

Large Array Interface

Software

Users Guide

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Introduction

Use the Large Array Interface software to operate the Phased Array Generator. This guide covers key aspects of the Large Array Interface software, including:

- Create and Load a UDS file
- Set the Power Limits (Total, Forward, and Reflected Power)
- Set the Frequency
- Set Sonification Duration
- Stack UDS files (Optional)

Creating a UDS file

A UDS file must be created before running the Large Array Interface software. An example UDS file used for controlling two cards is shown in Figure 1. The UDS file must not have any carriage returns or characters after the last line.

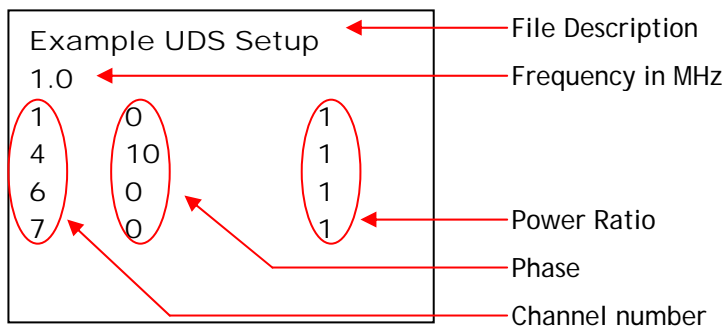


Figure 1: Example UDS Setup

Figure 1 illustrates a UDS file with a simple setup and four enabled channels. The file can be created in a text editor such as Notepad using the ANSI format. The first line, "Example UDS Setup" is a comment used to describe the configuration listed in the file. The second line is the operating frequency, which is set to 1.0 MHz in Figure 1. Each line following the operating frequency is used to enable the desired channel. The channel number is listed first, followed by the phase angle, and power ratio respectively. In the example shown in Figure 1, channels 2, 3, 5, and 8 are not enabled. Channels 1, 6, and 7 are enabled with a phase angle of zero and a power ratio of 1, while channel 4 is enabled with a phase angle of 10 and a power ratio of 1. The phase entry is in degrees and can range from 0 to 360. The power ratio controls the relative power

for each channel. The total power entered in the main software window is divided between each channel listed and then scaled according to the power ratio. A power ratio of 0 will result in no output for that channel. A power ratio of 2 will have twice the power as the channels listed with a 1.

When the UDS file is loaded the system will be set to the frequency listed in the UDS file. If a different frequency is entered (after loading the UDS file) in the frequency dialog of the main software window, the new value will be used.

Starting the Large Array Interface Software

If the software was installed with the default settings, launch the Large Array software from **Start>programs>Advanced Surgical Systems**. The main window (Figure 2) is displayed.

Navigating in the Main Window

Use the main program window to set the current directory, select a UDS file, set the power limits, control the output (total power), change the frequency, and set the sonication duration. You can also view the measured power and time remaining for the sonication duration, and enable/disable the output

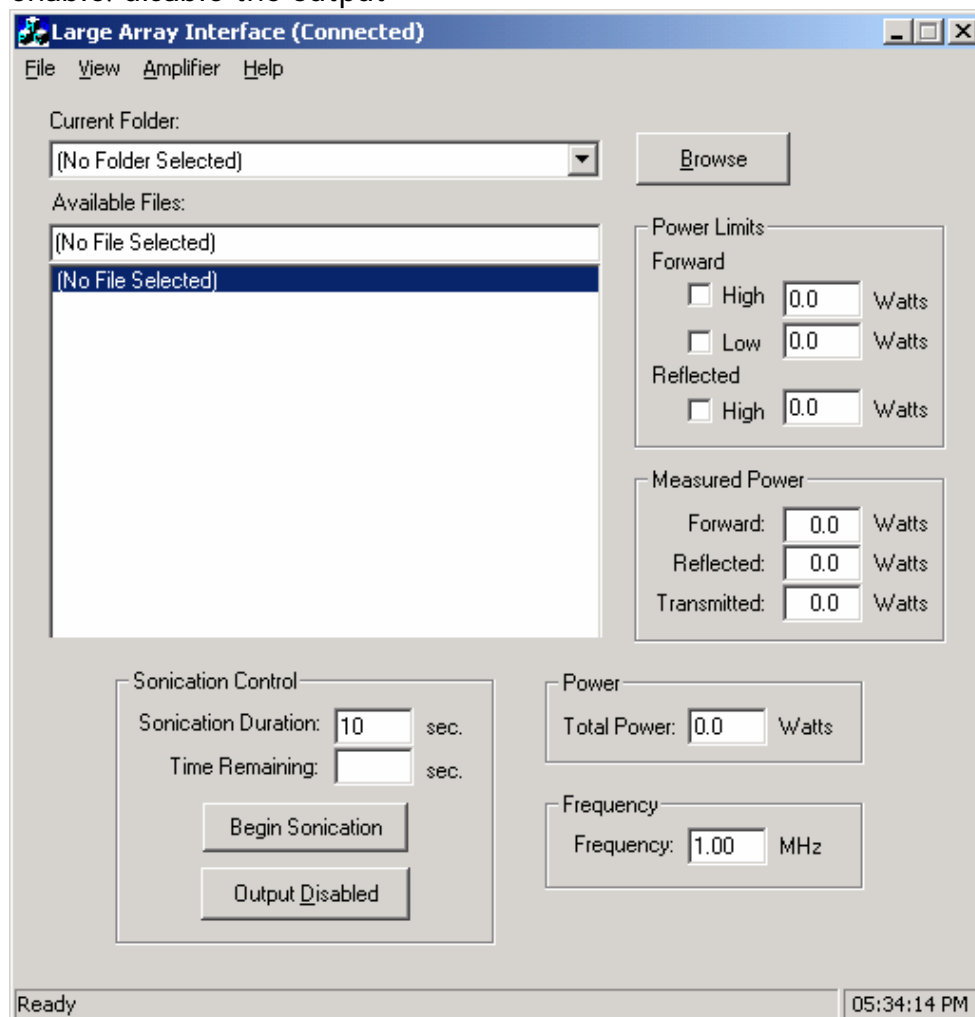


Figure 2: Main Program Window

Loading a UDS FILE

The main program window displays the path of the Current Folder along with the list of available files inside the Current Folder. A UDS file containing the desired power ratios should be loaded.

If the program is not set to the correct directory, use the browse feature to set the Current Folder to the desired location. The UDS files contained in the folder will be displayed in the Available Files field. The UDS file is loaded by clicking on the filename in the Available files list.

1. Set the **Current Folder** to the desired location.
2. Select the appropriate file to load from the available files list.

Setting the Power Limits

Use the Power Limits section (Figure 3) of the main program window to set maximum and minimum limits on the output power per channel, and maximum limit on the tolerable reflected power per channel.

To set the maximum forward power limit to 10 Watts per channel, and minimum forward level to .5, do the following:

1. Click the **High Watts** field and change the value to 10.
2. Mark the **Forward High** checkbox to enable the High Power Limit.
3. Click the **Low Watts** field and change the value to 0.5. The low power limit must always be set to a value lower than the high power limit.
4. Mark the **Forward Low** checkbox to enable the Low Power Limit.

Repeat steps 1 through 2 to set the Reflected Power Limit.

- If the Limits Disable Power option (in the amplifier menu) is unchecked the RF generator will not disable the output power in an over limit event. An error message will be sent to the large array software.

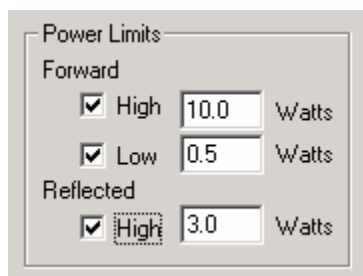


Figure 3: Power Limits section

Setting the Total Power

Use the Power section (Figure 44), of the main window to set the total power that will be output by the combination of all the cards listed in the UDS file. Click the **Total Power** field and change the value to the desired total power then press **Enter**.

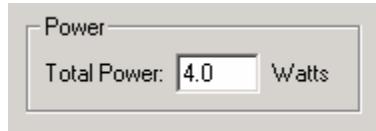


Figure 44: Power section

The total power entered is divided among the enabled channels according to the ratios set forth in the UDS file.

Setting the Frequency

Use the Frequency section of the main window to set the frequency (Figure 5). Although the UDS file initially determines the operating frequency, it can be set to a new value directly from the main program window. The output must be disabled in order to set the frequency. If the system is not set to operate in the correct frequency range errors will be received.

1. Check to ensure the output is disabled. If the text on the button located in the Sonication controls box reads **Output Disabled**, then proceed to step 2. If the button displays the text **Output Enabled**, click the **Output Enabled** button to disable the output.
2. Click the **Frequency** field and change the operating frequency to the desired value and then press **Enter**. The Cards can be queried and programmed regardless of the clock setting, but the RF generator prevents a channel from being enabled if the system clock is out of that channel's frequency range. If a channel is listed in the UDS file and the system clock is changed out of range, the channel will be disabled. If the clock returns within the range of operation the channel will be re-enabled. This event is not reported to the interface software. The user should ensure that the clock frequency is within the limits of the channels in use.

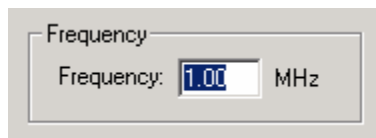


Figure 5: Frequency section

3. To enable the output click on the **Output Enabled/Disabled Button**.

Setting the Sonication Duration

Use the Sonication Control section (Figure 6) of the main window to set the desired Sonication Duration.

- Enter the time in seconds in the **Sonication Duration** field. If 180 is entered into the Sonication Duration field, the system will run for 3 minutes after the Begin Sonication button is pressed. The time remaining for the sonication process is displayed in the Time Remaining field.

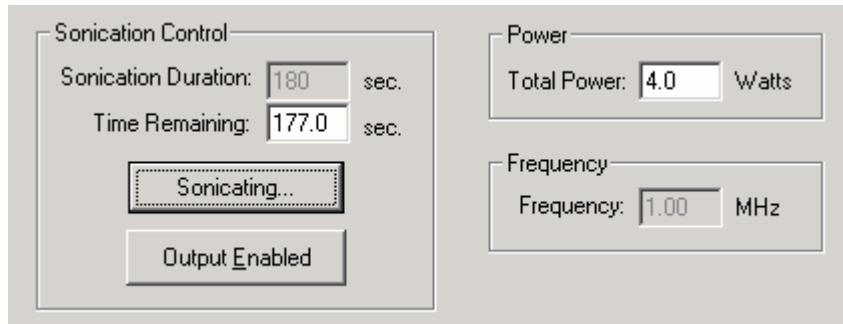


Figure 6: Sonication Control section

The total power can be adjusted while the output is enabled. To change the frequency, the output must be disabled.

- The power output can also be controlled externally using a function generator or a switch by selecting the External Enable option located under the Amplifier menu. External Enable is an active low signal.

Viewing the Power Measurement

View the total measured power from the Measured Power section of the main program window (Figure 7). This displays the forward, reflected, and transmitted power for the combination of all enabled channels.

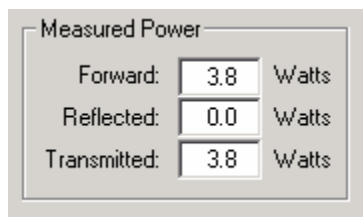


Figure 7: Measured Power section

If necessary, the Forward and Reflected power for each of the individual channels can be viewed.

To view the individual channel power measurements, click the **View** menu and then click the **Power Measurements** option (Figure 8).

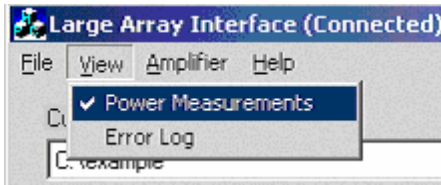


Figure 8: Power Measurements

To display the individual channel forward and reflected power measurements click the **Power Measurement** option under the **View** menu (Figure 9).

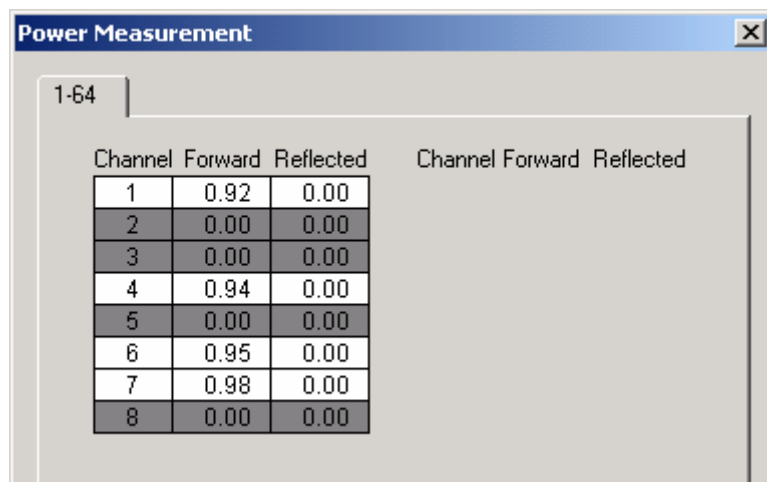


Figure 9: Power Measurement window

The Power Measurement window displays the enabled channels with a white background and disabled channels in grey.

Caution: A 50Ω load should always be connected to the power outputs, when enabled, to avoid damage to the system.

The Power Measurement window shows that the program is connected to a system with two cards using the UDS file shown in figure 1. Any channel can be enabled or disabled from the power measurement window by double clicking on the channel. If the channel was not initialized in the loaded UDS file the channel will not output any power when enabled in this way.

A text error log is stored in the current directory. To view the error log, click the **View** menu and then click the **Error Log** option (Figure 8). Notepad will open to display the data. If no errors have been reported, a message box will appear stating that the UDS log cannot be found.

Stacking UDS Files

Stacking is designed to quickly cycle through acoustic patterns coherently - so all the channels are synchronous (or very nearly so). The data to do this is downloaded to each generator card into a "stack" to prevent communication overhead from causing delays. Once the data is downloaded, data from the current stack level is loaded into the generators to produce a particular field pattern based on the stack rate or an external step input.

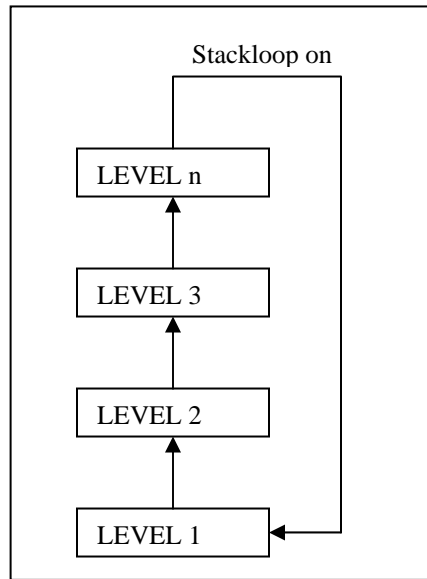


Figure 10: Stacking Diagram

The stacking feature allows the user to load multiple UDS files by selecting a UDT file. The UDT file is simply a list of the UDS files that will be loaded into the stack including the relative power for each stack level. Each UDS file contains phase and amplitude information for each generator channel and is stored in a different stack level. With stacking enabled, the system will step through each level at a rate specified by the stack rate setting or by the external step input. All UDS files must contain the same channels.

The .udt file format is as follows:

- Description
- Frequency in MHz
- UDS Filename #1 [tab] Power1
- UDS Filename #2 [tab] Power2

Where Power1 and Power2 are relative powers from 0 to 100 percent [0-100].

An example UDT file is shown in Figure 11. There should be less than 255 UDS files listed in the UDT file.

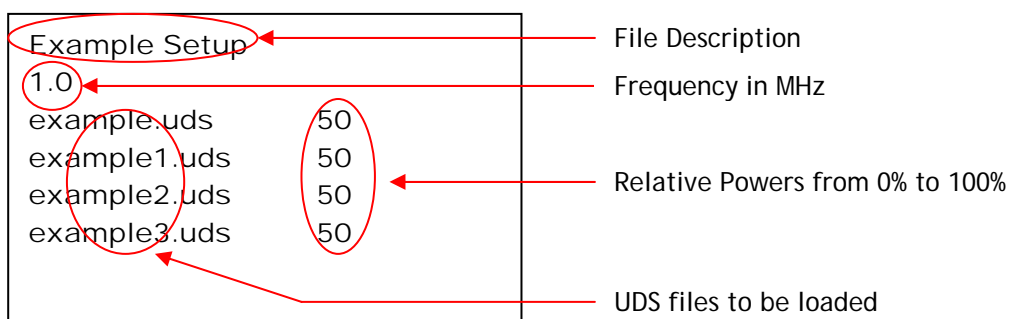


Figure 11: Example UDT file setup

The UDT file is loaded by selecting the filename from the Available files list. Stacking is enabled by selecting **stacking enable** from the Amplifier menu. A UDT file must be loaded in order to turn stacking on. When a UDS file is loaded during stacking, the stacking will automatically turn off. When stacking is turned off, the system will remain at the output settings of the current stack level. Output power must be turned off using the **Enable** or **External Enable** controls. The frequency listed in the UDT file will override the frequencies listed in the UDS files.

Changing the Stacking Rate

- To change the stacking rate, select the stack rate option from stacking options in the Amplifier menu.

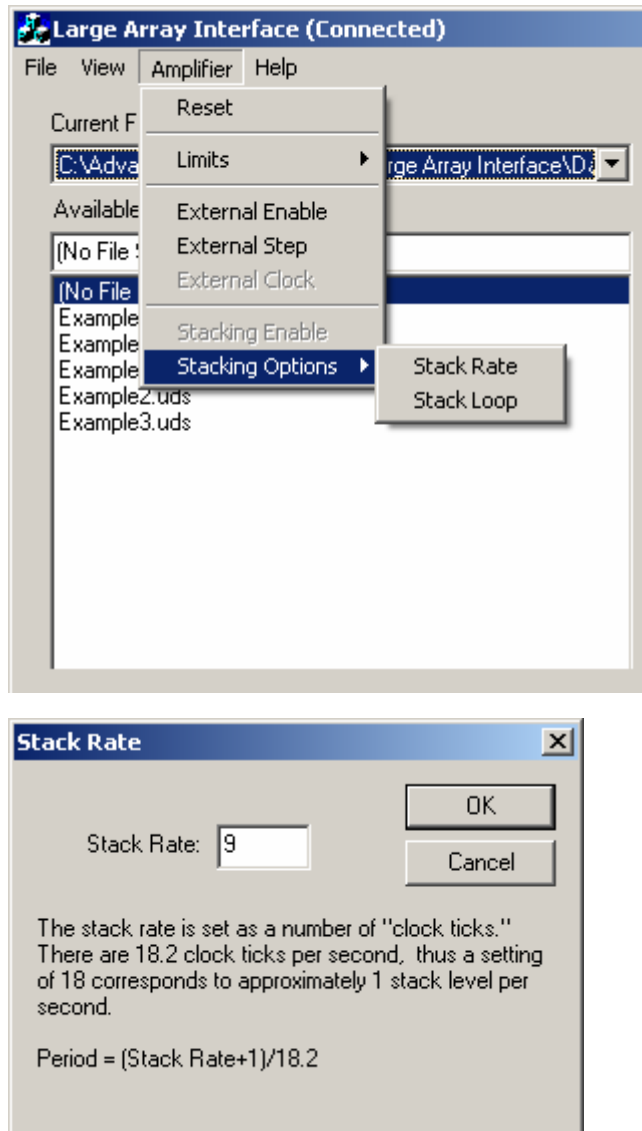


Figure 12: Changing the stacking rate

The rate is based on clock ticks, with 18.2 clock ticks per second. A rate of "18" is close to one file per second, and a rate of "1" is approximately 18 files per second. The period is given by:

$$\text{Period} = (\text{Stack Rate} + 1) / 18.2$$

- The Stack Loop setting, found in stacking options in the Amplifier menu, controls the stack cycle. When off, the system will progress through the stack levels and remain at the final level (including the output power and phase settings) until the output is disabled. When stack loop is on, the system will step through all stack levels and return to the first level, continuously cycling through the stack levels. Whenever the stack loop setting is toggled, stacking is disabled.
- The External Step option, found under the Amplifier menu, allows the stack rate to be controlled by an external source such as a function generator or a switch. When using the External Step option, the stacking is triggered on the falling edge of the input signal. To enable the external input, select **External Step** in the Amplifier menu.

Appendix A: Technical Support

Technical support is available at no charge throughout the life of the product.

Additionally, Advanced Surgical Systems is willing to work with its customers to make sure that the equipment is used to its maximum potential, whether this be regarding interfacing with the transducers, developing control software, or any other issues that may arise throughout the lifetime of the UDS system.



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