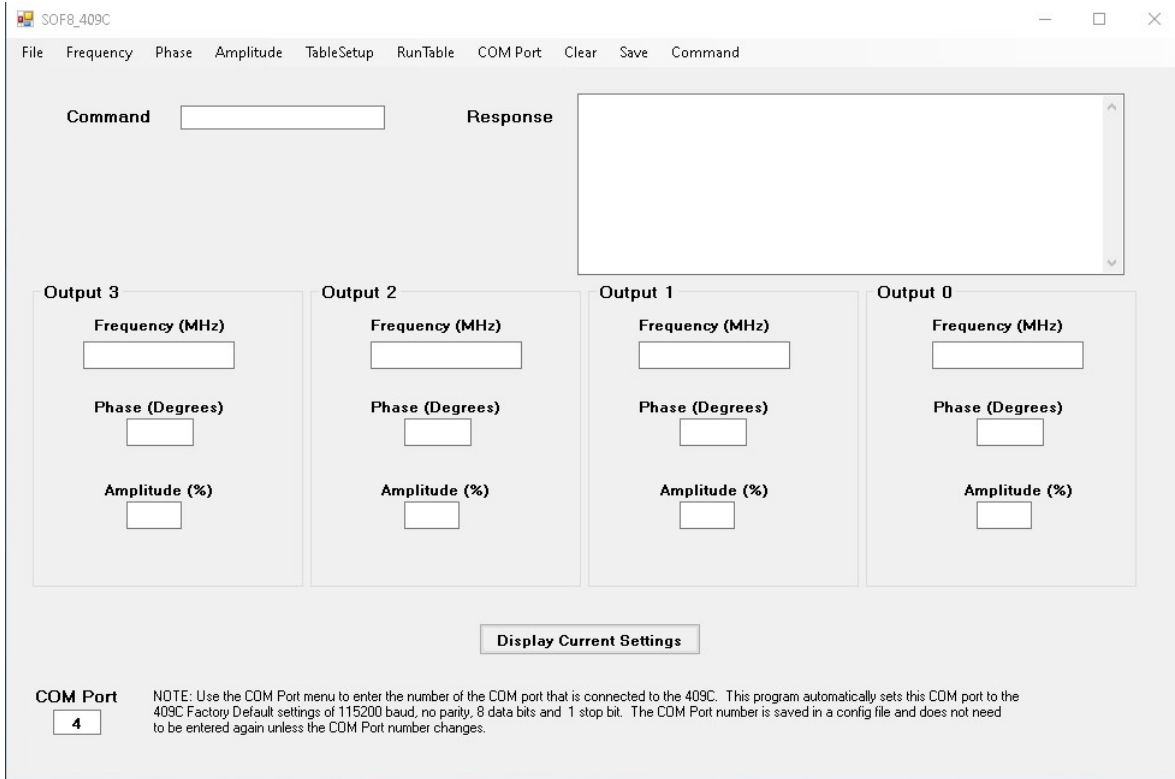


# NOVATECH INSTRUMENTS

## SOFTWARE INSTRUCTION MANUAL **SOF8\_409C**



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## 1.0 Getting Started

**1.1 Description** The SOF8\_409C Software provides a convenient way to control the Model 409C Four Channel DDS Signal Generator from a Windows computer.

**1.2 System Requirements** The SOF8\_409C software program requires a computer that has a Microsoft Windows operating system.

**1.3 Setup.** The SOF8\_409C program comes on a USB memory stick. To Install the program simply plug in the USB memory stick and run the setup file. The installation process will add a shortcut to your desktop and add a shortcut on your Start/Programs menu in a folder labeled “Novatech”.

**1.4 Communication with the 409C.** To communicate with the 409C you must connect the included USB cable to a USB connector on your computer and to the USB connector on the rear of the 409C. You also must have the correct USB driver installed on your computer. See the 409C manual for instructions on installing the USB driver.

**1.5 COM Port** The COM Port/View Available COM ports menu selection displays all the COM Ports present on your computer. You may need to check the windows device manager to determine which of the COM ports is connected to your 409C. Once you identify this COM port number you should use the COM Port/Set COM port menu selection to enter the COM port number into the SOF8\_409C program. The program will then automatically configure the COM port’s baud rate, parity and number of data bits and stop bits.

**1.6 SOF8\_409C Display Fields** Depressing the “Display Current Settings” button will populate the display fields. The SOF8\_409C display fields are Read Only so you cannot type information directly into them. You control the 409C using the pull down menus.

## 2.0 File Menu

### 2.1 Creating a Script File

**NOTE**

*A Script File is different from a Table file. See paragraph 4.0 for information on Table files*

The SOF8\_409C software can load a sequence of single channel settings from a text file into the 409C and run

them one line at a time. This is similar to running a script. The contents of the each line in the text file must conform to a specific format. This format is as follows:

Channel,Dwell,Frequency,Phase,Amplitude,

Where:

- Channel is the 409C output channel number. Valid entries are 0,1,2 or 3.
- Dwell is the delay time in seconds until the next line is executed when the script is run automatically. Valid entries are 0.001 to 99999.999.
- Frequency is the 409C output frequency in MHz. Valid entries are 0 to 171.1276031.
- Phase is the 409C output relative phase in degrees. Valid entries are 0 to 359.99.
- Amplitude is the 409C output amplitude in volts dc. Valid entries are 0 to 1.000.

The Channel, Dwell and Frequency parameters must be present. The Phase and Amplitude can be omitted. If you omit the Phase then you must also omit the Amplitude. There must be a comma between each parameter and at the end of the line. There can be no spaces in the line. After reading one line and running it, the SOF8\_409C software waits the amount of time set by the dwell parameter and then reads another line and runs it. Because of this communication the actual dwell time will likely be a minimum of approximately 0.1 seconds. For smaller dwell times, use the Table mode which offers dwell times as short as 13 microseconds.

An easy way to create script files is to use Microsoft Excel to create a file with titles at the top of the columns. Save this file as a comma delimited .csv file and then open the .csv file using Microsoft Notepad. Finally, use Notepad to remove the column titles and make sure there is a single comma at the end of each row and then save the file as a text file. The text file can then be opened from your SOF8\_409C program using the File/ Run Commands From File menu selection.

**2.2 Example Script File.** See page 6 for examples of script files.

**NOTE**

*A .txt file containing data for a SOF8\_409C script must contain one channel per line in the file. This is different from a .txt file that contains data to be loaded into the 409C table, since the table can contain 1, 2, 3 or 4 channels of data on a single line,*

**2.3 Running a Script File.** To run a script file, select The **File/Run Commands From File** menu selection. This will show a dialog box where you can choose to manually step through the lines in the scrip file or have the SOF8\_409C program step through them automatically. Make your selection and then a browse window will be displayed where you can navigate to the file containing the script. Once you find the script file, click on the open button and the SOF8\_409C program will display a dialog box that will give you the choice stepping through the script one line at time or automatically running through the entire script file.

### 3.0 Frequency, Phase and Amplitude Menus.

These menus each have four submenu selections for setting the frequency, phase or amplitude on each of the four output channels. For example, to set the output frequency of channel 3, select the **Frequency/Set Output 3 Frequency** menu. An input box will appear where you enter the frequency in MHz and then click OK.

### 4.0 Table Setup Menus.

The Model 409C contains Flash memory capable of storing up to 14249 rows of data in a table format. The Table Setup menu is used to add rows to the table, display the rows in the table and do other setup operations. The table can be set up so that, when you run the table, the 409C outputs are updated very fast, as fast as every 13 to 31 microseconds.

**4.1 Table Setup/Display Contents.** Selecting this menu will recall two input boxes where you enter the first and then the last row of the table that you want to display. The contents of these rows, if they were saved to flash, will then be displayed in the Response Text Field.

**4.2 Table Setup/Load Table from File.** Selecting this menu will recall a browse window where you can select a text file to upload to the table. The text file must have the data for each row of the table on a single line with the parameters separated by a comma as follows:

```
Row,Dwell,Channel#,Frequency,Phase,Amplitude,  
[Channel,Frequency,Phase,Amplitude,]  
[Channel,Frequency,Phase,Amplitude,]  
[Channel,Frequency,Phase,Amplitude,]
```

See the 409C manual paragraph 4.15 for details on each parameter in the T command.

The “[...]” indicates an optional entry. The Channel numbers can be in any order. When the SOF8\_409C program reads this file it will strip out the commas and send the appropriate T commands to the 409C. An easy way to create the table data text file is to use Microsoft Excel to enter the data with column headings, save this file as a .csv file and then open the .csv file with Notepad. Notepad automatically adds a comma after each parameter. Add a column heading with no parameters at the end of the row in the csv file and Notepad will put a comma at the end of each row when it opens the file. Finally, use Notepad to strip out the row with the column headings and save the result as a .txt file.. See page 5 for examples of .csv and .txt table files.

**4.3 Table Setup/Make Rows Active.** Selecting this menu will recall two input boxes to enable you to define the active rows of the table. Enter the beginning row number in the first box and the ending row number in the second box. The **Run Table** menus have selections for automatically or manually stepping through the active rows. The Display Settings button will return the current state of the **TRNG** setting which defines the active rows.

**4.4 Table Setup/Add or Replace a Single Row.** Selecting this menu will recall an input box that provides instructions and enables you to enter a new row into the table. If the entered row number is already in the table then the existing table row will be replaced with the new row. See paragraph 4.13 in the 409C manual for examples of valid table rows.

**4.5 Table Setup/Dwell Range Setup.** Selecting this menu will recall an input box where you can enter a Dwell Time scale factor of 1 or 4. With a scaling of 1, dwell times can be up to 8191.875  $\mu$ s with a resolution of 125 ns. With a scaling of 4 dwell times can be up to 32.7675 ms with a resolution of 500 ns. The dwell times of existing table rows are affected by this setting. For example, if a table row was created with a dwell time scale factor of 1 (this is the default), changing the scale factor to 4 causes the dwell time of this row to be 4 times longer.

**4.6 Table Setup/Save Table to Flash.** Selecting this menu will send a **TSAVE** command to the 409C and cause the 409C to save all table data to flash memory. On large files the TSAVE command may generate an error message. Ignore this error message.

**4.7 Table Setup/Clear Flash Table.** Selecting this menu will send a **TCLEAR** command to the 409C and cause the the 409C to reset all rows in the table to the empty state.

**4.8 Table Setup/Enable TS Input.** The TS rear panel input pins are disabled by default. Selecting this menu will enable these inputs.

**4.9 Table Setup/Make IOUD an Input.** The IOUD rear panel pins are outputs by default and indicate that the 409C microcontroller has triggered an update. Selecting this menu will change the IOUD pins to inputs and require the user to trigger a 409C update using an external hardware trigger pulse.

## 5.0 Run Table Menus.

Running the table means moving a table row from microcontroller memory to registers in the AD9959 DDS ASIC and then pulsing the IOUD line to trigger an update. Submenus enable this to be done for one row only, for a sequential selection of rows or for all the active rows including looping from beginning to end continuously. It can also be done using external hardware trigger pulses.

**5.1 Run Table/Run Active Rows Once.** Selecting this menu will send a **TONCE** command to the 409C. This will cause the 409C to move unsaved table rows from RAM to Flash memory and then run all the active table rows one time starting at the first row in the active range.

**5.2 Run Table/Run Active Rows Continuously.** Selecting this menu will send a **TRUN** command to the 409C. This will cause the 409C to move unsaved table rows from RAM to Flash memory and then run all the active table rows continuously starting at the first row in the active range. After reaching the end of the active range the 409C will loop back to the first active row and continue doing this until it receives a **TSTOP** command.

**5.3 Run Table/Stop Running.** Selecting this menu will stop a running table.

**5.4 Run Table/Go To Row.** Selecting this menu will recall an input box. Enter a row number in the box and click ok. This will send a **TS x** command to the 409C where x is the row number you entered. The 409C will output the values in row x and then maintain these settings. It is best to stop the table from running prior to using this command as it will cause an error if the table is running.

**5.5 Run Table/Single Step.** Selecting this menu will send a **TS** command to the 409C. If this is done after sending a **TS x** command then the 409C will advance one row and advance another row with each subsequent **TS** command. If this is done after sending a **TSTOP** command, then the 409C will go to the first active row and

advance one row with each subsequent **TS** command. Note that there is a keyboard shortcut for this menu which is “Alt N”. It is best to stop the table from running prior to using this command as it will cause an error if the table is running.

### NOTE

*If Go to Row or Single Step do not appear to work, then user the Table Setup/Save Table to Flash menu and try again.*

## 6.0 COM Port menus.

This menu has two submenus that enable you to view the COM port numbers available on your computer and to select the COM port number that is connected to your 409C.

## 7.0 Clear Menus.

This menu has two submenus. One enables you to clear the display fields and the other to reset the 409C to factory default values (except it does not reset the data stored in the Table flash memory).

## 8.0 Save 409C Settings to Flash Menu.

This menu saves all current 409C setting except the Table data to flash memory. Cycling power will recall these saved settings.

## 9.0 Command Menu.

This menu recalls an input box where you can enter any valid 409C command and send it to the 409C.

**Table 1: 409C Response & Error Codes**

<b>Error Code</b>	<b>Meaning</b>
OK	Good Command Received
?0	Unrecognized Command
?1	Invalid Frequency
?4	Invalid Phase
?6	Invalid Parameter
?7	Invalid Amplitude
?8	Invalid Baud Rate
?A	Invalid Amplitude
?C	Invalid Channel Number
?D	Invalid Dwell Time
?E	Empty Row in Active Range
?F	Invalid Frequency
?M	Invalid Parameter
?N	Invalid Table Row Number
?P	Invalid Phase
?R	Table is Running
?S	Invalid When Sweep Enabled
?T	Invalid Table Command
?V	Invalid Calibration Value
?W	Invalid Active Row Range

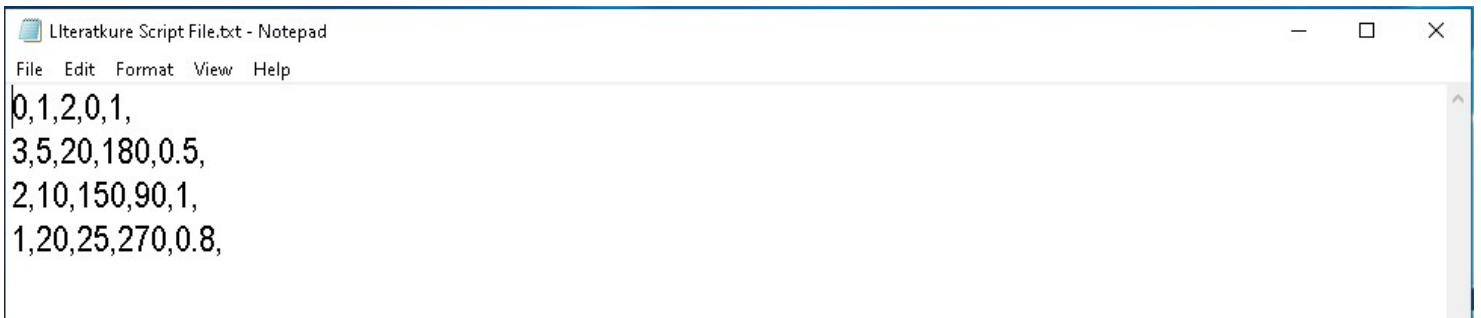
# SCRIPT

## How to create a .txt script file that the SOF8\_409C program can run directly

Use Microsoft Excel and enter script data, then save as a .csv file

	A	B	C	D	E	F	G	H	I	J
1	Channel Number	Dwell in seconds	Frequency in MHz	Phase in Degrees	Amplitude in Volts DC	Comma (empty column adds comma in data)				
2		0	1	2	0	1				
3		3	5	20	180	0.5				
4		2	10	150	90	1				
5		1	20	25	270	0.8				

Then open the .csv file in Notepad, delete the first row and save it as a txt file.



# TABLE

## How to create a .txt file that the SOF8\_409C program can load into a 409C Table

Use Excel and enter table data, then save as a .csv file similar to the one below. The last column must have a column heading but should not have any entries. Notepad will add a comma at the end of the row because of the empty column.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	Row	Dwell (Microseconds)	Channel	Frequency	Phase	Amplitude	Channel	Frequency	Phase	Amplitude	Channel	Frequency	Phase	Amplitude	Channel	Frequency	Phase	Amplitude	Comma
2	0	26	0	1	0	1	1	20	30	0	1	2	30	90	0.5	3	40	180	0.8
3	1	20	1	2	90	0.7	2	30	90	0.7	3	40	90	0.7					
4	2	14	2	3	180	1	0	40	90	0.7									
5	3	35	3	4	270	0.5													

Then open the .csv file in Notepad, delete the first row and save as a .txt file. The result should look like the text file below.

