XDAC-8MUB-R4G8-SMA

SPECIFICATION SHEET & MANUAL

2021

nicslab

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Important Notice and Disclaimer:

This product is designated for skilled user. You are entirely responsible for (1) choosing the appropriate Nicslab products for your operation, (2) designing, validating and testing your operation, (3) ensuring your operation meets applicable standards, and any other safety, security or other requirements.

Safety Note

Do not operate this product in any manner not specified by Nicslab. Failure to comply with these precautions or with specific warnings or instructions elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Nicslab assumes no responsibility for any damage caused by mishandling that is beyond normal usage defined in this manual of this product.

Before Applying DC Power Supply

Verify that DC power supply is good condition and safe to use. It is imperative to use ONE DC power supply as a source power for this product and the input voltage is no more than 38 V, or it can impair this product. Make all connections to the unit before applying power.

Do Not Discard the Instrument Cover

Only authorized personnel from Nicslab should remove the instrument cover.

Do Not Alter the Instrument

Do not put any unauthorized parts or modify the instrument without Nicslab approval and warranty.

Caution

This symbol indicates hazard of any operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data.

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1. Introduction

Nicslab XDAC-8MUB-R4G8-SMA system is a versatile multichannel source measurement system. The XDAC-8MUB-R4G8-SMA supports multiple voltage/current sourcing and voltage/current measurement. The system is suitable for sourcing and measuring low power applications from simple electronic circuits to complex photonic integrated circuits.

The XDAC-8MUB-R4G8-SMA provides independent 8 channels controlled by GUI and SCPI through Ethernet/USB port. The system has two modes: Constant Current (CC) ranging from ±500 mA per channel and Constant Voltage (CV) ranging from bipolar ±18 Volt per channel.

The features for XDAC-8MUB-R4G8-SMA in details are:

- 16-bits voltage control.
- 16-bits current control.
- Enable voltage range configuration through software (technology that enables the user to select the output range with software without lose control of the high-resolution feature).
- Flexible output configuration with 16-bit resolution: ±2.5V, ±5V, ±10V, ±18V *(Premium Upgrade)*
- Intuitive GUI.
- Maximum power output per channel 10 Watt.
- Save function to create database.
- Upload function to generate the registrable voltage and current pattern.
- Sequence function for continuous voltage and current.
- Short circuits protection.
- SCPI command support (Python, C# and LabVIEW).
- SCPI Library *(Premium Upgrade).*
- Windows, Mac, and Linux support.
- Ethernet port.

The XDAC-8MUB-R4G8-SMA is connected with DC Power then you can plug into the Device-Under-Test (DUT). The voltage/current can be controlled through GUI or SCPI command via Ethernet/Ethernet to USB port converter.

The system diagram is as follow:

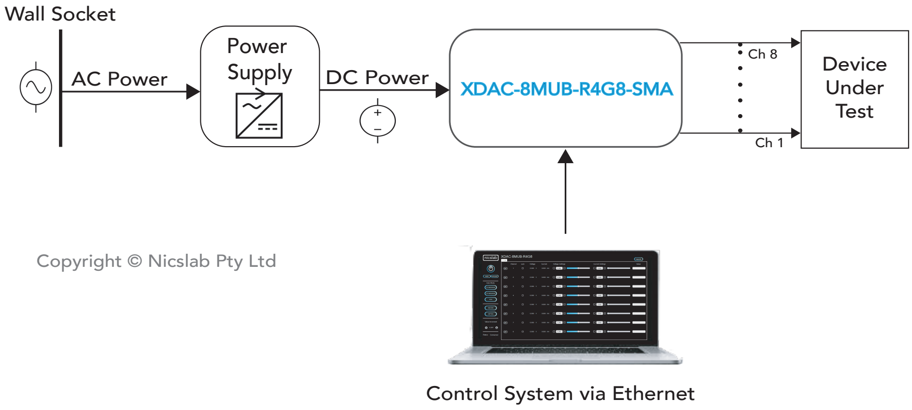


Figure 1. XDAC-8MUB-R4G8-SMA System Diagram

The package should include the following items:

No	Item	Qty (pc)	Checklist
1	XDAC-8MUB-R4G8-SMA Box	1	
2	DC cable (Red, Green, Black)	3	
3	Ethernet cable	1	
4	Ethernet to USB Converter		
5	USB flash disk	1	
6	Inside USB flash disk: a. GUI b. Specification & Manual c. Test Report d. Serial key (Upgrade) e. Software Library (Premium) f. Template Excel (upload, demo sequence)	1	

Table 1. Checklist Items

2. Hardware

Specification Conditions

The operating and measurement conditions are under the following conditions:

Items	Conditions
Room Temperature	0 ~ + 40°C
Humidity	5 ~ 80% (No Condensing)
Power Supply Input	DC Supply Max 38V (potential at red & black DC in). Required headroom 1.4 – 2 V. For example, if you need 12 Volt output per channel then the DC input is minimum 14 V.
Waterproof/Dustproof	To be operated under room condition
Calibration period	2 years

Table 2. Specification Conditions

Hardware Requirement

The requirements for the PC/Laptop to be used for this product installation are:

- Resolution Min. 1024 x 768 pixel
- Hard disk Min. 500 MB of available free space (32-bit and 64-bit operating system)
- USB Port USB 2.0
- RAM Min. 2 GB
- CPU 2.4 GHz or faster
- Ethernet port or internet connection via router.

Box Descriptions

The box size is 106 (W) x 164 (L) x 61.1 (H) mm, as the pictures below:

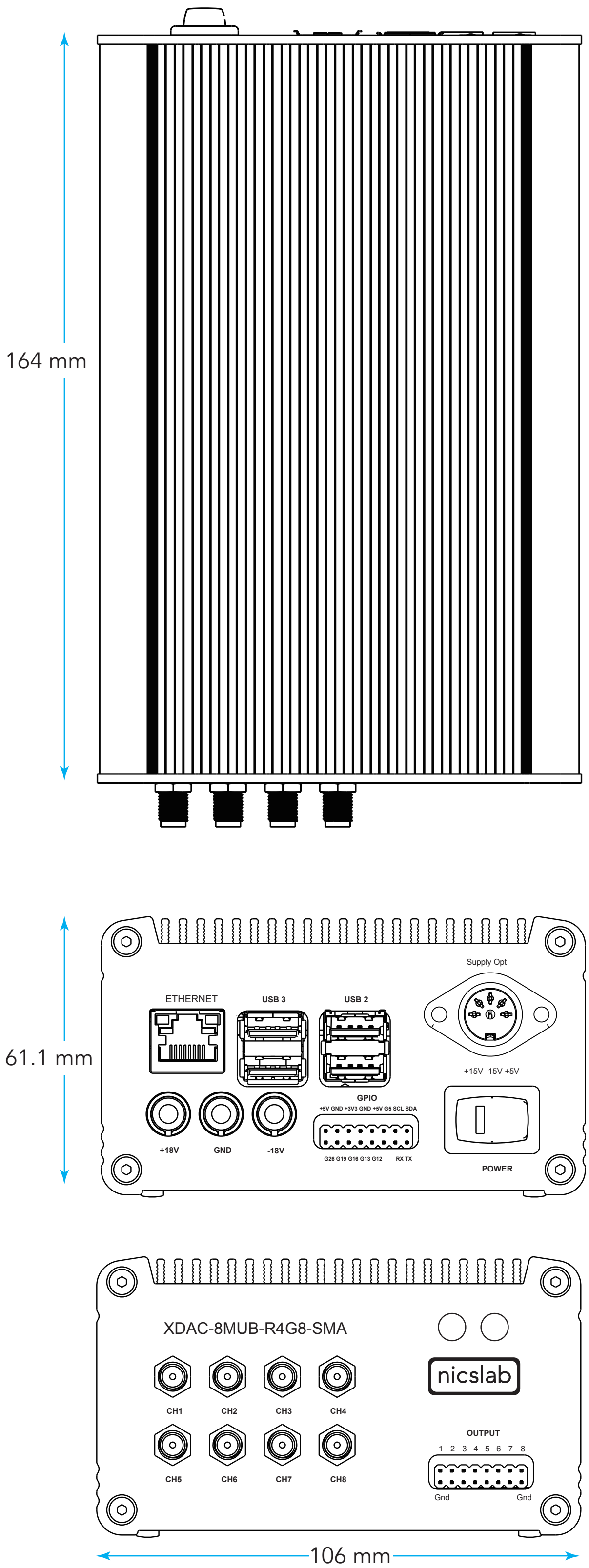


Figure 2. Product Dimension

The details of front and back panel of the box are described below:

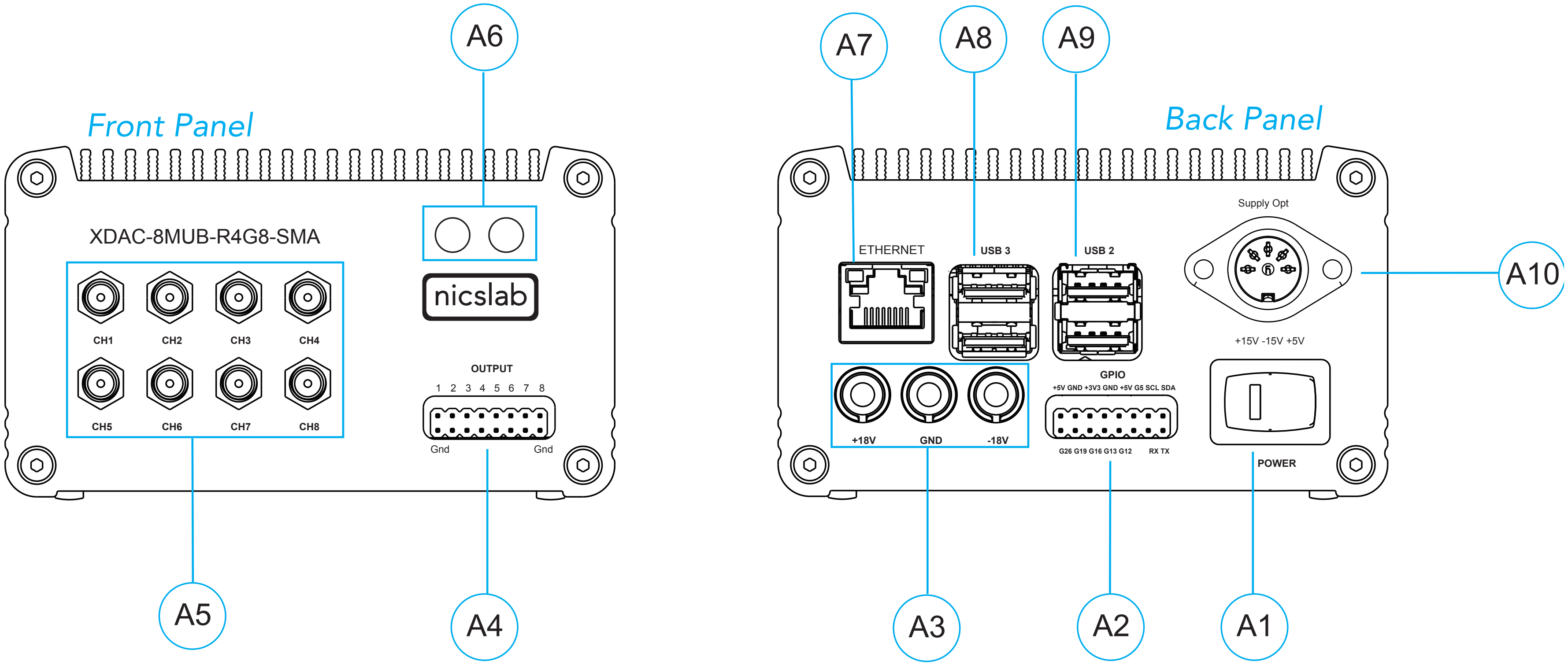


Figure 3. Front and Back Panel

Note:

A1	Power Switch	Turns the instrument on or off. Caution **Before turning OFF** please **close the GUI or type shutdown (SCPI command)** to minimize the risk of corrupting the system file (such as data loss).
A2	GPIO	You may use for external control and monitoring direct to microprocessor.
A3	Input DC Max 36 V	Caution Please follow the safety notice on your DC power supply. **USE ONLY ONE DC POWER SUPPLY** and the input is no more than 36V. Green cable inserts to +18 V **Black** cable inserts to GND Red cable inserts to -18 V
A4	Pin Output (8 channels)	To connect to Device Under Test (DUT) using jumper cable.
A5	SMA Connector	To connect to Device Under Test (DUT) using male connector.
A6	Indicator Light	Green -> Power Indicator. Blue -> Serial Transfer Data Active.
A7	Ethernet port	Use ethernet cable to connect or ethernet to USB port converter also possible to use if the computer doesn't have the ethernet port.
A8	USB 3.0	USB port version 3.0.
A9	USB 2.0	USB port version 2.0.
A10	Supply Opt	Alternative for DC input through off-the-shelf adaptor (+15V, -15V, +5V). This adaptor suitable for low power application with source total power 50 Watt (1.5 A) and sink 500 mA.

XDAC-8MUB-R4G8-SMA Specifications

The performance specifications of Digital Analog Converter (DAC) voltage are listed in the table 3 below:

No	Parameter	Min	Typ	Max	Unit	Test conditions/comments
1	Resolution	16			Bits	
2	Integral nonlinearity (INL)	-1	± 0.5	1	LSB	All ranges, except ±2.5V
3	Differential Nonlinearity (DNL)	-1	± 0.5	1	LSB	Specified 16-bit monotonic
4	Total unadjusted error	-0.1	± 0.01	0.1	%FSR	All ranges except ±2.5V
5	Unipolar offset error	-0.03	± 0.015	0.03	%FSR	All unipolar ranges
6	Unipolar zero-code error	0	0.04	0.1	%FSR	All unipolar ranges
7	Bipolar zero-code error	0	0.04	0.1	%FSR	All bipolar ranges
8	Full-scale error	-0.2	± 0.075	± 0.2	%FSR	All ranges
9	Gain error	-0.1	± 0.02	0.1	%FSR	All ranges except ±2.5V
10	Unipolar offset error drift		±2		ppm of FSR/°C	All unipolar ranges
11	Bipolar offset error drift		±2		ppm of FSR/°C	All bipolar ranges
12	Gain error drift		±2		ppm of FSR/°C	All ranges
13	Output voltage drift over time		5		Ppm of FSR	T_A = 40°C, Full-scale code, 1900 hours
DYNAMIC PERFORMANCE						
14	Output Voltage Settling Time		12		μs	¼ to ¾ and ¾ to ¼ scale setting time to ± 1 LSB, ±10V range, R_L = 5kΩ, C_L = 200pF
15	Slew Rate		4		V/μs	All range except 0 to 5V
16	Power-on glitch magnitude		0.3		V	Power-down to active DAC output, ±20V range, Midscale code, R_L = 5kΩ, C_L = 200pF
17	Output noise		15		μV p-p	0.1Hz to 10Hz, Midscale code, 0 to 5V range
18	Output noise density		78		nV/√Hz	1 kHz, Midscale code, 0 to 5V range
19	AC PSRR		1		LSB/V	Midscale code, frequency = 60Hz, amplitude 200 mVpp superimposed on V_{DD}, V_{CC} or V_{SS}
20	DC PSRR		1		LSB/V	Midscale code, V_{DD} = 5V, V_{CC} = 20V ±5%, V_{SS} = 20V
21	Code change glitch impulse		4		nV-s	1 LSB change around major carrier, 0 to 5V range
22	Channel to Channel AC crosstalk		4		nV-s	0 to 5V range. Measured channel at midscale. Full-scale swing on all other channels.
23	Channel to Channel DC crosstalk		0.25		LSB	0 to 5V range. Measured channel at midscale. All other channels at full-scale.
23	Digital feedthrough		1		nV-s	0 to 5V range, Midscale code, F_{SCLK} = 1MHz

Table 3. DAC Voltage Performance Specification

The performance specifications of current buffer circuit are listed in the table 4 below:

No	Parameter	Min	Typ	Max	Unit	Test conditions/comments
POWER OP AMP CHARACTERISTICS						
1	Input offset voltage		200	600	μV	
				1000	μV	0°C < TA < 70°C
				1300	μV	-40°C < TA < 85°C
2	Input offset voltage drift	-10	-4	10	μV/°C	
3	Input offset current	-100		100	nA	V_{CM} = 0 V
4	Input bias current	-600	-160		nA	V_{CM} = 0 V
5	Input noise voltage		3		$μV_{P-P}$	
6	Input noise voltage density		15		μV/√Hz	
7	Input noise current density		3		pA/√Hz	
8	Input resistance		500			Common mode
			100			Differential mode
9	Input capacitance		6		pF	Pin 8 and Pin 9 to Ground
10	Input voltage range	-14.5		13.6	V	Typical
		-12.0		12.0	V	Guaranteed by CMRR test
11	Common mode rejection ratio	92	105		dB	-12V < V_{CM} < 12V
12	Power supply rejection ratio	90	100		dB	V_{EE} = V- = -5V, V_{CC} = V+ = 3 V to 30 V
		110	130		dB	V_{EE} = V- = -5V, V_{CC} = 30V, V+ = 2.5 V to 30 V
		90	100		dB	V_{EE} = V- = -3V, V_{CC} = V+ = 5 V
		110	130		dB	V_{EE} = -30 V- = -2.5V to -30V, V_{CC} = V+ = 5V
13	Large-signal voltage gain	75			V/mV	R_L = 1K, -12.5V < V_{OUT} < 12.5
		40			V/mV	R_L = 100Ω, -12.5V < V_{OUT} < 12.5V
		5			V/mV	R_L = 10Ω, -5V < V_{OUT} < 5V, V+ = -V- = 8V
14	Output sat voltage low		1.9	2.5	V	V_{OL} = V_{OUT} – V- R_L = 100, V_{CC} = V+ = 15V, V_{EE} = V- = -15V
15	Output sat voltage high		1.7	2.3	V	V_{OH} = V+ – V_{OUT} R_L = 100, V_{CC} = V+ = 15V, V_{EE} = V- = -15V
16	Output short-circuits current	500	800	1200	mA	Output Low, R_{SENSE} = 0Ω
		-1000	-800	-500	mA	Output High, R_{SENSE} = 0Ω
17	Slew rate	0.7	1.6		V/μs	
18	Full power bandwidth	11			kHz	V_{OUT} = $10V_{PEAK}$ (Note 5)
19	Gain bandwidth product		3.6		MHz	f = 10 kHz
20	Settling time		8		μV	0.01%, V_{OUT} = 0V to 10V, AV = -1, R_L = 1K

CURRENT SENSE CHARACTERISTICS						
21	Minimum current sense voltage	0.1		10	mV	$VC_{SRC} = VC_{SNK} = 0V$
22	Current sense voltage 4% of full scale	15	20	25	mV	$VC_{SRC} = VC_{SNK} = 0.5V$
23	Current sense voltage 10% full scale	45	50	55	mV	$VC_{SRC} = VC_{SNK} = 0.5V$
24	Current sense voltage 100% of full scale	480	500	520	mV	$VC_{SRC} = VC_{SNK} = 5V$
25	Current limit control input bias current	-1	-0.2	0.1	µA	VC_{SRC}, VC_{SNK} Pins
26	SENSE- input current	-500		500	nA	$0V < (VC_{SRC}, VC_{SNK}) < 5V$
27	FILTER input current	-500		500	nA	$0V < (VC_{SRC}, VC_{SNK}) < 5V$
28	SENSE+ input current	-500		500	nA	$VC_{SRC} = VC_{SNK} = 0V$
		200	250	300	nA	$VC_{SRC} = 5V$, $VC_{SNK} = 5V$
		-300	-250	-200	nA	$VC_{SRC} = 0V$, $VC_{SNK} = 5V$
		-25		25	nA	$VC_{SRC} = VC_{SNK} = 5V$
29	Current sense change with output voltage		±0.1		%	$VC_{SRC} = VC_{SNK} = 5V$, $-12.5V < V_{OUT} < 12.5V$
30	Current sense change with supply voltage		±0.05		%	$VC_{SRC} = VC_{SNK} = 5V$, $6V < (V_{CC}, V+) < 18V$
			±0.01		%	2.5V < V+ < 18V, VCC = 18V
			±0.05		%	$-18V < (V_{EE}, V-) < -2.5V$
			±0.01		%	$-18V < V- < -2.5V$, $V_{EE} = -18V$
31	Current sense bandwidth		2		MHz	
32	Resistance FILTER to SENSE-	750	1000	1250	Ω	
LOGIC I/O CHARACTERISTICS						
33	Logic output leakage			1	µA	V = 15V
34	Logic low output level		0.2	0.4	V	I = 5mA
35	Logic output current limit		25		mA	
36	Enable logic threshold	0.8	1.9	2.5	V	
37	Enable pin bias current	-1		1	µA	
38	Total supply current		7	13	mA	V_{CC}, V+ and V-, V_{EE} connected
39	V_{CC} supply current		3	7	mA	V_{CC}, V+ and V-, V_{EE} separate
40	Supply current disabled		0.6	1.5	mA	V_{CC}, V+ and V-, V_{EE} connected, V_{ENABLE}
41	Turn-On delay		10		µs	
42	Turn-Off delay		10		µs	

Table 4. Current Limit and Buffer Performance Specification

Hardware Installation

This section describes how to install XDAC-8MUB-R4G8-SMA and how to connect your Device Under Test (DUT) to the output terminals.

The steps are as follow:

1. Precondition step: connect to the DC power supply (max 38 V). Make certain that DC power supply is always 'ON'.
2. Connect an Ethernet cable to your workstation (PC/Laptop) via Ethernet Port or USB 3.0 Ethernet Network Adapter.
3. Install the software/GUI (see the Software Installation section) from the flash disk or Dropbox link.
4. Turn ON the switch (indicator light: Green).
5. Wait until there is Blue light (meaning: the system is ready to use).
6. Double click (open) the GUI.
7. Connect XDAC output to your Device Under Test (DUT).

3. Software and Graphical User Interface (GUI)

Software Requirement

The GUI software is suitable with the following operating systems:

- Windows® 7 (32-bit, 64-bit).
- Windows® 10 (32-bit, 64-bit).

Software Installation

First step is to install the XDAC_setup.exe file into your computer then double click to launch the GUI. The icon is as below:

XDAC_setup.exe

Graphical User Interface (GUI)

The GUI details are on the next page.

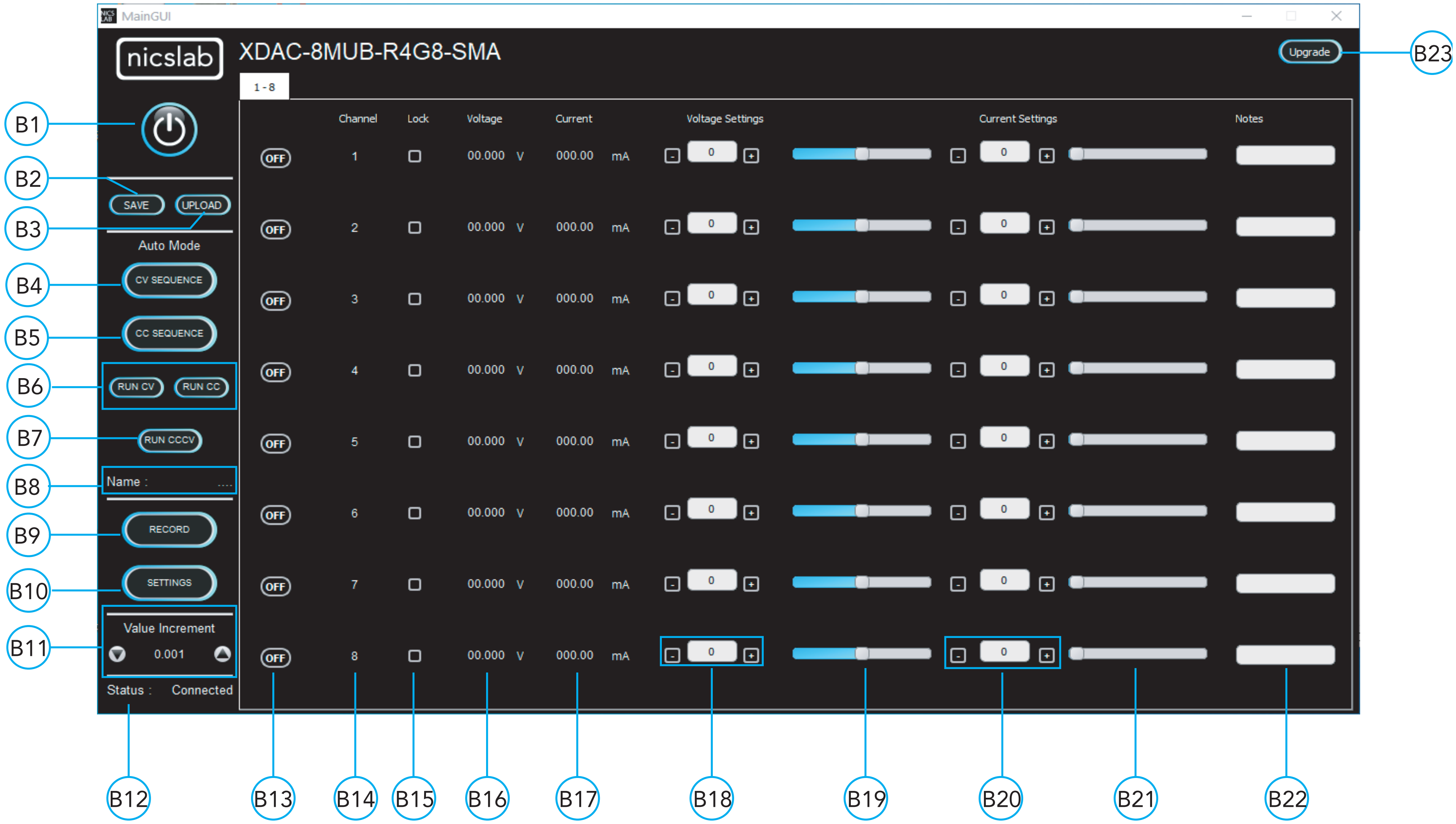

MainGUI
nicslab
XDAC-8MUB-R4G8-SMA
Upgrade
1 - 8
SAVE
UPLOAD
Auto Mode
CV SEQUENCE
CC SEQUENCE
RUN CV
RUN CC
RUN CCCV
Name :
RECORD
SETTINGS
Value Increment
0.001
Status : Connected
Channel
Lock
Voltage
Current
Voltage Settings
Current Settings
Notes
OFF
00.000 V
000.00 mA
B1
B2
B3
B4
B5
B6
B7
B8
B9
B10
B11
B12
B13
B14
B15
B16
B17
B18
B19
B20
B21
B22
B23

Figure 4. GUI

Note:

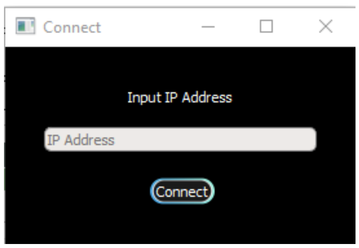
Callout	Description
B1	ON/OFF Switch
B2	Save File Button
B3	Upload File Button
B4	Auto Feature Sequence: Upload Table Button I CV Mode
B5	Auto Feature Sequence: Upload Table Button I CC Mode
B6	Auto Feature: Run Button CV and CC Mode separately
B7	Auto Feature: Run Button CV and CC Mode combined
B8	Name of the Sequence
B9	Record Data Button
B10	Setting for: 1. Set Limit voltage and current values 2. V Range (16-bit precision for every range of voltages: ±2.5, ±5, ±10, ±18 V)
B11	Increment Settings
B12	Status of connection
B13	ON/OFF Button per Channel
B14	Number of channels
B15	Enable/Disable (Lock) Channel Controller
B16	Voltage Value
B17	Current Value
B18	Voltage Value Based on Increment Setting
B19	Voltage Settings Slider
B20	Current Value Based on Increment Setting
B21	Current Settings Slider
B22	Notes
B23	Upgrade Button

Initializing the GUI

This section shows how to initialize the GUI:

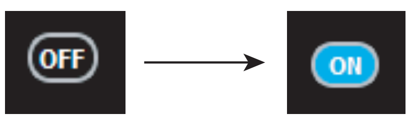
1. Launch the program by double clicking the "XDAC_setup_exe" icon.

2. Enter XDAC IP address as given. If the connection is successful, then the GUI will open and there is the Blue indicator light.



3. Press the 'ON/OFF' button (B1) to start the GUI.

4. Turn ON (B13) on each channel to input voltage and current values.



Constant Current Mode (CC Mode)

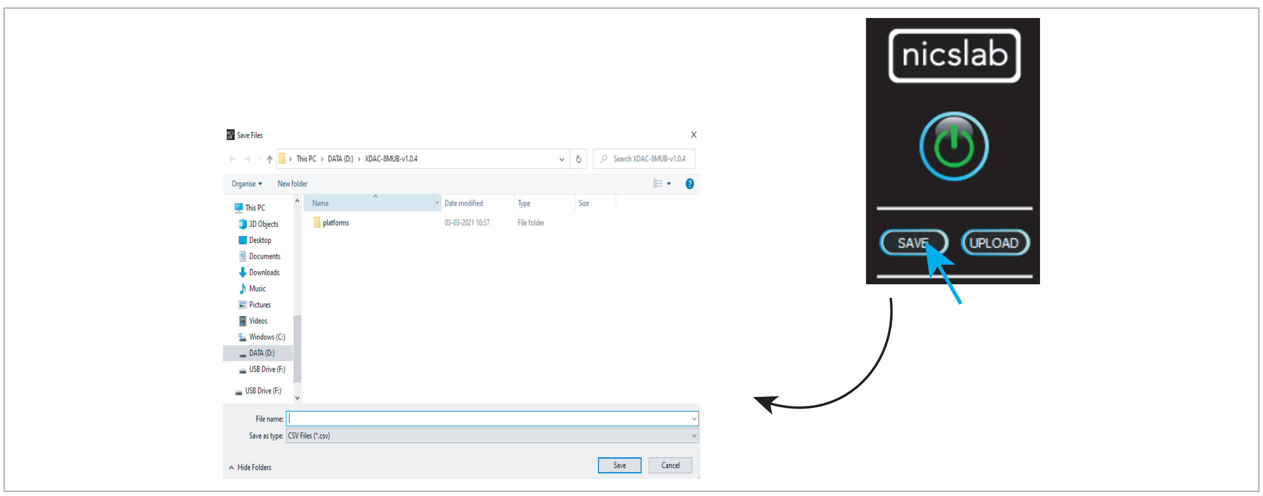
To do CC mode, you have to adjust the voltage value (B18) or move the slider (B19), then set the current value (B20 or B21). As an example, channel 2 in the below picture was given 100 Ω load.

Constant Voltage Mode (CV Mode)

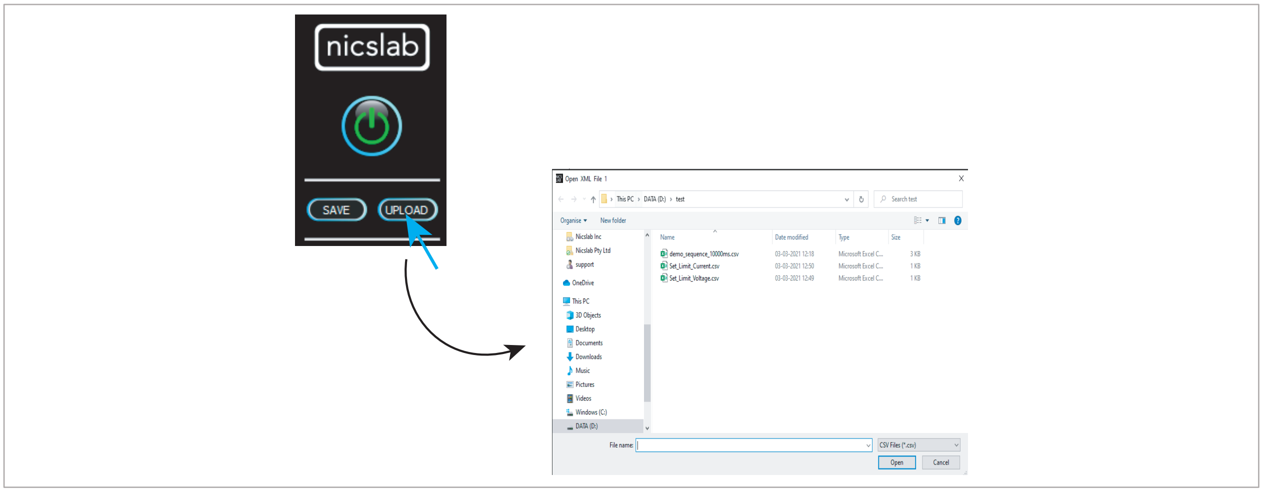
To do CV mode, adjust the values on value settings (B18) or move the voltage slider (B19). You may also adjust the current settings or current slider to maximum value (500 mA).

Save and Upload

You can save all the data in GUI by clicking the 'Save' button and the save file location will open.



You can upload the saved .csv file or your voltage and current setting values (.csv file template provided) by clicking the 'Upload' button.



Auto Mode - Sequence

Sequence is the setting that automates the determined values of current (mA) or voltage (V) given the certain Delay Time (in millisecond).

1. The template of Sequence is given, then you need to input your intended values of CC Sequence (± 500 mA), CV Sequence (± 18 V) and Delay Time (in millisecond). Set the delay time more than 2 seconds to have more accurate values. To have faster response (switching time) you can set via SCPI command.

	A	B	C	D	E	F	G	H	I	J
1		Seq 1	Seq 2	Seq 3	Seq 4	Seq 5	Seq 6	Seq 7	Seq 8	Note
2	Delay Time	6000	5478	4912	3409	4213	5902	6012		
3	Channel 1	5	50	0	100	150	150	0	300	Fan1
4	Channel 2	10	50	0	100	160	150	0	300	Fan2
5	Channel 3	15	50	0	100	170	150	0	300	Motor1
6	Channel 4	20	50	0	100	180	150	0	300	Motor2
7	Channel 5	25	50	0	100	190	150	0	300	Sensor1
8	Channel 6	30	50	0	100	200	150	0	300	Sensor2
9	Channel 7	35	50	0	100	210	150	0	300	Sensor3
10	Channel 8	40	50	0	100	220	150	0	300	Not Used

A

B

Note:

A. Template given for CC and CV sequences.

B. Input your intended values according to the modes (CC: ±500 mA, CV: ±18 V).

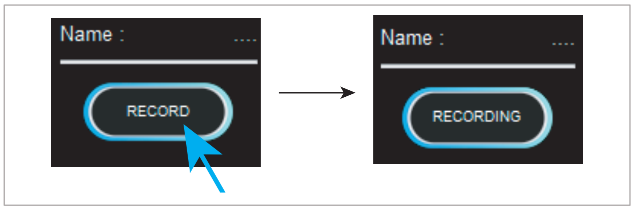
2. Upload the .csv file of sequence by pressing CC Sequence (for CC Mode) and CV Sequence (for CV Mode).

3. After uploading, choose sequence mode by clicking either 'Run CV' (B6 - Mode for CV sequence), 'Run CC' (B6 - Mode for CC sequence), or 'Run CCCV' (B7 – Mode for both CC and CV sequences).

Important note: when 'Run CCCV' use the same delay time on the template .csv of CC and CV sequence.

Record

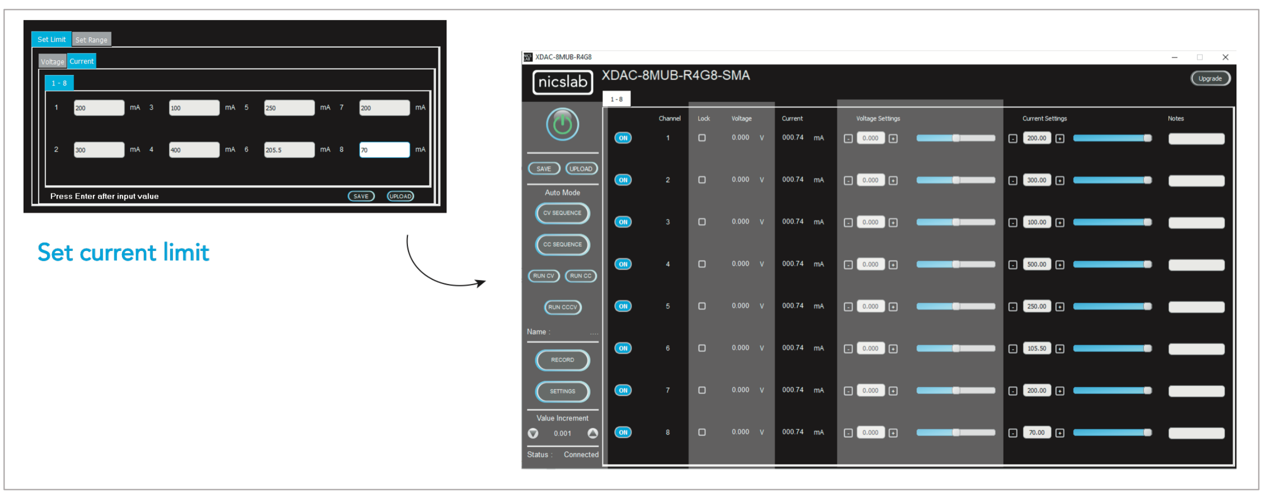
'Record' (B9) keeps data of voltage and current values. The record starts by the time you click the Record button and finish until you click again the same button. The Excel file (.csv) will be created automatically in the same folder as XDAC's GUI file.

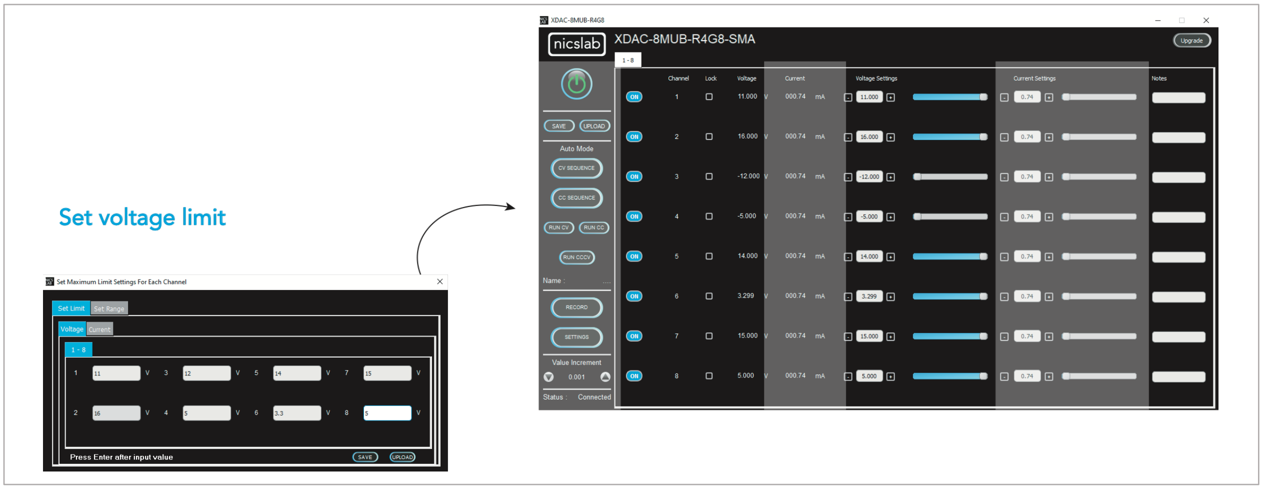


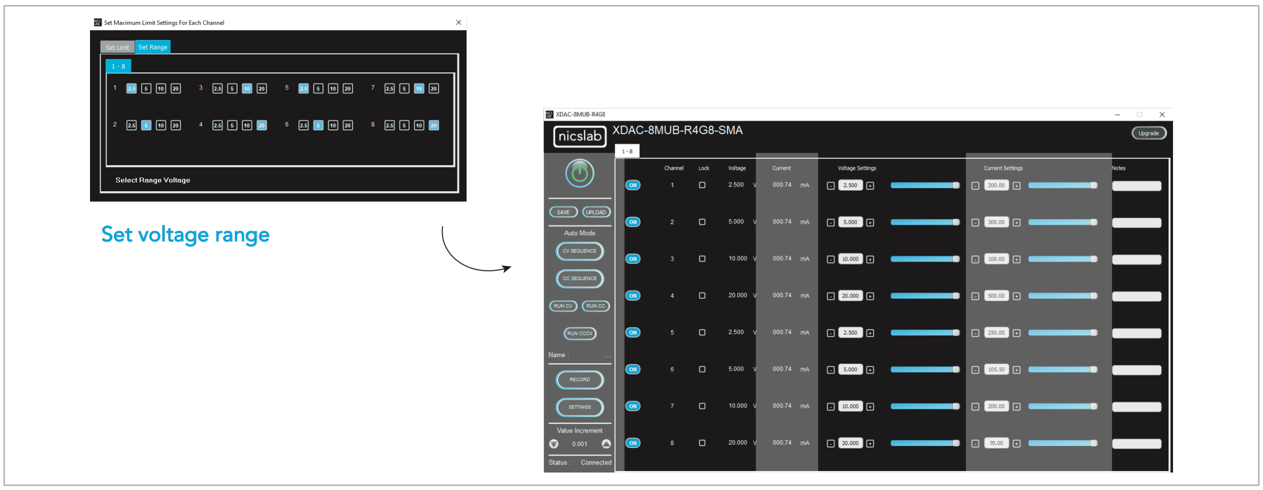
Settings

The 'Settings' feature consists of:

- set maximum limit for both current and/or voltage values
- set range for voltage values where you can choose the voltage range to limit the voltage values (B16, B18, and B19), the range of voltages are ±2.5 V, ±5 V, ±10 V, and ±20 V. Each range has 16-bit precision.

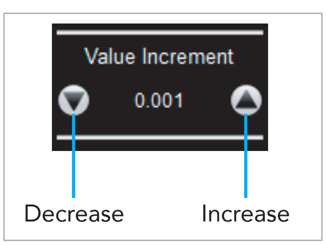






Value Increment Setting

In this setting, the value of the voltage and current can be incrementally changed from minimum 0.001 to 1. Adjust the arrow to increase and decrease the value increment (B11).



4. Operating XDAC through SCPI command

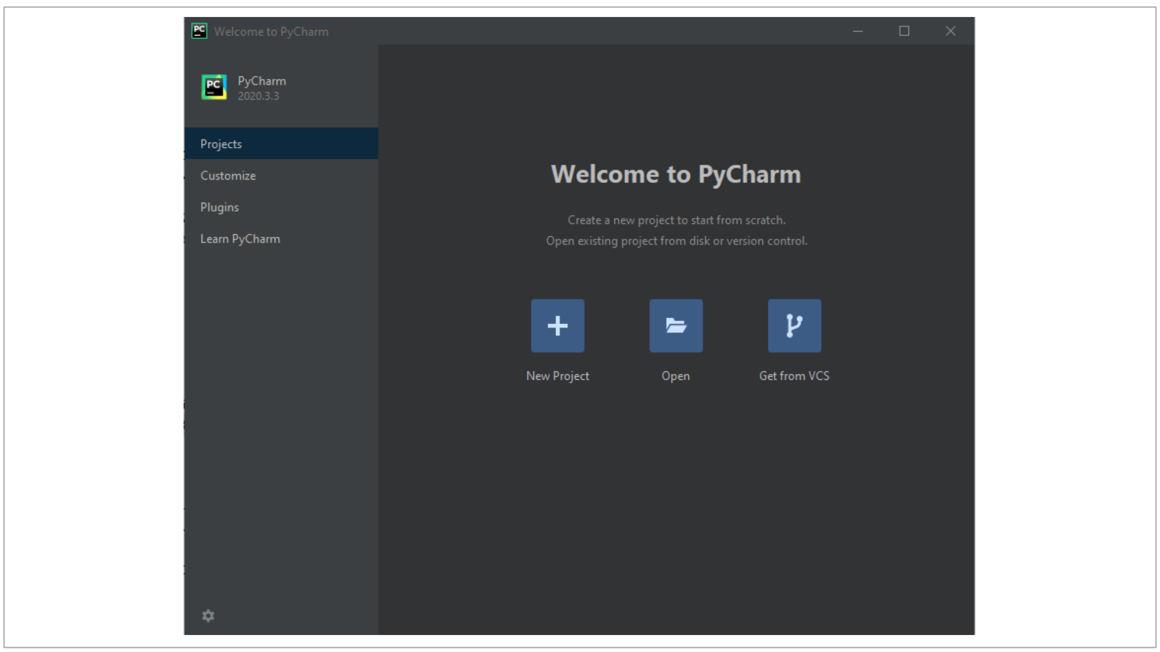
This section set guidelines to help you develop program for any language suits you best. As an example, we give the Python example.

Python Installation (Example)

Please follow steps below for dynamic programming using SCPI command through Python via TCP/IP.

The following Python and packages need to be installed:

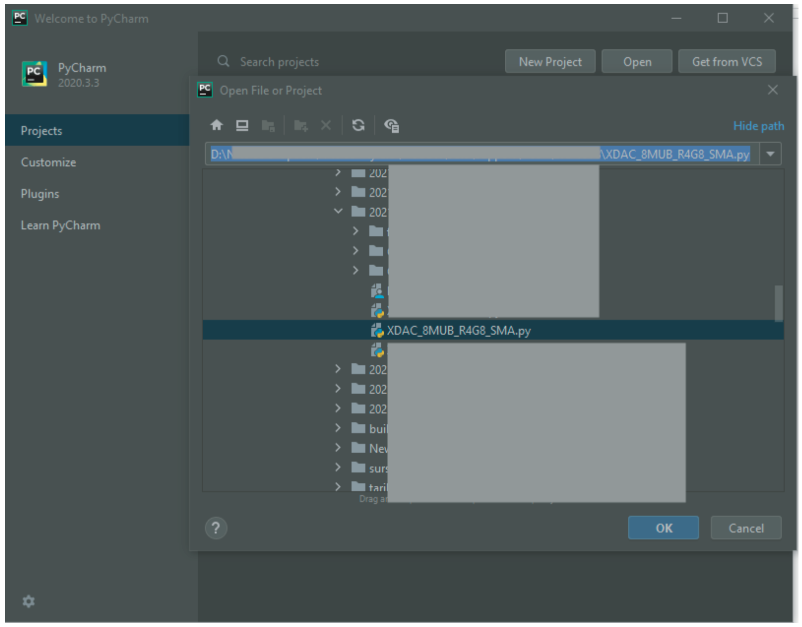
1. Python 2.7 or Python 3.X (download and install the latest version from www.python.org). *Tested with Python 3.9.
2. PyCharm 2017.3.4 or the latest version (download and install the latest version from https://www.jetbrains.com/pycharm/)



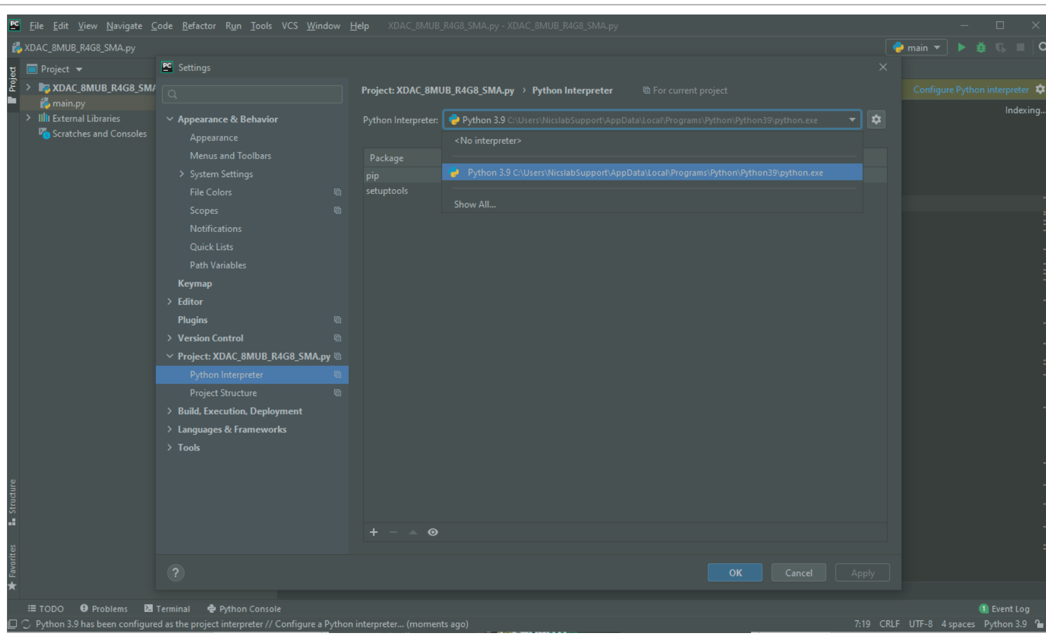
Run Python Code (Example)

To run the Python code please follow the steps below:

1. Open PyCharm software and open file example (e.g XDAC-8MUB-R4G8-SMA.py)



2. Configure Python interpreter (see figure below) by clicking Configure Python Interpreter link on the drop-down menu, or in File >> Settings >> Project Interpreter.

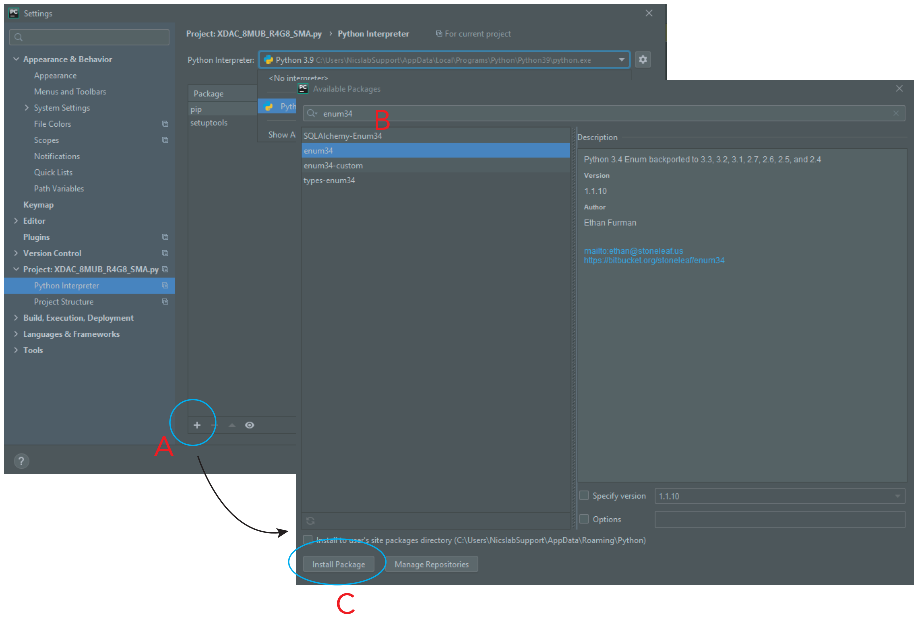


3. Install additional packages, for example: enum34, by:

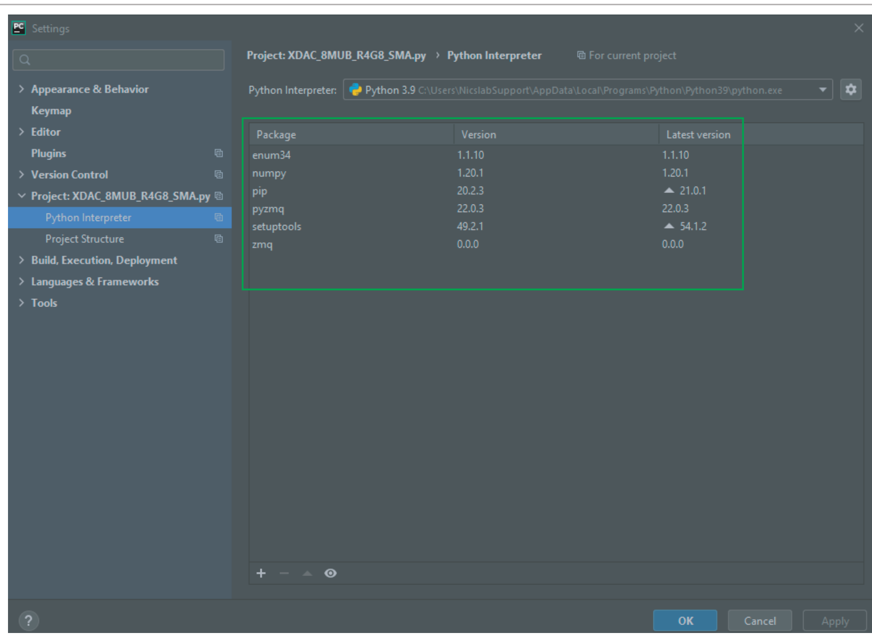
   A. clicking '+' button

   B. search and choose enum34

   C. install all the packages.



4. The packages for the Python Interpreter are listed in the green rectangle.



5. Select Python Configuration and choose the file name.

6. Run the file by clicking the green arrow button on the top right corner to test the XDAC (Please refer to the code and SCPI commands references).

Python Function (Example)

1. Set Voltage for single channel

   setChannelVoltage(channel, voltageVal)

   channel (int): channel number

   voltageVal (float): -20 – 20 V

2. Set Current for single channel

   setChannelCurrent(channel, currentVal)

   channel (int): channel number

   currentVal (float): 0 - 500 mA

3. Set for all channels

   setVoltageAllChannels(AllVValues)

   AllVValues (float array): voltage values in array (V)

   setCurrentAllChannels(AllCValues)

   AllCValues (float array): current values in array (mA)

   Example:

   AllCValues = [100, 150, 100, 50, 200, 10, 10]

   AllVValues = [20.1, 2.5, 13.0, 4, 5, 10.5, 9.5, 22]

4. Set OFF for single channel

   setOff(channel)

   channel (int): channel number

5. Get Current Offset for all channels

   getCurrentOffset(numAverage)

   numAverage (int): number of reading to be average

   return list of current offset

6. Read real-time value for all channels

   readAllChannelVoltage()

   Return list of voltage from all channels

   readAllChannelCurrent(currentOffset)

   currentOffset(list): list of current offset

   Return list of voltage from all channels

7. Shutdown

   shutdown ()

SCPI Commands

The XPOW can be controlled using Standard Commands for Programmable Instruments (SCPI).

Description: Set output voltage for single channel

Format:

SETV:CHANNEL:VOLT

Example 1: Set output of channel 1 to 20 V.

SETV:1:20

Example 2: Set output of channel 3 to -12.5 V.

SETV:3:-12.5

Description: Set output current for single channel

Format:

SETV:CHANNEL:CURRENT

Example 1: Set output of channel 1 to 500 mA.

SETC:1:500

Example 2: Set output of channel 3 to 50 mA.

SETC:3:50

Description: Set zero voltage for single channel

Format:

ZERO:CHANNEL

example: Set zero of channel 1

ZERO:1

Description: Shutdown System

Format:

EXIT

5. Troubleshooting

Please use the following guidelines to identify particular problem. If the solution does not rectify the problem, contact us at support@nicslab.com.

Problem	Cause	Solution
Failed to connect at GUI	The DC power supply is OFF	Turn ON the DC power supply and switch ON the power
Failed to connect at GUI	The switch power is OFF	Switch ON the power
Failed to connect at GUI	No Green light (XDAC system is not ready)	Restart the system by pressing 'Reset' button and wait until the Green lights ON
Failed to connect at GUI	No Blue light (no data transfer)	Restart the GUI
Blue light offs when software active or software freeze	Initialization failed	Restart the software / unplug - plug USB/Ethernet connector/Press Reset Button
No channel output detected at device under test	Connection failed	Check metal pad check point to intended channel
Unable to upload the file	File format problem	Make sure the file format is .csv
No value after upload the file	File problem	Check the file content, make sure there is no blank space on each row.
Unable to use Auto Mode feature	File format problem	Check file format should be csv file. Check content format

Table 5. Troubleshooting

6. Warranty

Nicslab warrants the hardware and software designed by Nicslab to work accordingly, fulfilling the highest standard of quality product. Nicslab is not liable for consequential or incidental damages or for errors in subject to misuse, neglect, accident, modification, use in critical operation, or has been soldered or altered in any way outside stated by us or unauthorized maintenance.

Nicslab retains to change the material and technical data of this manual at any time without notice, in future editions.

Please do not hesitate to contact us at support@nicslab.com if you would like to have more information on warranty or return and refund policy.

7. Contact

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