NOVATECH
INSTRUMENTS

INSTRUCTION MANUAL

Model SOF8_409

File   Frequency   Phase   Amplitude   COM Port   Clear   Save   Clock   Command

Command   [QUE‖]   Response   QUE
05F5E100 0000 0000 0000 00000000 00000000 000301
1DCD6500 1000 0100 0000 00000000 00000000 000301
3B98E7BF 2000 0300 0000 00000000 00000000 000301
5D0E8C87 3000 0266 0000 00000000 00000000 000301
20 BC0000 0000 6102 10

Clock Source [Internal]   Clock Multiplier [15]   External Clock Frequency in MHz [0]

Output 3
Frequency (MHz)
[156.1234567]
Phase (Degrees)
[270]
Amplitude (%)
[60.019]
☑ Save Settings Enabled

Output 2
Frequency (MHz)
[99.9876543]
Phase (Degrees)
[180]
Amplitude (%)
[75.073]
☑ Save Settings Enabled

Output 1
Frequency (MHz)
[50.0000000]
Phase (Degrees)
[90]
Amplitude (%)
[25.024]
☑ Save Settings Enabled

Output 0
Frequency (MHz)
[10.0000000]
Phase (Degrees)
[0]
Amplitude (%)
[0]
☑ Save Settings Enabled

[Display Current Settings]

COM Port   NOTE: Use the COM Port menu to enter the number of the COM port that is connected to the 409A. This program automatically sets this COM port to the 409A Factory Default settings of 19200 baud, no parity, 8 data bits and 1 stop bit. The COM Port number is saved in a config file and does not need to be entered again unless the COM Port number changes.
[1]

**Software Program
for Controlling the Model 409A
Four Channel DDS Signal Generator
Version N2.0**

Table of Contents

1.0 Description

The SOF8_409 Software provides a convenient way to control the Model 409 Four Channel 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 dwell time between the loading of each set of settings.

2.0 System Requirements

The SOF8_409 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 programs installed.

3.0 Installation

3.1 The SOF8_409 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 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_409 program comes in a setup file. To Install the program simply load the SOF8 CD, navigate to the SOF8_409 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_409 NET2 setup file requires Microsoft Installer 3.0 to operate. Microsoft Installer 3.0 comes pre-installed on new computers with Windows XP or later operating systems. If your computer does not

have Microsoft Installer 3.0 then you will need to download it from the Microsoft web site. The Microsoft Installer 3.0 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_409 program can be operated using a keyboard only, no mouse. To use the keyboard 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. This will not enable you to click on the Display Settings button. Instead you can navigate to the Command menu and select Display Current Settings.

5.0 Communication with the 409A

5.1 To communicate with the 409A you must connect a serial cable from your computer to the serial connector on the rear of the 409A. You will need one cable to control all four channels of the 409A. If your computer does not have a serial port then you can use a USB to Serial Port adapter. The USBGEAR Model USBG-2X232 dual serial port adapter has been tested by Novatech Instruments. However any commercially available USB to Serial adapter should work. The USBG-2X232 and can be found at:

http://www.usbserial.com/USBG-2X232.html

5.2 You will need to enter the COM port number into the SOF8_409A software in order to communicate to the 409A. Once the SOF8_409A 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_409 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 SOF8_409 Display Fields

All of the display fields are Read Only so you cannot type information directly into these fields. You control the 409A using the pull down menus or by loading settings from a file. The Command field will display the command sent to the 409A after using a menu selection to send a command. The Response field will display the response received back from the 409A. To populate the display fields with the current 409A settings, you click on the Display Current Settings button or use the Command menu and select Display Current Settings.

7.0 File Menu (Scripts)

The SOF8_409 software can load a sequence of settings from a text file into the 409A 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 the File Menu/Save Settings section, paragraphs 7.31 to 7.34. You can load the settings from the file one line at a time and program a dwell time after loading each line. This process is described in the File Menu/Load Settings section 8.1.

7.1 File/Run Commands From File

This menu selection will bring up a dialog window to enable you to select a file to load. Once you select the file and click the open button in the dialog box, the settings in the file will be loaded into the 409A. The file selected must have the settings in the exact same format as described in the File Menu/Save Settings Menu described in paragraphs 7.31 to 7.34. This file may be created by using the File/Save Settings menu or it can be created by using a text editor like Notepad. Do not use a word processor to create or edit the file because word processors may add undesirable hidden characters. The SOF8_409 program will load a line from the file, wait the amount of seconds as indicated by the Dwell Time and then go to the next line. There is no limit to the number of lines in the file.

7.2 File/Load From File to RAM Table

This menu selection will bring up a dialog window to enable you to select a file to load. The RAM table only works with channels 0 and 1 so be sure the file only contains settings for these two channels. Also, both channels must be present. Once you select the file and click the open button in the dialog box, the settings in the file will be loaded into the 409A RAM Table. The file selected must have the settings in the exact same format as described in the File Menu/Save Settings Menu described in paragraphs 7.31 to 7.34. This file may be created by using the File/Save Settings menu or it can be created by using a text editor like Notepad. Do not use a word processor to create or edit the file because word processors may add undesirable hidden characters. The SOF8_409 program will read a line from the file, convert the line to the proper HEX characters needed by the 409A Table Mode and then send the line to the 409A. Note that the dwell time is read in steps of 0.1 Milliseconds and the maximim allowed is 255 (25.5 Milliseconds). There is no limit to the number of lines in the file. To run the table you must use the Command Menu to send on "M O" and then an "M t" Command (See the 409 Hardware Manual for more details).

7.3 File/Save Settings To File

This menu selection enables you to save the settings currently displayed by the SOF8_409 program. These displayed settings can be different from the settings in the 409A Signal Gererator because the displayed settings are not automatically updated after you change a 409A setting. For this reason it is a good idea to click on the Displayed Settings button to update the displayed settings just prior to selecting File/Saved Settings.

7.31 After selecting File/Saved Settings you will be presented with a dialog window that enables you to create a new text file or navigate to an existing text file. If you save the settings to an existing file, the current contents of the file will be overwritten. (You will get a warning prior to overwriting a file.) Only channels with the Saved Settings Enabled box checked will be saved. The information stored in the file will be in the following format:

0 100.1234567 00000 0000 0000
1 050.1234567 05000 0010 0005
2 001.1234567 10000 0255 0010
3 000.1234567 16383 1023 0015

7.32 The first line above refers to Channel 0 settings

and the second line refers to Channel 1 settings etc..
The numbers on each line represent the following:

Channel Number
Frequency MHz
Relative Phase = number/16384
Attenuation = number/1023
Dwell Time (seconds or 0.1 milliseconds)

7.33 You must include leading and trailing zeros. Also, exactly one space must separate each value and there can be no spaces at the end of a line. For example, a setting of 9 MHz would be entered as 009.000000. The allowable frequency settings are from 000.0000001 to 171.0000000. The Channel Number is either a 0, 1, 2 or 3.

7.34 The SOF8_409 software always saves a Dwell time of 0000. This 0000 value can be edited using a text editor such as Notepad. Word processors should NOT be used to edit this file because word processors may embed undesireable hidden characters in the file.

7.4 File/Append Settings To File
This menu selection operates the same as the File/ Saved Settings menu selection in paragraph 8.2 above, except the settings are added to the end of the file and the current information in the file is not overwritten.

8.0 Frequency Menu
8.1 The Frequency Menu provides selections to set the output frequency of any of the four frequency channels. These four channels are 0, 1, 2 and 3. This selection will recall an input box where you should enter the desired frequency in Megahertz. Enter a number from 0.0000001 to 171.0000000. Leading and trailing zero's are not required. Do not enter any text characters such as MHz etc. Click ok and a command will be sent to the 409A and this command will be displayed in the SOF8_409 Command Field.

9.0 Phase Menu
The Phase Menu provides selections to set the relative Phase of each of the four output channels. Enter a number from 0 to 16383. The phase settings will be this number devided by 16384 times 360 degrees.

In order to achieve absolute channel to channel phase relationships you must first use the command menu to put the 409 into manual update mode using the I m

command. After entering the desired phase values you should then send the I p command. See the 409 hardware manual Table 2 and Section 4 for additional information about setting the phase.

10.0 Amplitude Menu
The Amplitude Menu provides selections to set the Amplitude of each of the four output channels in percent of full scale. Enter a number from 0 to 1023. The Amplitude setting will be this number devided by 1023.

11.0 COM Port Menu

11.1 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 409A 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.

11.2 COM Port/View Available COM Ports
This menu selection will recall a message box listing the COM Ports currently installed on your computer.

12.0 Clear Menu
12.1 Clear/Clear Computer Display
This menu selection will clear all the fields on the SOF8_409 program's display except the COM port field. This command does not change any settings inside the 409A Signal Generator.

12.2 Clear/Clear 409A
This menu selection will cause the clear command to be sent to the 409A. This command clears the EEPROM and the RAM memory in the 409A 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 and full scale amplitude.

12.3 Clear/Clear External Clock Frequency
This menu selection will enter a value of zero into the SOF8_409 configuration file that stores the external clock frequency value and it will also enter a zero into the External Clock Frequency Display field.

13.0 Save Menu
13.1 Save/Save 409 Settings to EEPROM
This menu selection allows you to save 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 409A it loads the values from EEPROM memory into RAM memory and the RAM memory determines the current output settings of the 409A. If you make a change on any channel, this will change the value in RAM memory but it will not change the value in EEPROM. Thus, if you turn the power off on the Model 409, the current RAM settings will be lost. The factory ships the 409A with EEPROM memory that contains frequency settings of 10MHz on all channels and phase setting of zero and an amplitude setting of full scale.

13.2 Save/Save External Clock Frequency to Config File

This menu selection will cause the SOF8_409 program to store the External Clock Frequency that is currently displayed in the External Clock Frequency display field into the SOF8_409 configuration file. This stored value is saved when you exit the SOF8_409 program.

14.0 Clock Menu

The 409A has an internal crystal oscillator that is used as the default clock source for the internal DDS ASIC. This internal clock has been selected so that, when used with a clock multiplier of 15, the commanded frequency and the actual output frequency are identical. The 409A also can be used with an externally supplied clock that can be connected to the rear mounted BNC labeled "REF IN". When this external clock is used, the commanded frequency must be scaled in order to determine the actual output frequency. See the 409A hardware manual for an explaination of this scaling. The SOF8_409 software program performs this scaling when the 409A is set to external clock. The scaling is based on the external clock frequency value entered by the user and displayed in the External Clock Frequency display field.

14.1 Clock/Enter External Clock Frequency

This menu selection will recall a message box that will ask you if you currently have an external clock frequency connected to the 409A. If you do not have an external clock frequency connected you should click the No button and you will then not be able to enter an external clock frequency. If you do have an external clock frequency connected then click the Yes button and you will be presented with an input box where you should enter the value of the external clock frequency in Megahertz. The value entered can be any number

between 10.0000000 and 125.0000000. Do not enter the units characters, just the number. It is possible to enter a clock frequency even if you do not have an external clock connected by falsely answering yes when the first message box appears. This first message is intended to prevent accidental entries.

14.2 Clock/Set 409 To External Clock Operation

This menu selection will recall a message box that will ask if you currently have an external clock connected. If no external clock is connected you should click the No button. If you do have an external clock connected then click the yes button and a command will be sent to the 409A that causes the 409A to use the signal received on the REF IN BNC as the clock source for the direct digital synthesizer. It will also cause the SOF8_409 software to scale the frequency commands based on the value in the External Clock display field.

14.3 Clock/Set 409 To Internal Clock Operation

This menu selection will send a command to the 409A to put it into internal clock operation mode.

14.4 Clock/Set Clock Multiplier

This menu selection will recall an input box that will ask you for a clock multiplier value and will then send the entered value to the 409 Signal Generator. Valid entries are the integer numbers 1, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19 or 20. The internal clock is intended to be used with a multiplier of 15 and this is the factory default. Normally you only need to change the clock multiplier when you are using an external clock source.

15.0 Command Menu

The Command menu enables you to send a text command to the 409A Signal Generator. See the 409A data sheet for a listing of these commands. The text commands perform identical functions to those you can perform using the various SOF8_409 menus.

15.1 Command Menu/Display Current Settings

This menu performs the same functions as the Display Current Settings button (see 16.0).

16.0 Display Current Settings Button

Clicking this button sends a "QUE" command to the 409A, reads the response returned by the 409A, converts the HEX characters returned to decimal values and displays these values in the text fields.

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