

# How to Control Tabor AWGs with Python

## Using SCPI Commands

In this tutorial, we will give a quick start guide on how you can communicate with the Tabor AWG with & without the use of NI-VISA to send Standard Commands for Programmable Instruments (SCPI). SCPI commands are an ASCII-based set of commands for reading and writing instrument settings.

For this tutorial, we will use win7 64bit OS, Python 2.7.12 (Anaconda2 4.2.0 64-bit) and a Tabor WX2184C using TCP/IP interface. To ensure you successfully established all the necessary settings for remote control over the Tabor instrument using LAN/USB/GPIB, please make sure you have already installed the latest <u>NI-VISA</u> (if you choose to use it) from the National Instruments website. Also please go over our <u>connectivity</u> <u>tutorials</u> on the Tabor's website, to make sure you installed all necessary drivers.

#### To connect and control the Tabor Instrument using SCPI Commands

- 1. Set the USB/LAN/GPIB as the remote interface, using the Tabor's front panel buttons.
  - a. If you choose to communicate using LAN interface:

Go to "Utility"->"Remote Interface"->"LAN". Modify the IP Address, Subnet Mask & Default Gateway as necessary to ensure TCP/IP connectivity between the Tabor device & the PC. For more information regarding TCP/IP connectivity, please refer to <u>Here</u>.

b. Go to "Utility"->"Remote Interface"->"Select Interface"->"Control from Interface". Press Enter to select the active Interface you need. Wait for the answer "Done". We chose to demonstrate using LAN.

► Utility ► Re	mote Interface			▶ Utility ▶ Re	mote Interface	9
Select Interface	CTCP/IP Network Physical Addres Host Name:	Properties s: 3C:D9:2B:6E:F1:80 YARON-HP	l	Select Interface	Control from Int	terface JSB 📀 LAN
GPIB The second	DHCP Enabled: IP Address: Subnet Mask: Default Gatewa	No ♦ 192.168. 0 .197 255.255.255. 0 y: 0 . 0 . 0 . 0		GPIB VSB	NOTE: Press Ente interface. Connected (GD * IP Address * Subnet Masl	r to select the active BIP) 192.168.0.11 k 255.255.255.0
LAN	Note: Modificati only after execu Select Interface	ons will take effect ting: ->LAN->Enter		LAN	* Def Gateway	/ 192.168.0.100
BASE MODE	SYNCECH1->CH23	EVENT INPUT		BASE MODE	SYNCICH1->CH2]	EVENT INPUT
COUPLE: DC RUN: CONT	POS: ØPts STATE: OFF	LEVEL: +1.600 SLOPE: POSITIVE		COUPLE: DC RUN: CONT	POS: 0Pts STATE: 0FF	LEVEL: +1.60V SLOPE: POSITIVE



2. Example using PyVISA (NI-VISA wrapper) for Tabor WX instruments:

a. Open NI-MAX and configure the instrument address as raw socket:

- b. Download the attached zip folder for this tutorial from the Tabor website tutorials section. Unzip & save them under the same directory on your PC's hard drive.
- c. Make sure 'teawg.py' & 'pyte16.py' ('pyte14.py' for using PyVISA 1.4) are on the same folder as the example:

Solution → usi	ng visa 🗸 44 Search using visa	×
Organize 👻 Share with 👻	Burn New folder 🔠 🔻 🗍	0
⊿ 🔆 Favorites ■ Desktop	Documents library Arrange by: Folder	
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<ul> <li>✓ Contraction</li> <li>✓ Documents</li> <li>✓ Music</li> <li>✓ Pictures</li> </ul>	<ul> <li>pyte14</li> <li>pyte16</li> <li>teawg</li> <li>wx2184_example</li> </ul>	
5 items	• • III	Þ



d. Open Spyder or any other Python IDE. Run Example1.py:

Spyder (Python 2.7)	
File Edit Search Source Run Debug Consoles Projects Tools View Help	
<u>-</u> L ☞ G ™ ≔   F ⊡ E' E' \	🚾 🗛 🎢 🥊 🚽 (pocuments (Elad Work (tutorials (python 🔹 🖕 🕇
Editor - C:\Users\elad.TABORSBS\Documents\Elad work\tutorials\python\Example1.py	문 × File explorer 문 2
Example 1.py 🗵	¢ 0 0 0 0
1 # Simple WX2184 Example using PyVISA	Name Size Type Date Modified
2 3 import teawg 4	Example1.py         1,012 bytes         py File         1/15/2017 6:47 PM           D pyte14.py         47 KB py File         9/28/2016 6:44 AM
5 # Connect to the instrument	☐ pyte16.py 46 KB py File 1/15/2017 6:17 PM
6 print	pyte16.pyc 37 KB pyc File 1/15/2017 6:17 PM
/ print 'Please insert the instrument address'	teawg.py 37 KB py File 1/15/2017 6:16 PM
o print (either iP-Address or NI-VISA Resource Name)	teawg.pyc 28 KB pyc File 1/15/2017 6:16 PM
10 conn_str = raw_input('Enter the address: ')	
11 print	
12 inst = teawg.TEWXAwg(conn_str, paranoia_level=1)	
13	
15 # Perform a reset	Variable explorer File explorer Help
16 inst.send cmd('*RST')	
17 # Ask for identification details from instrument	
18 print	Console 1/A 🗵 🛛 🔳 🎗
<pre>19 IDN = inst.send_query('*IDN?')</pre>	
20 print	In [1]:
21 print 'Connected to: {0}'.format(IDN)	E
22 print 23 # Set instrument to standard mode	<pre>In [1]: runfile('C:/Users/elad.TABORSBS/Documents/Elad work/</pre>
24 inst.send cmd(':FUNC:MODE FIX')	tutorials/python/Example1.py', wdir='C:/Users/elad.TABORSBS/
25 # Set Channel1 as active	Documents/Elad work/tutorials/python')
26 inst.send_cmd(':INST:SEL CH1')	Please insert the instrument address
27 # Set the frequency of the waveform	(either IP-Address or NI-VISA Resource Name)
<pre>28 inst.send_cmd(':FREQ 50e6')</pre>	
29 # Set the amplitude in Vp-p	
30 Inst.sena_cma( :VULT 2 )	Enter the address: TCPIP0::192.168.0.197::5025::SOCKET
32 inst.send cmd(':FUNC:SHAP_SOU')	
33 # Turn the active channel's output	
34 inst.send_cmd(':OUTP_ON')	Connected to: Tabor Electronics.WX2184C.0000215470 2:19
35 print	
36 syst_err = inst.send_query(':SYST:ERR?')	
3/ print 28 print 'End of the Evernle - Status: (0)' format(syst car)	
39 print	End of the Example - Status: 0, No error
40	
41 # Close session	
42 inst.close	Python console History log IPython console
Permissions: RW End-of-lines: CI	CRLF Encoding: UTF-8-GUESSED Line: 28 Column: 28 Memory: 80 %

e. Following the examples above, as can be seen on a scope, a 50MHz 2Vp-p square waveform was created:



The outputted 50MHz 2Vp-p square waveform.



For a more advanced example using PyVISA with the WX2184C, please run 'wx2184\_example.py'.

- 3. Example without the use of PyVISA for Tabor WX instruments:
  - a. Download the attached zip folder for this tutorial from the Tabor website tutorials section. Unzip & save the files under the same directory on you PC's hard drive (Make sure the 'tewx.py' is on the same folder as the example).



- b. Please read the 'ReadMePlease.txt' file before proceeding, as establishing communication without NI-VISA using USB requires installation of Python-USBTMC.
- c. Open Spyder or any other Python IDE. Open and Run Example2.py:





d. Following the examples above, as can be seen on a scope, a 50MHz 2Vp-p square waveform was created:



The outputted 50MHz 2Vp-p square waveform.

For a more advanced example of using the WX2184C, please run 'wx2184\_example\_without\_visa.py'.

#### 4. Example without the use of PyVISA for Tabor WW instruments:

a. Download the attached zip folder for this tutorial from the Tabor website tutorials section. Unzip & save them under the same directory on you PC's hard drive (Make sure the 'teww.py' is on the same folder as the example).

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b. Open Spyder or any other Python IDE. Open and Run Example3.py:



c. Following the examples above, as can be seen on a scope, a 25MHz 2Vp-p square waveform was created:



The outputted 25MHz 2Vp-p square waveform.

Inside the 'teww.py' file, you will find another example of how to download 3 segments, & define a simple 3 step sequence.



For a full list of the SCPI commands, you can use to control the AWG with, go to the Programming Reference chapter in the Tabor AWG's User Manual.

	1. Channel and Group Control	Commands	
Keyword	Parameter Form	Default	Notes
:FORMat			
: DATA	SEParate   COMMon	SEParate	Common will download the waveform into both of the memories, Arbitrary and Digital
:ARBitrary			
:RESolution	1P   2P	1P	2P will duplicate any arbitrary wave for sync between Arb and Dig frequency
:INSTrument			
[:SELect]	CH1   CH2   CH3   CH4   1   2   3   4	CH1	Select channel for prog
:SKEW	-100e-12 to 100e-12	0	Channels Skew in same part
:COUPle			Couple 1&2 with 3&4
:OFFSet	0 to ±(n-128) (n = waveform length)	0	Course offset adjustment
:SKEW	-3e-9 to 3e-9	0	Fine skew adjustment
:STATe	OFF   ON   0   1	0	
:XINStrument			
:MODE	MASTer   SLAVe   MSLave	MAST	System configuration
:OFFSet	0 to n (n = waveform length)	0	Multi-instrument offset
:SKEW	-5e-9 to 5e-9	0	
:STATe	OFF   ON   0   1	0	

Table 4-1, Model WX2184C Commands List Summary

The User Manual can be downloaded from the <u>Tabor website</u> (you must be registered first):

Home » Downloads					
Download	s				
Welcome to Tak decided to enabl provided that the	oor Electronics Download e our customers to downlo e customer will register an	Center. As a part of o bad software, drivers, up d obey the terms of use	ur quality service ogrades, manuals ar in this site.	progr nd dat	am, we at Tabor have asheets free of charge
Please note that	in order to download mate	erial from our site you w	ill need to register o	only o	nce.
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Please choose Model Number Model WX2184C Manuals	the type of content tha Model WX2184C • Manual for mode	t you need Download Type Is WX1284C and WX218	Manuals 4C 15/07/2015 Ver. 1.2	·	SEARCH >

In the next tutorials of the series "How to Control Tabor AWGs Using Python", we will show how to communicate with the Tabor AWG using the IVI driver functions.

### For More Information

To learn more about how to remote control Tabor instruments using Python, visit our website Support & Tutorials zone. If you encounter difficulties with connecting to Tabor units using Python, please contact us at <u>support@taborelec.com</u> and our support team will gladly help. For more of Tabor's solutions or to schedule a demo, please contact your local Tabor representative or email your request to <u>info@tabor.co.il</u>. More information can be found at our website at <u>www.taborelec.com</u>

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