

Simulate, Stimulate, Test...

How to Control Tabor AWGs with MATLAB

Using SCPI commands

In this tutorial, we will give a quick start guide on how you can communicate with the Tabor AWG using Standard Commands for Programmable Instruments (SCPI). SCPI commands are an ASCII-based set of commands for reading and writing instrument settings.

In order to control instruments using MATLAB, the instrument control toolbox is required. Please note that the Instrument Control Toolbox is an additional application that needs to be added. For more information you can visit the <u>Mathworks</u> website.

For this tutorial, we will use MATLAB version R2014a 32bit and a USB interface. To ensure you successfully established all the necessary settings for remote control over the Tabor instrument using LAN/USB/GPIB, please go over the connectivity tutorials on the Tabor's website.

→ To connect and control the Tabor's Instrument using the Test & Measurement Tool

 Set the USB/LAN/GPIB as the remote interface, using the Tabor's front panel buttons. To do so, 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 USB.





2. Once the MATLAB is up and running, type "tmtool" on the command window to open the Test & Measurement Tool.

Con	nmand Window
ا (1)	New to MATLAB? Watch this <u>Video</u> , see <u>Examples</u> , or read <u>Getting Started</u> .
fx.	>> tmtool >>

A new Test & Measurement Tool dialog box opens up:





- **3.** On the left window, one may choose which interface to communicate through with the Tabor AWG.
 - a. If you would prefer not to work with VISA, you could choose to communicate through TCPIP by right clicking on "TCPIP" and adding new TCPIP instrument:



After doing so, extend "TCPIP" and choose the Tabor AWG's IP address. The communication dialog box will appear.

Test & Measurement	
A Instrument Control Toolbox	
🗄 🧱 Hardware	
🗉 🝠 Serial	
E CPIP	
- 192,168.0.398,5025	
- 문을 나다면	
- Ea Bluetooth	
- N9 11C	
#9 GP18	
🗄 🚭 VISA	

b. If you prefer working with VISA, you could connect trough TCPIP by extending "VISA", right click on "TCPIP(VXI-11)" and scan for TCPIP instruments using VXI-11 auto detection.



c. If you would prefer working with VISA trough USB, just click on VISA to extend VISA->USB & scan for the USB address of the Tabor device:

🗄 🚔 VISA
with the second
一号 TCPIP (VXI-11)
<mark></mark>
🗄 🚓 M Scan for USB instruments
🖨 🚏 Instrument Objects
🖨 🚏 Interface Objects



Through all of the interfaces you will communicate with, you will use the same dialog box. From here after, we will demonstrate how to connect & send SCPI commands using the USB interface:

4. Click on the Tabor address to open a communication dialog box with the device. Click on the "Connect" button as shown below:

0 0					
Test & Maxwement	Connection Connection Connection Connection Connection Connection Connection Connection Connect C				
	Communicate Configure Service Log Service date Outs type: ASCB Outs thematic Takin Data to serve	- Data type - Data type time bytemi	9 4503 54	Post Cics Co an instru Z. Cics the to read a disc the instrume	
	Trainate re-sering and infere series	Trapersa Trapersa Trapersa Trapersa Trapersa Trapersa	a he may best fish	Control 4 Chick the Session Section The fee	
	Action Date		Sce Format	shish yo to recrea 5. Clice Dia Visitume	

5. Send "*IDN?" Query to check the connection, information identify Tabor's Model should come up as a new action line:

a C						
est & Mazsurement	US80-0x168C+0x2184-000	0215470-0 (Tabor Electronics, WI0264	C100021547813.13			Help
Test & Massurement Instrument Centrol Toolbos ■ Instrument Centrol Toolbos ■ Jardowe # J Serial # Car CPIP - Car DOP - C	Connection Connection status to us Last identification reque Communicate Configu Sending data Data type ASCB Data to write "Data to write "Exhibite in workcipe	Connection Connection status to sub-manufacturer id 0x15BC (model code 0x2184): Connected Connection status to sub-manufacturer id 0x15BC (model code 0x2184): Connected Last identification request on 10-Nov-2013 14:30-46. Tabor Electromics, WX2184C, 0000215470, 115 Communicate Configure Session Log Sending data Receiving data Data type ASCI + Data format: Size Context Size (optional): Reportse			Concentral Selecting th communica part. 1. Click to real 2. Click to real 3. Click to real 3. Click to real 4. Click Model 4.	
Standard Collect contract and a free free free free free free free fr	ann Flock	(0.s) Query Write	Read data as	her dring	Plush	Sess sess See f more This
	Action	Data		Size	Format	which
	Connecting to	Connecting to VISA-US8-0-0x068C-0x2184-0000215470-0			15 rec	
	Write (Query) "IDN/			1x5	Tialin	B. Cath



- 6. Here is a short basic example of how to set a 50MHz, 2Vp-p square waveform in standard mode, just to get the feel of how to communicate using SCPI commands:
 - a. Type ':RESET' and press the 'Write' button.
 - b. Type ':INST CH1' and press the 'Write' button, to set Channel 1 as the active channel.
 - c. Do the same with ':FREQ 50e6' and 'VOLT 2' to set the frequency and amplitude.
 - d. Type ':FUNC:SHAP SQU' and press the 'Write' button, to change to Square waveform.
 - e. Type ':OUTP ON' and press the 'Write' button to open channel 1.
 - f. Press the 'Disconnect' button.

Connection Connection status to usb	manufacturer id 0x168C (model cod	e (h.2184): Discor	mected	Conn	ect	Disconnec
Last identification reques	t on 10-Nov-2015 14:30:46: Tabor Ele	ctronics, WXQ184	C,0000215	5470,1.15		
Sending data	e Seision Log	Rareiving dat				
Data barro ASCE	Data barra	Lacen.				
para labora		nurs the	805.0			
Data format: Salm	Data format:	745				
Data to write:	Size (optional))i]				
OUTP ON	Response					
Deterpret data as here (De)	E fiead data	as her sh	ling		
interpret data as her i	De	Fiead data	as her sh Export	ling]	For	Flush
Connection to	Deta	Find data	as her st	ling] Size	For	Flush mat
Connecting to	Deta VISA-USB-0-0x168C-0x2184-00 "IDN?	fiend data	as her st	Size	For	Thuh mat
Connecting to Write (Query) Read (Query)	Deta	final data final	as her st	Size	For Sidy Sic	Fluih mat
Connecting to Write (Query) Read (Query)	Deta	final data final	as her sh Export	Sige 1x5 1x6 1x6	For 964) 956	Fluih mat
Interpret data at her (Action Connecting to Write (Query) Read (Query) Write Write	Deta Data VISA-USB-0-0x168C-0x2184-00 'IDN? deta2 (Tabor Electronics,WX RESET PNST CH1	() fixed data () fixed () () () () () () () () () () () () () () (as her sh Esport	Size 1x5 1x42 1x6 1x9	For 9685 9687 9687 9687	Fluth mat n n
Cinterpret date as here (Action Connecting to Write (Query) Write Write	Deta Query Write Data VISA-USB-0-0x168C-0x2184-00 'IDN? deta2 (Tabor Electronics,WX RESET #NST CH1 #RESET #REQ 50000000	() Final data Final () () () () () () () () () () () () ()	as her sb Export	Size 1x5 1x42 1x6 1x9 1x14	For 968) 968) 968) 968) 968)	Flush mat n n n
Clinterpret date as here (Action Connecting to Write (Query) Read (Query) Write Write Write Write	Deta Data UISA-USE-0-0x168C-0x2184-00 UIDN7 data2 (Tabor Electronics, VX RESET INST CHI FREQ 50000000 VOLT 2	Finad data Finad 000215470-0	as her sh Esport	Sige 1x5 1x42 1x6 1x9 1x14 1x7	For 965 966 966 966 966 966 966	Flash mat n n n
Connecting to Write Query) Read (Query) Write Write Write Write	Deta	Finad data	as her sh Esport	Size 1x5 1x42 1x6 1x9 1x14 1x14 1x7 1x14	For 764) 756 764) 764) 764) 764)	Flush emat n n n n n
Interpret data at here Action Connecting to Write (Query) Read (Query) Write	Deta	Finad data Finad (00215470-0	es her st	Size 1:55 1:42 1:65 1:44 1:65 1:59 1:54 1:57 1:54 1:58	For 7643 7567 7567 7567 7567 7567 7567	Flush mat n n n n n n n n

Each time you press the 'Write' button, the command you write to the instrument is also saved as an Action line that can be used later as part of a MATLAB script for automation purposes.





7. As can be seen on scope, a 50MHz 2Vp-p square waveform was created:

The outputted 50MHz 2Vp-p square waveform.

8. In order to save this process as a MATLAB code, go to 'Session log', where you will see that all the actions you have made were automatically translated into MATLAB code. Press the 'Save Session' button.

580:0x168C:0x2184:0000215470:0 (Tabor Electronics, WX2184C,0000215470,1.15)
Connection Connection status to usb manufacturer id 0/d68C (model code 0x2184): Disconnected Connect Disconnect Last identification request on 10-Nov-2015 14:30:46: Tabor Electronics, WX2184C,0000215470,1.15 Communicate Configure Session Log
<pre>1 % Find a VISA-USB object. 2 obj1 = instrfind('Type', 'visa-usb', 'RsrcName', 'USB0 3</pre>
<pre>4 % Create the VISA-USB object if it does not exist 5 % otherwise use the object that was found. 6 if isempty(obj1) 7 obj1 = visa('NI', 'USB0::0x168C::0x2184::000021547 c olse</pre>
<pre>9 fclose(obj1); 10 obj1 = obj1(1) 11 end</pre>
12 13 % Connect to instrument object, obj1. 14 fopen(obj1);
+ M +



Simulate, Stimulate, Test...

And Save your session as a MATLAB script:

Organize.+ Here	Tolder			· · · · · · · · · · · · · · · · · · ·
😭 Favoritas 🗮 Desktop	Do son	cuments library	Anunge	ly) Folder +
🐊 Downloads 📆 Recent Places	hiam	•		
	1	Paterin	ente match your coamh	
Documents				
J Music	1			
Pictures	1.00			
H Videos				
🛤 Computer				
🚢 Local Disk (C:)	• (6)	1.1		
	CreatingSqua	reliaveform		
File name: (

9. After saving the session as a '*.m' file, you can run it through your MATLAB command window as a script.





For a 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 - Downituate							
Download	s						
Welcome to Tat decided to enabl provided that th Please note that	oor Electronics Down e our customers to do e customer will registe in order to download	load C wnload r and d nateri	enter. As a part of o d software, drivers, up obey the terms of use al from our site you w	sur qi ograd In thi sill nei	uality service p les, manuals an is site, ed to register o	orogr d dat sniy o	am, we at Tabor have asheets free of charge ince.
Please choose	the type of content	that y	/ou need				
Madel Number	Model WX2184C	•	Download Type	Mar	nuals	2	SEARCH >
MARKED BUTCHING AN							
MODEL MATTOAC	120000102000	nodeis	WX1284C and WX216	4C	15/07/2015	isi.	Download (7.6 Mb)
Manuals	Manual for r				Ver. 1.2		

In the next tutorials of the series "How to Control Tabor AWGs Using MATLAB", we will show how to communicate with the Tabor AWG using the IVI driver functions, followed by four practical MATLAB coding examples.

For More Information

To learn more about how to use MATLAB with Tabor instruments, visit our website Support & Tutorials zone. 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>

© Proprietary of Tabor Electronics Ltd.