected. See Problem 1: A dialog is displayed stating that no evaluation board was detected.
2. In some cases, Windows may reconfigure the parallel port after some system operations, such as printing (even to a network printer) or use of peripheral devices with the parallel port. In such cases, rebooting the computer should correct the problem.

Make sure that any peripheral devices connected to the parallel port (other than the evaluation board itself) are disconnected before Windows restarts.

Problem 3: A dialog stating "AD6624 timed out" appears during data capture.

Possible causes and solutions:

1. No ADC (clock source) is connected to the evaluation board, or the ADC is not powered. Connect an operational, powered ADC (or clock source) to the AD6624A Evaluation Board.
2. The evaluation board is not powered. Ensure that the 9 V wall transformer's dc power plug is connected to the evaluation board, and that the wall transformer is plugged into a powered 120 V ac outlet.
3. The AD6624A has not been programmed. After configuring the channels as desired, program the AD6624A by either (a) selecting the File | Program menu command; (b) selecting the Program button on the Global tab page; or (c) pressing the Program hot-key combination Alt+P.
4. The AD6624A channel being captured is in Sleep mode. The Program command leaves all channels in Sleep mode. Use the Sync | Soft Sync, Sync | Pin Sync, and/or AutoSync menu items to start the desired channels after programming.

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