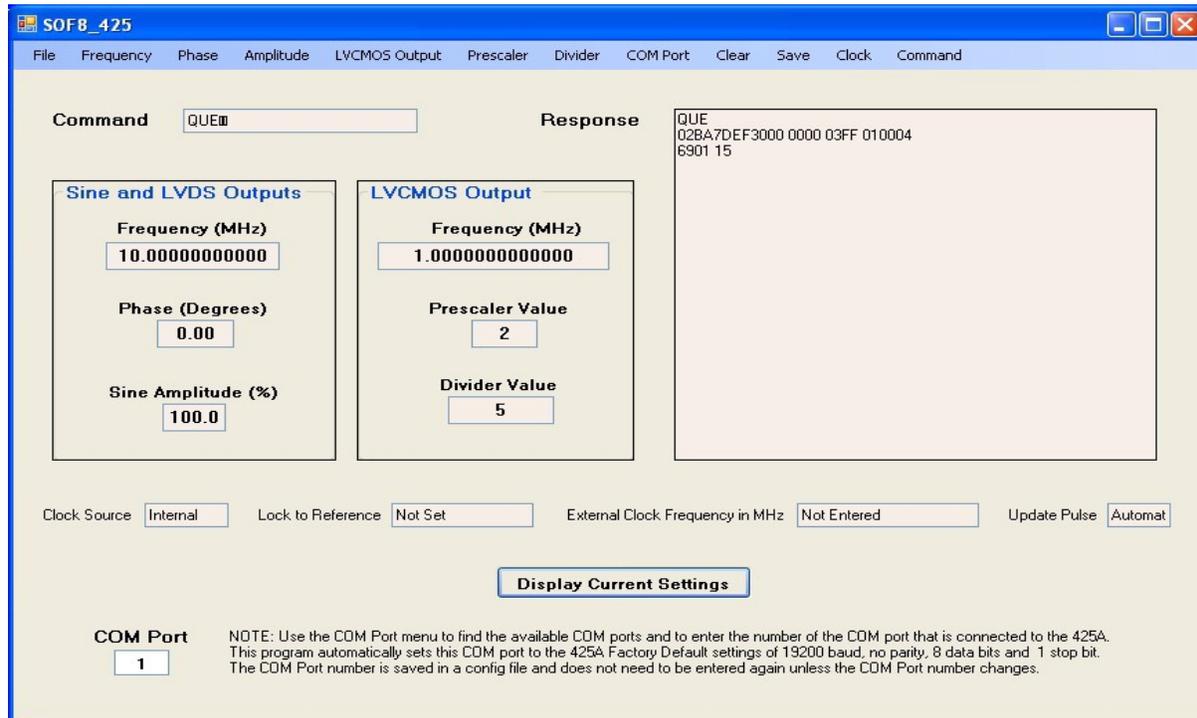


# NOVATECH INSTRUMENTS, INC

## SOF8\_425 SOFTWARE INSTRUCTION MANUAL



### Software Program for Controlling the Model 425 Precision DDS Signal Generator

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## 1.0 Description

The SOF8\_425 Software provides a convenient way to control the Model 425 DDS Signal Generator from a Windows computer. In addition, it provides a way to store a sequence of settings in a computer file and load these settings in sequence with a programmed wait time between the loading of each set of settings

## 2.0 System Requirements

The SOF8\_425 software program requires a computer that has Windows 2000 or later operating system and has both the .NET Framework v2 and the Microsoft Installer 3.0 or later programs installed.

## 3.0 Installation

**3.1** The SOF8\_425 program requires a computer that has Microsoft .NET Framework v2 installed in order to operate. The .NET Framework v2 is available for no charge from Microsoft. Many newer software programs require this Framework so it may already be installed on your computer. If it is not installed on your computer then you can download it from Microsoft's web site. There are different download files of the .NET Framework v2 depending on the computer that the Framework will be installed on. For example, the x86 class of 32-bit computers takes a different download file than the x64 64-bit class of computers. The Microsoft download files are called Redistributable files and, at the time this document is being written, they are located at:

<http://msdn2.microsoft.com/en-us/netframework/aa731542.aspx>

**3.2** To install the .NET Framework v2 you need to download the appropriate file and then double click on it to start the installation process.

**3.3** The SOF8\_425 program comes in a setup file. To Install the program simply load the SOF8 CD, navigate to the SOF8\_425 install folder, open the folder and double click the setup file. The installation process will add a shortcut to your desktop and add a shortcut on your Start/Programs menu in a submenu labeled "Novatech".

**3.4** The SOF8\_425 setup file requires Microsoft Installer 3.0 or later to operate. Microsoft Installer comes pre-installed on computers with Windows XP or later operating systems. If your computer does not have Microsoft Installer then you will need to

download it from the Microsoft web site. The Microsoft Installer is a free download. At the time this document is being written the Microsoft Installer download site is located at:

<http://www.microsoft.com/downloads/details.aspx?familyid=5FBC5470-B259-4733-A914-A956122E08E8&displaylang=en>

**3.5** The SOF8 CD contains the x86 version of the .NET Framework v2 and the Microsoft Installer 3.0 as a convenience to our customers. However, we do not warrant that these are the correct versions for your computer and we do not provide support for the installation of these programs.

## 4.0 Keyboard Operation

The SOF8\_425 program menus can be operated using a keyboard only, no mouse. To use the keyboard to access the menus you first hold down the Alt Key and hit the Enter Key. You can now navigate the menus with the up/down and right/left arrow keys. Hitting the ESC key will remove keyboard access to the menus.

When you are not accessing the menus, you can use the keyboard to depress the Display Current Settings button by hitting the Return key.

## 5.0 Communication with the 425 Signal Generator

**5.1** To communicate with the 425 you must connect a serial cable from your computer to the serial connector on the rear of the 425. If your computer does not have a serial port then you can use a USB to Serial Port adapter. Any commercially available USB to Serial adapter should work. At the time of publishing this manual you could find USB to Serial adapters at:

<http://www.usbserial.com/461.html>

**5.2** You will need to enter the COM port number into the SOF8\_425 software in order to communicate with the 425. Once the SOF8\_425 software knows the COM port number it will automatically configure the COM port's baud rate, parity and number of data bits and stop bits.

**5.3** To find the appropriate COM port number you can navigate to the Windows Start/Settings/Control Panel then double click on the System Icon. A dialog window appears and select the Hardware tab and then click on the Device Manager button. A tree view will appear

and you can find the COM ports available by expanding the Ports selection. You can also go to the SOF8\_425 COM Port menu and it will provide you with a selection that displays the available COM ports on your computer. If you are using a USB Serial Port Adapter please be advised that your computer may change the assigned COM port number after the computer has been restarted or shutdown.

## 6.0 Display Fields and Display Current Settings Button

All of the display fields are Read Only so you cannot type information directly into these fields. You control the 425 using the pull down menus or by loading settings from a file. The Command field will display the command sent to the 425 after using a menu selection to send a command. The Response field will display the response received back from the 425. To populate the display fields with the current 425 settings, you click on the *Display Current Settings Button*.

## 7.0 File Menu (Scripts)

The SOF8\_425 software can read a set of parameters from a text file and use these parameters to send commands to the 425 Signal Generator. This is similar to running a script. The contents of the file must conform to a specific format. This format is described in paragraph 7.4. The SOF8\_425 program reads the parameters from the file one line at a time and can also wait a programmed amount of time before reading the next line. This process is described in paragraph 7.1. The file of parameters may be created by using the SOF8\_425 software as described in paragraph 7.2 or it can be created by using an Excel spreadsheet or a text editor like Notepad. If you use Excel then you should save the file as a Tab Delimited text file. Do not use a word processor to create or edit the file because word processors may add undesirable hidden characters.

### 7.1 File/Run Commands From File

This menu selection will bring up a dialog window to enable you to select a file to read. Once you select the file and click the open button in the dialog box, the parameters in the file will be used to create commands that will be sent to the 425. The SOF8\_425 program will load a line from the file, wait the amount of seconds as indicated by the Wait parameter and then go to the next line. There is no limit to the number of lines you can have in the file.

### 7.2 File/Save/Append Displayed Settings to File

This menu enables you to save the settings currently displayed by the SOF8\_425 program into a text file. Be sure that none of the displayed settings are blank. It is a good idea to click on the Display Current Settings button to update the displayed settings just prior to using this menu. Selecting this menu will present you with a dialog window that enables you to create a new text file or navigate to an existing text file. You click the save button to copy or append the values in the SOF8\_425 Displayed Settings fields to this file. If you save the settings to an existing file, the displayed settings will be appended on a new line at the end of the file. In addition to the displayed settings, a wait time parameter is also included at the end of each line of the file (See paragraph 7.3 below).

### 7.3 File/Set Wait Time for Saved Settings

This menu enables you to enter a time in seconds between 0.0001 and 999999. This time is saved in a configuration file on your computer. If you do not enter a Wait time with this menu then the default wait time of 2 seconds will be used. The wait time is inserted as the last parameter on each line when you use the SOF8\_425 program to create a script file.

### 7.4 Format of Files

The information stored in each line in the file must be in the following format:

Frequency Phase Amplitude Prescale Divide Wait

The six parameters above must be separated by a Tab. Valid values for these parameters are as follows:

Frequency in MHz (xxx.xxxxxxxxxx)

Phase from 0 to 360 Degrees (xxx.xx)

Amplitude from 26.9% to 100.0%(xxx.x)

Prescale integer value of 1 (Disabled) or 2 (Enable - meaning Divide by 2) (x)

Divide integer value from 1 to 65536 (xxxxx)

Wait time from 0.0001 to 999999 seconds (xxxxxx.xxxx)

The default Wait time is 2 seconds. This can be changed using the File/Set Wait Time menu.

Any of the six parameters can be skipped by entering an "e" character instead of a value for the parameter.

Care should be taken that there are no extra spaces or

other characters in the file as this will stop the file from being processed and result in the display of an error message.

### 7.5 Example File

An example File of Commands is as follows:

```
10.0000000000 0.00 100.0 1 1 2
10 0 100 1 1 2
165.65 180 65.3 2 200 6.8
10 e 90 e 1 e
```

The first line sets the 425 to the factory default settings of 10MHz output, 0 phase, 100% amplitude, Disabled Prescale (divide by 1), Divider value of 1 and wait time of 2 seconds.

The second line is identical in function to the first line and illustrates that you do not need trailing zeros in the file.

The third line sets the 425 to 165.65 MHz, 180 Degrees of phase, 65.3% amplitude, Enabled Prescale (divide by 2), Divider value of 200 and wait time of 6.8 seconds.

The fourth line illustrates using the "e" character to skip parameters. It sets the frequency to 10MHz, skips the phase so that it is left at 180 Degrees from line 3, sets the amplitude to 90%, skips the Prescale parameter so that it is left at divide by 2 from line 3, sets the divide parameter to 1 and skips the wait so that there is no delay before going to the next line or ending if there are no more lines.

### 8.0 Frequency Menu

This selection will recall an input box where you should enter the desired frequency in Megahertz. Valid entries are numbers from 0.2500000000 to 350.0000000000. Do not enter the MHz units characters. Leading and trailing zero's are not required. After entering the Frequency value, click ok and a frequency command will be sent to the 425 and will also be displayed in the SOF8\_425 Command Field.

### 9.0 Phase Menu

This selection will recall an input box where you should enter the desired phase. This must be a number from 0.00 to 359.98 representing the phase in degrees. The phase command sent to the 425 will be this number divided by 360 and multiplied by 16,384. After entering the phase, click ok and a phase command will be sent

to the 425 and will also be displayed in the SOF8\_425 Command Field.

### 10.0 Amplitude Menu

This selection will recall an input box where you should enter the desired percent amplitude as a number from 26.9 to 100. Do not enter the % sign. The SOF8\_425 will use the desired percent amplitude you enter to compute the amplitude command using the formula  $0.27 + N * 0.19 / 264$  where N is the command value and is between 0 and 1023. After entering the amplitude value, click ok and an amplitude command will be sent to the 425 and will also be displayed in the SOF8\_425 Command Field.

### 11.0 LVCMOS Output Menu

This menu allow you to Enable and Disable the LVCMOS output. Disabling the LVCMOS output can improve the noise performance of the 425 Sine output. The LVCMOS output Frequency Display Field will display the LVCMOS output when the LVCMOS is Enabled and will display the text "Disabled" when the LVCMOS is Disabled.

### 12.0 Prescaler Menu

This selection will recall an input box where you should enter an integer number between 1 and 2. This is stored as the Prescaler parameter value. The number 1 means Disable (D) the Prescaler while the number 2 means Enable (E) the Prescaler. When Disabled the Prescaler has no affect. (This is the same as dividing the Frequency by 1.) When enabled, the Prescaler divides the Frequency output by 2 before it enters the LVCMOS Divider. After entering the Prescaler value, click ok and a Prescaler command will be sent to the 425 and will also be displayed in the SOF8\_425 Command Field.

### 13.0 Divider Menu

This selection will recall an input box where you should enter an integer number between 1 and 65536 . This number is saved as the divider parameter value. The LVCMOS output frequency is equal to the Frequency setting divided by the prescaler value and then divided by the divider value . After entering the divider value, click ok and a divider command will be sent to the 425 and will also be displayed in the SOF8\_425 Command Field.

## **14.0 COM Port Menu**

### **14.1 COM Port/Set COM Port Number**

This menu selection will recall an input box where you should enter the number of the COM port connected to the 425 and then click OK. Enter an integer number up to 999. Do not enter the text "COM". See paragraph 5.3 for help in finding the correct COM port number to use.

### **14.2 COM Port/View Available COM Ports**

This menu selection will recall a message box listing the COM Ports currently installed on your computer.

## **15.0 Clear Menu**

### **15.1 Clear/Clear Computer Display**

This menu selection will clear all the fields on the SOF8\_425 program's display except the COM port field. This command does not change any settings inside the 425 Signal Generator.

### **15.2 Clear/Clear 425**

This menu selection will cause the clear command to be sent to the 425. The Clear command clears the EEPROM and the RAM memory in the 425 and restores the factory default settings to these memory locations. The factory default settings on all channels are 10 MHz output frequency and zero phase, full scale amplitude, Prescale of 1, Divider of 1, Internal Clock and Automatic Update Pulse.

### **15.3 Clear/Clear External Clock Frequency**

This menu selection will enter a value of zero into the SOF8\_425 configuration file that stores the external clock frequency value and it will also enter Not Entered into the External Clock Frequency Display field.

## **16.0 Save Menu**

### **16.1 Save/Save 425 Settings to EEPROM**

This menu selection saves the current RAM settings into EEPROM. EEPROM memory is nonvolatile. This means information stored in EEPROM is not lost when the power is turned off. When power is applied to the 425 it loads the values from EEPROM memory into RAM memory and the RAM memory then determines the current output settings of the 425. If you make a change to any 425 parameter, this will change the value in RAM memory but it will not change the value stored in EEPROM. Thus, if you turn the power off on the 425 without first saving the settings to EEPROM, the current RAM settings will be lost.

### **16.2 Save/Save External Clock Frequency to Config File**

This menu selection will cause the SOF8\_425 program to store the External Clock Frequency that is currently displayed in the External Clock Frequency Display field into the SOF8\_425 configuration file. This configuration file is located on your hard disk drive. The last saved External Clock Frequency setting is used as the default value the next time you start the SOF9\_425 program.

## **17.0 Clock Menu**

The 425 has an internal voltage controlled temperature compensated crystal oscillator (VCTCXO) that is used as the default clock source. This internal oscillator has been selected so that the commanded frequency and the actual output frequency are identical and there is no round off error. Alternately, the 425 internal crystal oscillator can be phase locked to an external 10MHz frequency or it can use an external frequency input between 250MHz and 1000MHz as the clock source instead of the internal 425 crystal oscillator. When locking to a 10MHz external clock or when using an external frequency as the clock source, the SOF8\_425 software will compute a scale factor before sending a frequency command.

### **17.1 Clock/Use Internal Clock**

This menu selection will cause the 425 to be configured to use the 425 internal VCTXO oscillator as the clock source. The Clock Source display field will indicate "Internal" and the Lock to Reference display field will indicate "Not Set". When you set a frequency output on the 425 by using the frequency menu, the frequency command sent to the 425 is identical to the frequency entered into the frequency menu.

### **17.2 Clock/Lock Internal Clock to External 10MHz**

This menu selection will cause the 425 to phase lock the internal VCTXO oscillator to the signal applied to the REF IN BNC connector on the rear of the 425. The signal applied to the REF IN connector must be 10MHz. The SOF8\_425 program Clock Source display field will indicate "Internal" and the Lock to Reference display field will indicate either "Set but not Locked" or "Set and Locked". When you set a frequency output on the 425 with the frequency menu, the SOF8\_425 program detects that the internal clock is phase locked to an external 10MHz reference and multiplies the desired frequency by 0.998138215288 to obtain the frequency command sent to the 425.

### **17.3 Clock/Use External Clock**

This menu selection will cause the 425 to use the signal applied to the REF IN BNC connector on the rear of the 425 as the 425 clock. The signal applied to the REF IN connector must be between 250MHz and 1000MHz. After selecting this menu the clock source display field of the SOF8\_425 program will indicate "External". When you use the frequency menu to set a frequency output on the 425 after the 425 has been set to use an external clock, the frequency command must be computed. The SOF8\_425 program does this by dividing 938.24992236885 by the external clock frequency in MHz and multiplying the result by the frequency entered. The result of this calculation is the frequency command sent to the 425. The external clock frequency used in this calculation is the last value entered using the Clock/Enter External Clock Frequency menu and this value is shown in the external clock frequency in MHz display field.

### **17.4 Clock/Enter External Clock Frequency**

This menu selection will recall a message box that will ask you to enter the external clock frequency in MHz. The external clock signal should be connected to the REF IN connector on the rear of the 425. The external clock frequency can be any frequency between 250MHz and 1000MHz. The value entered is displayed in the "External Clock Frequency in MHz" display field. It can also be stored permanently using the Save menu as explained in paragraph 16.2.

### **18.0 Command Menu**

The Command menu enables you to send a text command to the 425 Signal Generator. See the 425 data sheet for a listing of these commands. The text commands enable you to perform all the functions that you can perform using the various SOF8\_425 menus. The reset (R), Echo (E x), I/O update (I x) and B commands are only available by using the Command Menu. Please see the 425 hardware manual for more information on these commands.