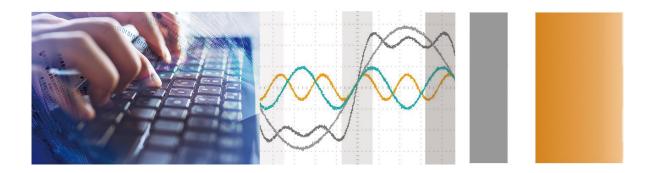
VDS6000 Series PC Oscilloscopes (VDS6102/A, VDS6102P)

User Manual



Продажа измерительных приборов и инструмента: ТОО «МЕСС-ЭЛЕКТРОНИК» Адрес: 050009, Республика Казахстан, Алмалинский район, г. Алматы, улица Толе би, сооружение 202а Тел. +7 701 126 0577 E-mail: info@mess-electronic.kz https://mess-electronic.kz/ Copyright © Lilliput. All rights reserved. Licensed software products are owned by Lilliput or its subsidiaries or suppliers, and are protected by national copyright laws and international treaty provisions.

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Contacting Lilliput

Fujian Lilliput Optoelectronics Technology Co., Ltd. No. 19, Heming Road Lantian Industrial Zone, Zhangzhou 363005 P.R. China

Warranty

Thanks for choosing OWON product, in the coming days, really hope you will enjoy the time that OWON product accompanies you.

OWON product, created and made by Lilliput.

Since the delivery date, OWON product been granted 36 natural months' warranty for device, and 12 months' warranty for attached parts / accessories.

* The delivery date here means the one written onto formal shipping documents given to first-hand buying party.

Within warranty period of OWON product, provided any non-outside force defects appear, Lilliput provides 3 options for first-hand buying party -

option 1. to return the defective product only; option 2. to replace the defective product; option 3. to repair the defective product.

To assure the timely service within warranty period of OWON product, the first-hand buying party should notify Lilliput of the non-outside force defects in no time, in written form.

Lilliput recommends OWON product user(s) to register your product online via "Support & Service" column from official English website <u>https://mess-electronic.kz/</u>, to get timely after-sales service.

This warranty shall not apply to any defect, damage caused by improper operation, or improper / inadequate maintenance towards OWON product. Lilliput shall not be obligated to under this warranty -

a). repair damages resulted from attempts by personnel other than those from Lilliput, or authorized one by Lilliput to repair or service OWON product;

b). repair damages resulted from improper operation, or improper connection to incompatible equipment towards OWON product;

c). service OWON product that has been modified or integrated with other products, provided the effect of such modification or integration increases the difficulty of servicing non-original OWON product.

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Table of Contents

I. General Safety Requirements	5
II. Safety Terms and Signs	6
III. PC Configuration Requirements	9
IV. Communication Interface Introduction	0
V. How to Communicate the Device with PC	1
i. software installation solution	1
ii. to install NI-VISA driver	1
iii. to install PC Software	8
iv. to work PC Software	8
v. to communicate the device with PC	8
VI. Operation Interface of PC Software	9
VII. Device Operation	2
i. how to set the probe compensation	2
ii. how to set the vertical system from PC software	2
iii. how to set the horizontal system from PC software 2	4
iv. how to set the trigger system from PC software 2	4
v. how to set channel from PC software	7
vi. how to use automatic measurement2	9
vii. how to set sampling mode	1
viii. how to set built-in function generator	
ix. how to use cursor measurement	4
x. how to set the display system	6
xi. how to change utility setting	8
xii. how to use main action button	9
xiii. how to use socket connection	0
xiv. how to use LAN communication interface	3
xv. how to work WiFi with PC software5	2
VIII. Technical Specifications	9
IX. Appendix	4
Appendix A. Device Accessory List	4
Appendix B. Device Maintenance	5

I. General Safety Requirements

! Before using the device, Lilliput strongly recommend to browse "**Safety Warnings**" carefully and completely, so as to avoid any possible human body injury, or any damages to the device, or its accessories, or communicating facility. !

Safety Warnings

i. The device only been allowed to work within specified application scenario.

ii. Before communicating the device with PC, please refer to user manual to familiarize the allowed rating value completely.

iii. Making sure the allowed rating value of all terminals been well-followed, so as to avoid any potential short circuit or electric shock.

iv. NO direct human body touch with any naked conductor of device when working the device. The naked conductor covers joints, connecting probe tip, communication interface, and others.

v. No further operation is allowed provided any undetermined failure appears when working the device, better to seek the assistance of qualified technicians.

vi. DO NOT work the device in humid environment.

vii. DO NOT work the device in the explosive atmospheres.

viii. Keep the device in good ventilation environment, and always keep the device surface clean and dry.

ix. Better to send the device to qualified technicians for necessary maintenance.

II. Safety Terms and Signs

Safety Terms

Terms in this user manual. It covers,



Warning which indicates the condition or the operation may cause body injury or permanent life loss.



Caution which indicates the condition or the operation may cause device damage, or its accessory damage, or communicated facility damage.

Terms on the device. It covers,

Danger	which indicates the operation may result in the immediate human body injury.
Warning	which indicates the operation may result in potential human body injury.
Caution	which indicates the operation may result in potential damage to the device, or its accessory, or communicating facility.

Safety Signs

Signs on the device. It covers,



Hazardous Voltage



(please refer to user manual for further details)



Protective Earth Terminal



Chassis Ground



Communication Interface Ground

To avoid possible human body injury, and / or device damage, and / or its accessory or communicating facility damage, before working the device, Lilliput strongly recommend to read the following safety information,

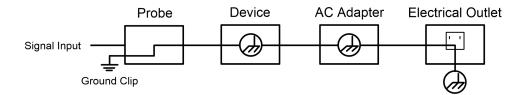
▲ Warning

To avoid any potential short circuit or electric shock, DO use the power adapter of original local standard, or recommended by Lilliput.

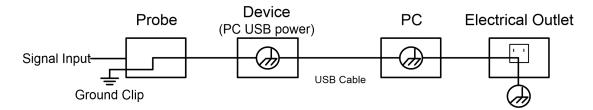
Marning

The channels of the device is non-isolated electrically. When working the device, to avoid possible short circuit, the ground of two probes are NOT allowed to connect to 2 different non-isolated DC level.

The illustration of the device's built-in ground wire connection -



When the device communicating with PC via USB communication interface (with PC powered by AC power source), the illustration of the ground wire connection -



It is NOT allowed to measure AC power when the device been powered by AC power source through the adapter, or when the device powered by PC through USB connection cable (via USB communication interface of PC, with PC powered by AC power source).

Marning

When the device input is getting through the voltage larger than 42 Vp-p (30Vrms), or on circuit of 4800+VA, to avoid any potential short circuit or electric shock -

i. DO use probes and adapter come along with the original device, or those ones recommended by Lilliput.

ii. Before working the device, DO check probes and accessories carefully to see whether any mechanical damages exists, making sure probes and accessories in normal-working status.

iii. When device in non-working condition, to remove probes and accessories firstly, then put them in suitable places.

iv. When working the device in CAT II environment,

DO NOT get the 40+ V input voltage from earth surface through any non-isolated input;

DO NOT get the 40+ V input voltage of dropout voltage through any non-isolated input

v. DO NOT input the voltage larger than the rated one, especially when probe attenuation set in 1:1, since the voltage from probe tip will go through to the device itself.

vi. NO NOT contact the exposed part of metal BNC terminal directly by hand or any other human body part.

vii. DO NOT insert any metal object into connectors.

- Note -

i). The rated voltage mentioned in point v. is the fixed value of working voltage, matching VACrms / 50 - 60Hz under AC sine wave application, and VDC under DC sine wave application;

ii). CAT II indicates local level for electrical appliance and portable device.

III. PC Configuration Requirements

Minimum System Requirement

CPU:Pentium® 4/ 2.4 GHzInternal Memory:1GBEffective Hard Disk Space:1GB

Recommended System Requirement

CPU:Pentium® Dual-Core/ 2.4 GHzInternal Memory:2GBEffective Hard Disk Space:2GB

Other Requirement

Operating System:	Windows 11, or Windows 10 /
	8 / 7 / Vista / XP (32-bit, or
	64-bit)
	macOS 10.15.x / 10.14.x /
	10.13.x
Communication Interface:	USB 2.0, or USB1.1; LAN
LCD Resolution:	1024 x 768, or above

IV. Communication Interface Introduction



Figue IV-1. Communication Interface of the Device

- 1. power input: for AC-DC adapter
- 2. USB host: for Wi-Fi extension

3. USB device (type-C): for PC communication

Note: when the device powered by PC through USB connection cable (via USB communication interface of PC, with PC powered by AC power source), without adapter connection, the input current should reach 1.5A or above

- 4. LAN: for PC communication within network
- 5. Built-in Signal (3.3 V/1 kHz) Output: for probe compensation
- 6. MULTI: for signal output of function generator
- 7. CH2: for signal input
- 8. CH1: for signal input

V. How to Communicate the Device with PC

to communicate the device with PC, it's a must to install software firstly.

i. software installation solution

i). full installation

Target user(s): general PC oscilloscope user(s), and programmer(s) gets secondary development need

Installation process -

• On the basis that NI-VISA driver or similar VISA driver already worked normally onto PC, to install "VDS6000Series_PC_Software.exe" from accompanying CD which comes along with device.

• Provided no proper VISA driver found onto target PC, as first step, to install "ni-visa_19.5_online_repack.exe*" from accompanying CD which comes along with device.

*. This .exe file will instruct the user(s) to download NI-VISA driver, and the user(s) could choose necessary NI package kit in the process as well.

The second step is to run "VDS6000Series_PC_Software.exe".

Note: According to the user preferences, different version NI-VSA available via -

visit <u>www.ni.com</u> through web browser, type "NI-VISA" onto search column, click NI-VISA Download web linkage from searching results, in accordance with the PC operation system and its version, to choose preferred suitable NI-VISA version.

ii). simple installation

Target user(s): general PC oscilloscope user(s)

Installation process -

To install Runtime version NI-VISA driver from accompanying CD which comes along with device firstly, after that, to run "VDS6000Series_PC_Software.exe".

iii). minimum installation

Target user(s): PC oscilloscope user(s) who only need to communicate the device with PC via direct network cable (no requirements for USB communication)

Installation process -

To run "VDS6000Series_PC_Software.exe" from accompanying CD which comes along with device directly.

Note: The users could refer to <u>xiii.how to use socket connection</u> for "when the device communicates with PC by direct network cable".

ii. to install NI-VISA driver

To assure PC software running normally, and smoothly, it is a must to install NI-VISA driver firstly.

Note: On condition that NI-VISA driver, or similar VISA driver already worked normally onto the target PC, step ii could be skipped.

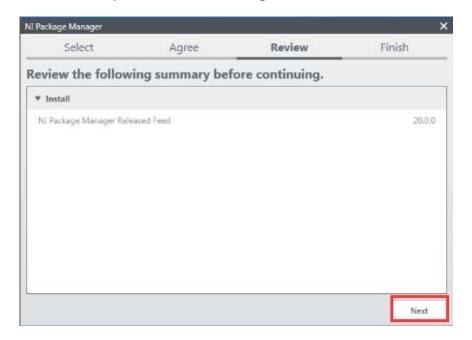
To run **N**ni-visa_19.5_online_repack.exe from accompanying CD which comes along with device, to start NI-VISA driver installation,



click "Yes" to continue, and following window comes,

NI Package Manager			×
Select	Agree	Review	Finish
You must accept	the license agreem	ents below to pro	oceed.
NI			
NATIONA	L INSTRUMENTS SO	OFTWARE LICENSE	AGREEMENT
THE SOFTWARE AND/OI PROCESS, YOU AGREE WISH TO BECOME A CONDITIONS, DO NOT IN ACCOMPANYING WRITT RECEIPT. ALL RETURNS are accepting these terms these terms.	SOFTWARE LICENSE AG R CLICKING THE APPLICAL TO BE BOUND BY THE PARTY TO THIS AGREE ISTALL OR USE THE SOFT EN MATERIALS AND THEI TO NI WILL BE SUBJECT is on behalf of an entity, you ent apply to the computer so	BLE BUTTON TO COMPLE TERMS OF THIS AGREEM MENT AND BE BOUND WARE, AND RETURN THE R CONTAINERS) WITHIN TO NI'S THEN-CURRENT F agree that you have autho	TE THE INSTALLATION IENT. IF YOU DO NOT BY ITS TERMS AND SOFTWARE (WITH ALL THIRTY (30) DAYS OF RETURN POLICY. If you writy to bind the entity to
This license agreement app	blies to the following package	es: NI Package Manager	
L		I accept t	he above license agreement.
		⊙ I do not a	ccept the license agreement.
			Next

dot-tick "I accept the above license agreement", then "Next",



another "Next", to enter into NI Package Manager processing window,

Select	Agree	Review	Finish
	5		
n NI Package Mana	ger Deployment Support		
y na rackaye Walla	ger behröment subbolt		

then this window,



later, when following window appears,

Installing NI-VISA			×
Select	Agree	Review	Finish
Additional items yo	ou may wish to i	nstall:	
		lways trust software from NI. for installers that have a valic	
NI I/O Trace Debugging utility for mo	nitoring function calls to	various National Instruments	APIs.
NI PXI Platform Services NI PXI Platform Services specifications, and suppl	Runtime supports NI PXI	Chassis and Controllers, imple er NI products.	ements the PXI
NI-VISA .NET Developme Installs the local assembl specified by the IVI Foun	y for development of NI-	VISA applications using the st	andard .NET API
NI-VISA .NET Runtime Enables you to run applie	ations that use the NI-VI	SA .NET API.	
NI-VISA C Examples Provides examples for pr	ogramming using the C /	API.	T
Select All Deselect A	i j		Next

to select additional items you may wish to install,

Installing NI-VISA			×
Select	Agree	Review	Finish
Additional items y	ou may wish to i	nstall:	
NI-VISA .NET Runtime Enables you to run app	lications that use the NI-VI	SA .NET API.	*
NI-VISA C Examples Provides examples for	programming using the C A	API.	
NI-VISA Configuration Provides support for vi		II-VISA resources in NI MAX.	
NI-VISA Driver Develop Provides the NI-VISA D		for creating INF files for PXI a	nd USB.
NI-VISA Interactive Co Provides the NI-VISA In		interact and communicate wit	th NI-VISA resources.
NI-VISA LabWindows/ Provides examples for	CVI Examples programming in LabWindo	ws/CVI.	
NI-VISA LabWindows/ Provides development	CVI Support files for programming in La	bWindows/CVI.	
NI-VISA Server Provides remote acces	s to resources on the currer	nt machine.	Ļ
Select All Deselect	All		Next

via scroll bar, to select more necessary options,

from here,

Select	Agree	Review	Finish
ou must accept	t the license agreen	ents below to pro	ceed.
NI IVI			
NATION	AL INSTRUMENTS SO	OFTWARE LICENSE	AGREEMENT
PROCESS, YOU AGRE WISH TO BECOME A CONDITIONS, DO NOT ACCOMPANYING WRIT RECEIPT. ALL RETURN	OR CLICKING THE APPLICAI E TO BE BOUND BY THE ' A PARTY TO THIS AGREE INSTALL OR USE THE SOFT ITEN MATERIALS AND THEI IS TO NI WILL BE SUBJECT ms on behalf of an entity, you ment apply to the computer so	TERMS OF THIS AGREEM MENT AND BE BOUND WARE, AND RETURN THE S R CONTAINERS) WITHIN TO NI'S THEN-CURRENT R agree that you have author	ENT. IF YOU DO NOT BY ITS TERMS AND SOFTWARE (WITH ALL THIRTY (30) DAYS OF ETURN POLICY. If you rity to bind the entity to
	pplies to the following package	es: NI Update Service, LabVIE	W Runtime (32-bit), NI-
This license agreement ap	pplies to the following package		W Runtime (32-bit), NI- oove 2 license agreements

dot-tick "I accept the above 2 license agreements", again "Next",

until this window,

installing NI-VISA		11	×
Select	Agree	Review	Finish
You must accept t	ne license agreen	nents below to pro	oceed.
Microsoft Silverlight 5	Microsoft Silverlight 5.1	L	
MICROSOFT SOFTWARE	LICENSE TERMS		
MICROSOFT SILVERLIGH	HT 5		
versions, and successor • supplements, • Internet-based serv • support services	s to the software, collectiv rices, and		
This license agreement appli	es to the following packag	and the second se	
		I accept the all	bove 2 license agreements.
		◯ I do not accep	ot all the license agreements.
Back			Next

dot-tick "I accept the above 2 license agreements" for another time, and another "Next",

to welcome "Review" window,

Select	Agree	Review	Finish	
Review the following summary before continuing.				
▼ Install				
LabVIEW Runtime (32-bit NI Update Service NI-VISA NI Certificates Installer NI Measurement & Autor NI System Configuration NI System Configuration NI-VISA Configuration Su NI-VISA Runtime	mation Explorer .NET Runtime Runtime		2019 19.0.0 19.5.0 20.2 19.5.0 19.5.0 19.5.0 19.5.0	
Back			Next	

via "Next",

to get access to NI-VISA installation,

installing NI-VISA			×
Select	Agree	Review	Finish
Installing NI EULADepot			
			Next

one more "Next",

to make your decision at this window,

	NATIONAL INSTRUMENTS
Do you want to participate in the National Instruments Custom	er Experience Improvement Program?
By joining the National Instruments (NI) Customer Experience Improvement data related to your use of our products, you can help our engineers improve products. This information will not be used to identify or contact you, or share and the state of t	ve the performance and capabilities of our
Read the online NI Customer Experience Improvement Program Privac	y Policy
Yes, I want to participate in the NI Customer Experience Improvement	nt Program
No, I do not want to participate in the NI Customer Experience Impro	ovement Program

then press "Ok" to finish the whole process,

this window indicates the successful installation,

Select Agree Review Finish Reboot to complete operation. Image: Complete operation Image: Complete operation
A reboot is needed in order to complete the operation.

to reboot the PC through mouse-clicking "Reboot Now"

After PC restarts, the NI-VISA driver been installed onto target PC successfully.

iii. to install PC Software

To run "VDS6000Series_PC_Software.exe" from accompanying CD which comes along with device directly, to install PC software accordingly.

iv. to work PC Software

Via short-cut to PC software from the desktop of target PC, double-click "VDS6000 Series PC DSO" to start the software.

v. to communicate the device with PC

The user(s) gets 2 options to communicate the device with PC: through USB communication port, or through LAN port.

to communicate the device with PC through USB communication port

After powering the device via AC-DC adapter, its status indicator lights red for seconds.

Via USB connection cable (type-C), through matching communication interface, to connect the device with PC. When the status indicator lights green, PC software detects effective USB port, mouse-click the detected option to communicate the device with PC.

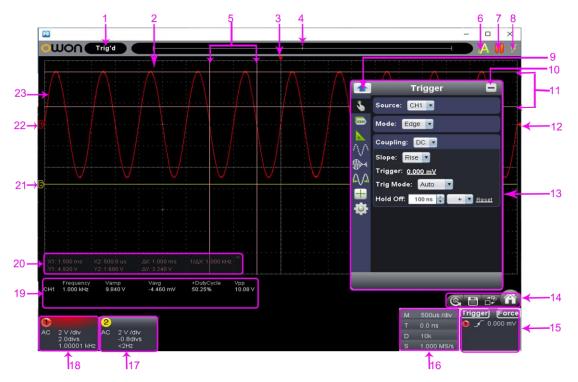


to communicate the device with PC through LAN port

2 solutions available to communicate the device with PC through LAN port -Solution 1. By socket connection, upon with the combination of IP address and port, please refer to <u>xiii. how to use socket connection</u> from VII. Device Operation.

Solution 2. By adding LAN/LXI network device, please refer to <u>xiv. how to use LAN communication</u> <u>interface</u> from VII. Device Operation, and <u>xv. how to work WiFi with PC software</u> from VII. Device Operation.

VI. Operation Interface of PC Software



- 1. Status Indicating Area: please refer to "Status Details List"
- 2. Main Display Area
- 3. Red Pointer: to indicate the horizontal position of one conditioned trigger
- 4. Violet Pointer: to indicate the trigger position in the recorded data
- 5. Time Range measured by certain cursor measurement
- 6. Auto Set: please refer to xii. how to use main action button
- 7. Run/Stop: please refer to xii. how to use main action button
- 8. Single Trigger: please refer to xii. how to use main action button
- 9. Back to Home of Function Menu
- 10. Hide the current menu
- 11. Voltage Range measured by certain cursor measurement
- 12. Red Pointer: the trigger level position of Channel 1; Yellow Pointer: the trigger level of Channel 2.

Via dragging Red / Yellow Pointer upwards or downwards, to adjust the trigger level position of Channel 1 / 2.

13.

Function Menu: to hide/show it via mouse-clicking 0 ; each side-bar icon matches corresponding function, please refer to Home of Function Menu for details -





14. Shortcut to back to default factory settings, please refer to "Default";

Shortcut to export signal data, please refer to "Pause & Export";

Shortcut to switch between 3-window / 1-window VIEW. When working in 3-window VIEW, the upper-left window is for XY mode.

Shortcut to hide/show Function Menu

- 15. Trigger extension window, please refer to iv. how to set the trigger system from PC software
- 16. Sample and Period extension window, please refer to iii. how to set the horizontal system from PC software
- 17. Channel extension window for Channel 2, please refer to ii. how to set the vertical system from PC software
- 18. Channel extension window for Channel 1, please refer to ii. how to set the vertical system from PC software
- 19 Measurement Details extension window for Channel 1 and Channel 2. please refer to vi. how to use automatic measurement
- 20. Cursor Measurement extension window, please refer to ix. how to use cursor measurement
- 21. Yellow Pointer: to show the grounding base point (zero point) of Channel 2; provided no Yellow Pointer comes, it means Channel 2 is off.
- 22. Red Pointer: to show the grounding base point (zero point) of Channel 1; provided no Red Pointer comes, it means Channel 1 is off.
- 23. The Displayed Area of Input Signal of Channel 1.

Status Details List

i. following status appears when communicating the device and PC

- the device is communicating with PC Linking
- Connect the device successfully communicates with PC
- Match the PC software is matching the device as per model type
- Syncing the PC software is synchronizing the device's settings

ects the communication between the device and PC
no communication between PC software and the device
the device found
USB driver installation error appears
the device not identifiable

iii. following status indicates the working of the device					
Auto	automatic trigger mode				
Ready	ready for receiving trigger				
Trig'd	signal triggered				
Scan	slow scan mode				
Stop	the device stops acquiring signal data				
Error	error occurred				
ReSyncing	re-synchronize with the device				
AutoSet	in process of auto setting				

Keyboard Shortcuts

F5	Run/Stop
Ctrl + Enter	Auto Set
Q	1 division less from Channel 1's voltage division
А	1 division more from Channel 1's voltage division
W	1 division less from Channel 2's voltage division
S	1 division more from Channel 2's voltage division
←	1 division less from time base
\rightarrow	1 division more from time base

VII. Device Operation

i. how to set the probe compensation

Before working the probe with either of input channels (Channel 1 / Channel 2), better to adjust its compensation, so as to assure ideal measurement effect. Following operation steps to adjust probe compensation -

- i) From PC software operation interface, mouse-click 🔟 to get access to device function menu, choose "Channel";
- ii) then "CH1", set the "Probe Rate" at certain option (either x1, or x10, or x100, or x1000). Next, from physical probe, switch the probe attenuation to the matching option correspondingly.

Note: The probe compensation setting from function menu will keep valid until new setting change introduces.



Caution:

The default probe compensation setting into PC software reads **x10**, before working the probe with the device, making sure the probe compensation of both places is matching.



Figure VII-1. Probe Attenuation Switch Position



Caution:

For physical probe, when the compensation set in $\mathbf{x1}$, the probe itself will limit the device bandwidth at 5MHz.

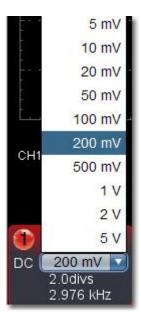
To reach the full bandwidth, the physical probe's compensation should be set in **x10**, or above.

ii. how to set the vertical system from PC software

In "Channel extension window for Channel 1 / 2" (as item 18 and 17 described under <u>VII. Operation Interface of PC Software</u>), related options of vertical system could be adjusted accordingly.

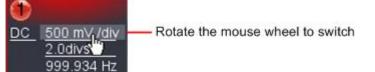


Through voltage divisions,

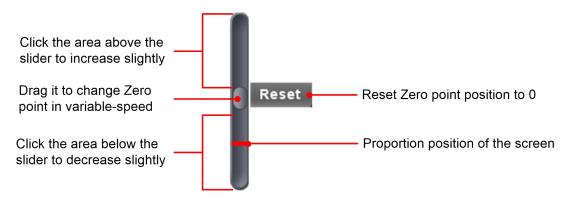


choose the ideal option.

Or through rotating the mouse wheel, to choose the ideal option.



Through zero point position control bar,



to reset zero point position will change the vertical position of the signal, via moving the slider upwards, or downwards - the farther slider from the center of control bar, the faster the vertical position changes.

Another solution is to drag the zero point pointer upwards or downwards (as item 22 and 21 goes under <u>VII. Operation Interface of PC Software</u>).

	Keyboard Shortcuts
Q	1 division less from Channel 1's voltage division
Α	1 division more from Channel 1's voltage division
W	1 division less from Channel 2's voltage division
S	1 division more from Channel 2's voltage division

Frequency Counter

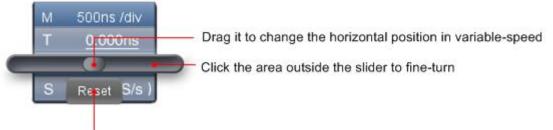
The device gets built-in 6-digit frequency counter, with frequency measurement range starts from 2Hz till full bandwidth.

iii. how to set the horizontal system from PC software

Via "Sample and Period extension window" (as item 16 described under <u>VII. Operation Interface of PC Software</u>), related options of horizontal system could be adjusted accordingly.

N	1 2us /div	——— Click to show time base combo box
Т	0.0 ns	——— Click to show Horizontal Trigger Position slider bar
D) 10k	——— Click to show Record length combo box
s	(250MS/s)	——— Show sample rate

Through horizontal position control bar,



Reset Horizontal position to 0

to reset the horizontal position of the signal, via moving the slider leftwards, or rightwards - the farther slider from the center of control bar, the faster the horizontal position changes; or through dragging the red pointer to reset the horizontal position of the signal (as item 3 goes under <u>VII. Operation Interface of PC Software</u>).

Keyboard Shortcuts				
←	1 division less from time base			
\rightarrow	1 division more from time base			

iv. how to set the trigger system from PC software

The "trigger" commands the device to capture the signal at what time, and then output the result - in the form of waveform. Once trigger been set properly, the output result will be valuable waveform over unstable signal segmentation.

How trigger works ? When trigger been set, before trigger condition met, the device will collect the data as more as possible so as to output the ideal result in the left side of the trigger point; then once trigger condition met, the device will capture the data continually, and completely to output the ideal result in the right side of the trigger point.

Mouse-click **W** to get access to Function Menu,

Note: For first operation, after mouse-clicking , the Home of Function Menu comes, Home Trigger > Channel > Measure > Sampling > Funtion Generator > Mark Cursor > Display > Utility >

via to choose "**Trigger**" option (or mouse-click **Trigger** from right-bottom extension window to show this option).



The **Trigger** option here indicate single trigger, it is the one to use one trigger signal to capture data from two channels, simultaneously, the operation steps -

i). choose "CH1" or "CH2" from "Source";

ii). next "Mode", 4 options under "Mode": edge trigger, video trigger, slope trigger and pulse trigger.

Edge Trigger: when certain level gets through trigger signal input at certain direction, edge trigger happen

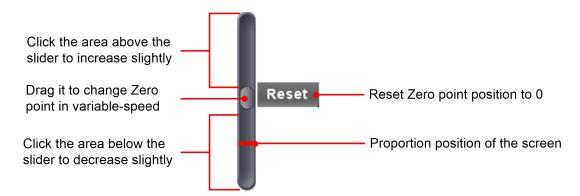
Video Trigger: field / line trigger on standard video signal Slope Trigger: triggers on signal's rising / falling rate Pulse Trigger: to capture certain pulse width at given trigger condition

1) Edge Trigger

i). choose "Edge" from "Mode", to trigger on the threshold value of input signal;

ii). choose "Rise" under "Edge" to trigger on the rising edge of input signal; and to choose "Fall" to trigger on falling edge of input signal;

iii). click the voltage value after "Trigger" (below "Rise" or "Fall") to show slider bar. The Red / Yellow Pointer could be dragged to adjust the trigger level position, please refer to item 12 under VII. Operation Interface of PC Software ;



iv). use suitable "Trig Mode" from 3 options -

- Auto in this trigger mode, the device could capture the signal without set trigger condition
- **Normal** in this trigger mode, only capture the signal with set trigger condition met
- **Single** in this trigger mode, only capture the signal once with set trigger condition met once, then stop

v). input "Hold Off" time

It's for setting the time interval to re-activate the trigger, the timespan ranges 100ns till10s.

Setting method: choose "+"/"++"/"+++", click ▲, or ▼, the last/middle/first digit will go upwards/downwards by 1.

Click "Reset" after this option to get Hold-off time back to default status, say, 100ns.

Or to set options through "Trigger extension window":



Force (Trigger): to create a trigger signal by force, mainly work for "Normal" and "Single" mode under "Trig Mode".

2) Video Trigger

- i) choose "Video" from "Mode", to trigger on fields / lines of video signals;
- ii) choose NTSC, or PAL, or SECAM standard under "Video";

iii) pick up one trigger synchronization method from Line / Field / Odd Field / Even Field / Line Number.
 The concrete line number could be set when "Line Number" is picked up.
 iv) Hold Off setting, please refer to point v) under 1) Edge Trigger.

3) Slope Trigger

i) choose "Slope" from "Mode", to set the trigger condition on the positive/negative slope within the specified time;

- ii) pick up suitable slope "Condition";
- iii) set slope time;

iv) set the upper limit of "High Level", and the lower limit of "Low Level";

v) set "Trig Mode", please refer to point iv) under 1) Edge Trigger ;

vi) set "Hold Off", please refer to point v) under 1) Edge Trigger.

Slew rate comes as a result by auto-calculating, it = (High Level vale - Low Level value) / slope time

4) Pulse (Width) Trigger

i) Choose "Pulse" from "Mode".

Under pulse trigger, the pulse width decides the trigger time, and the unusual pulse could be captured through setting special pulse trigger condition.

- ii) pick up suitable pulse "Condition";
- iii) set pulse time;
- iv) set "Trigger" level;
- v) set "Trig Mode", please refer to point iv) under 1) Edge Trigger ;
- vi) set "Hold Off", please refer to point v) under 1) Edge Trigger.

Know more about icons from "Trigger extension window" -

- 📶 Rise in Edge mode
- Eall in Edge mode
- where synchronized trigger in Line under Video mode
- synchronized trigger in Field under Video mode
- synchronized trigger in Odd Field under Video mode
- synchronic trigger in Even Field under video mode
- Rising Condition in Slope mode
- Falling Condition in Slope mode
- +Pulse Width Condition in Pulse mode
- -Pulse Width Condition in Pulse mode

v. how to set channel from PC software

From Function menu, via to choose certain channel, or to mouse-click **b** or **c** from "Channel extension window for Channel 1 / Channel 2" (please refer to item 18 / 19 under <u>VII. Operation Interface of PC Software</u>) to choose certain channel.



to turn on/ turn off Channel 1 / Channel 2

Press "CH1" or "CH2" to choose target channel, check "On" to turn on the target channel, uncheck "On" to turn off the target channel. As alternative method goes, from "Channel extension window for Channel 1 / Channel 2", click right-upper icon as marked below.



to invert a displayed waveform

waveform invert: to turn the displayed waveform in 180 degrees against the earth potential Press "CH1" or "CH2" to choose the target channel, check "Invert" to invert the displayed waveform in 180 degrees, uncheck "Invert" to back to normal display status.

to set bandwidth limit

Mouse-click "20M", or "Fullband"

20M: set the channel bandwidth at 20MHz - it's for reducing the noise of displayed waveform **Fullband**: restore the channel bandwidth to full bandwidth.

to set channel coupling

DC: when this option chosen, both direct and alternating components of the input signal could get through AC: when this option chosen, the direct component of the input signal will be shielded Ground: when this option chosen, the input signal be disconnected

From "Channel extension window for Channel 1 / Channel 2", click certain icon functions the same.

to set the probe compensation

To assure ideal measurement result, the built-in probe compensation setting from Function menu should always match the one onto physical probe for target channel (please refer to <u>i. how to set the probe compensation</u>).

Giving one example: when the attenuation of the physical probe for target channel set in x1, the built-in probe compensation setting from Function menu should be set in x1 as well.

to measure current

It's possible to measure current via certain unit conversion, the detailed operation is, to use probe to measure the voltage drop across certain resistor.

Press "CH1" or "CH2" to choose target channel, then check "Measure Current On", via \checkmark or \checkmark to set the A/V ratio (Amps/Volts ratio).

Amps/Volts ratio = 1/Resistor value.

vi. how to use automatic measurement

From Function menu. via

, enter into "**Measure**" option.

When moving the mouse at the main display area, on the left, 🖤 will appear, click it, the Measure menu will hide; another click will show the Measure menu.

Automatic measurement available in 20 options under Measure menu. From the left-bottom of the main display area, up to 8 measurement options could be accommodated.

All of 20 automatic measurement options go in Vpp, Vmax, Vmin, Vtop, Vbase, Vamp, Vavg, Vrms,

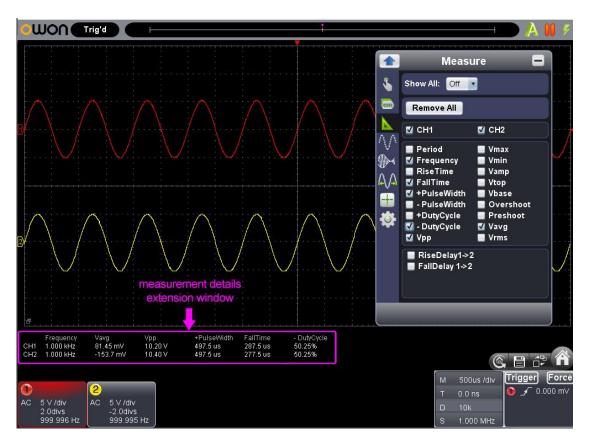
Overshoot, Preshoot, Frequency (abbreviated as "Freq"), Period, Rise Time, Fall Time, Delay $A \rightarrow B^{-}$, Delay $A \rightarrow B^{-}$, +Width, -Width, +Duty, -Duty.

The "Measure" option covers several useful functions -

Show All: When choosing Channel 1, or Channel 2 from "Show All", one window will be called out, to show all of involved measurement values from Channel 1, or Channel 2.

Add measurement: Check CH1, or CH2, or both firstly, the measurement results will come in full details at the left-bottom of the main display area. Provided any/all of the current 8 measurement options not the required, another 8 measurement options possible to add for each channel. The new measurement option(s) will replace the current one(s) in the order of first till last. Note: The measurement results of both channels possible to come together.

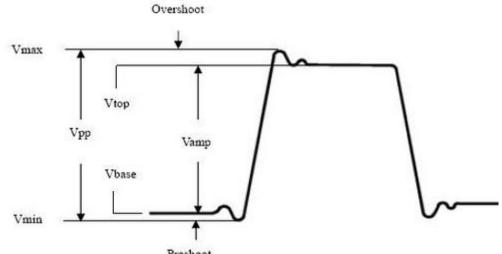
Remove measurement: Uncheck certain measurement option (20 options in total) to remove it. Mouse-click "Remove All" button to remove all of 20 measurement options.



automatic measurement options towards voltage value

10 options involved: Vpp, Vmax, Vmin, Vavg, Vamp, Vrms, Vtop, Vbase, Overshoot and Preshoot.

Following illustration to assist better understanding different measurement options,



Preshoot

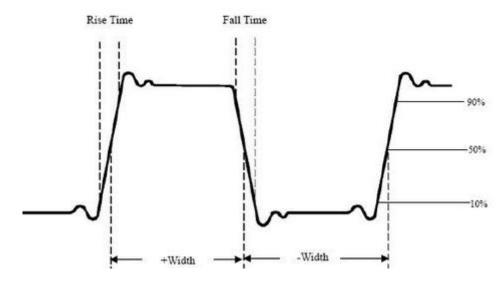
Definitions about these options -

Vpp	voltage between upper peak and lower peak from measured signal
Vmax	voltage between upper peak and ground (GND)
Vmin	voltage between lower peak and ground (GND)
Vamp	voltage between flat top and flat base from measured signal
Vtop	voltage between flat top and ground (GND)

Vbase	voltage between flat base and ground (GND)
Overshoot	equals (Vmax - Vtop) / Vamp
Preshoot	equals (Vmin - Vbase) / Vamp
Vavg	the arithmetic average voltage value of complete measured signal, or chosen part of measured signal
Vrms	true RMS voltage value over complete measured signal, or chosen part of measured signal

automatic measurement options towards time measurement 10 options involved: Frequency (abbreviated as "Freq"), Period, Rise Time, Fall Time, +Width, -Width, Delay $1 \rightarrow 2^{-1}$, Delay $1 \rightarrow 2^{-1}$, +Duty and -Duty.

Following illustration to assist better understanding different measurement options,



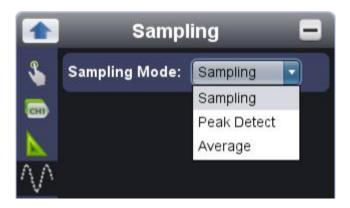
Definitions about these options -

Rise Time	the time span for signal amplitude rise from 10% to 90%, judged by the rising edge of its first pulse
Fall Time	the time span for signal amplitude fall from 90% to 10%, judged by the falling edge of its first pulse
+Width	the pulse width that the first positive pulse at 50% amplitude point
-Width	the pulse width that the first negative pulse at 50% amplitude point
Delay 1→2 	the time delay of Channel 1 and Channel 2 at rising edge
Delay 1→2 ^t	the time delay of Channel 1 and Channel 2 at falling edge
+Duty	measured by +Width / Period
-Duty	measured by -Width / Period

vii. how to set sampling mode

From Function menu, via

, enter into "Sampling" option.



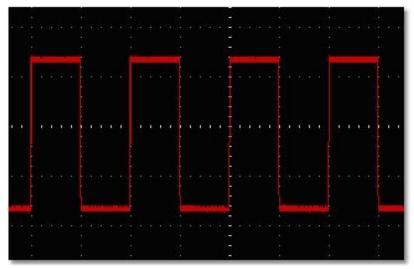
To know more about different sampling mode -

Sampling indicates normal sampling mode

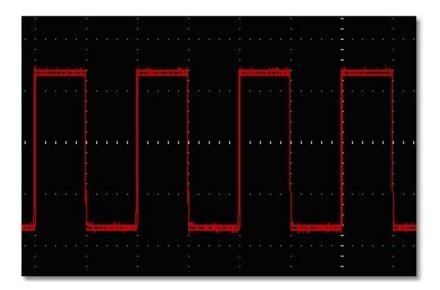
Peak Detect this sampling mode always been used to capture interrupting signal noise

Average this sampling mode is to reduce random / irrelevant signal noise, with set range from 1 to $128 (1 \le \text{the set no.} \le 128)$

Following illustration is signal output under normal Sampling mode, no interrupting signal noise been captured,



Following illustration is signal output under Peak Detect mode, the interrupting signal noise been captured in details,

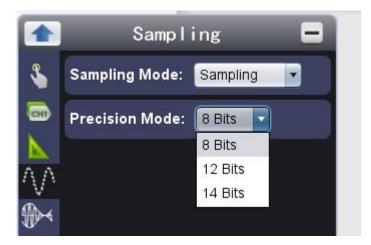


Following illustration is signal output under Average mode, with average number set in 16, from here, the interrupting signal noise been reduced to certain degree,

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vertical resolution option this option is available only in VDS6102A / VDS6102P

Via "Precision Mode",



to know more about this option -

- 8 Bits indicates the device works in 8-bit vertical resolution from ADC
- **12 Bits** indicates the device works in 12-bit vertical resolution from ADC
- 14 Bits Indicates the device works in 14-bit vertical resolution from ADC

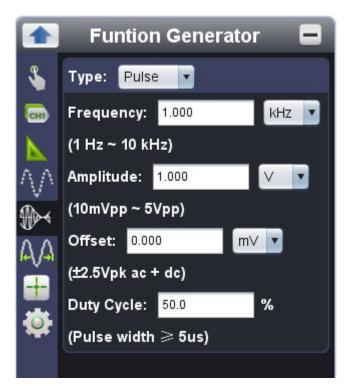
viii. how to set built-in function generator

The built-in function generator of 5MHz frequency output available from the device, with 4 basic waves output - sine, square, ramp and pulse, through MULTI communication interface.



From Function menu, via 🔍

, enter into "Function Generator" option.



i) choose preferred wave type from "Type", either Sine, or Square, or Ramp, or Pulse;

ii) input Frequency range, remember to match its unit - Hz / kHz / MHz;

iii) set Offset correctly

From Function menu, via

Further, Symmetry option comes under Ramp wave Type; and Duty Cycle option available in Pulse wave Type.

ix. how to use cursor measurement

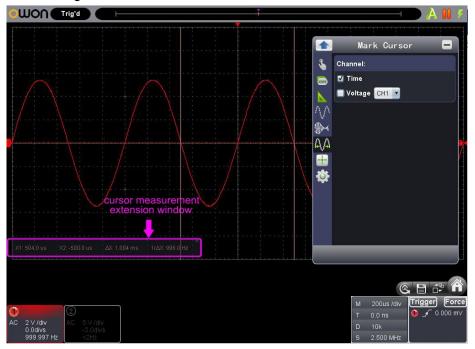
, enter into "Mark Cursor" option.



 i) check / uncheck measurement type, available in Time and Voltage option, cursor measurement works for either Time, or Voltage measurement, or both measurement at the same time;
 ii) when in Voltage measurement type, the target channel could be chosen from "CH1" and "CH2" option;

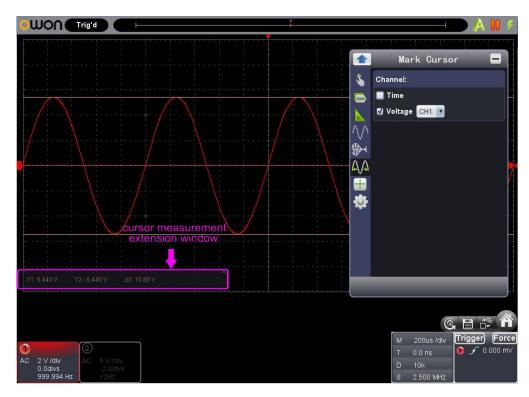
time cursor measurement: Check "Time" option, from the vertical direction of main display area, two lines in light color appears, indicating Cursor 1 and Cursor 2.

When moving mouse pointer through Cursor 1 or Cursor 2, it shapes \leftrightarrow , drag \leftrightarrow leftwards, or rightwards to adjust the measurement range between Cursor 1 and Cursor 2. The cursor measurement extension window (located at the bottom-left of main display area) tells the current time of Cursor 1 / Cursor 2, the absolute time difference between Cursor 1 and Cursor 2, and the frequency, as the illustration goes,



voltage cursor measurement: Check "Voltage" option, from the horizontal direction of main display area, two lines in light color appears, indicating Cursor 1 and Cursor 2.

When moving mouse pointer through Cursor 1 or Cursor 2, it shapes \uparrow , drag \uparrow upwards, or downwards to adjust the measurement range between Cursor 1 and Cursor 2. The cursor measurement extension window (located at the bottom-left of main display area) tells the current position of Cursor 1 / Cursor 2, the absolute value of the voltage amplitude difference between Cursor 1 and Cursor 2, as the illustration goes,



x. how to set the display system

From Function menu, via



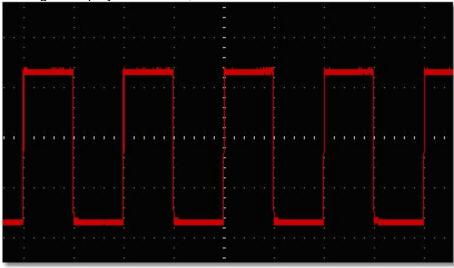
, enter into "**Display**" option.



Available in 2 display type, "Vector" and "Dots".

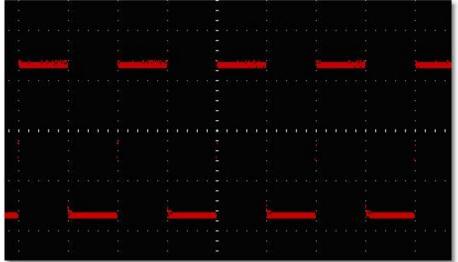
Vector to fill the room between the two adjacent sampling points, in dots of vector

Dots to display sampling points only



The signal displayed in Vector,

In contrast with the same signal displayed in Dots,



XY Mode

Check "XY Mode", the main display area switches to 3-window VIEW mode. In the XY mode window (upper-left window), the first channel reflects in X axis, the second channel in Y axis.

Note: When the device works in XY Mode, the record length been restricted at 1K points. The record length setting changes to 1K points automatically.

Persistence

When "Persistence" chosen, the device emulates the persistence display effect of CRO: the originally captured signal data in fading color, and the new data in fresh color, in cycle, continually.

The option of "Persistence" lasting available in Off, 0.5s, 1s, 2s, 5s, and Infinite, when set in "Infinite", the recording point continues to be there, until the persistence lasting option been changed. Press "Clear" to clear the current persistence.

Note: When any changes introduced towards time base, voltage division, or record length, or channel been turned on/off again, the current persistence will be cleared automatically, then to record the signal data after the aforementioned operation, again.

Grid Brightness

Drag the slider to adjust the grid brightness from main display area.

xi. how to change utility setting

From Function menu, via , enter into "Utility" option, Utility L Language: English -CHI Skin: Black **Print Preview** Save Image Data(*.zip) Pause & Export Self Cal Default Network TipsWindow About

Language

Available in 2 options: English and Chinese (simplified).

Skin

Works for operation interface skin color, either Black or Blue. After different color chosen from the current one, "Restart Effect" option comes, press "Restart" after the option, the PC software will restart in newly-set operation interface skin color.

Print Preview

Press the option to open the Print Preview Window for main display area.

The menus in Print Preview Window:

File

Page Set	to set Printer Page Space
Print	to print the current page onto chosen printer
Exit	to close the Print Preview Window

View

Page Transform Whole Page	to switch the current page between horizontal and vertical layout function as full page display of the current page
Face Size	to display the current page in its actual size
Default Scale	to display the current page in preferred size (measured in %)

Show Wave Background Check the option to display the background color of main display area; uncheck the option to display the background color of previewed page.

Set Preview Page Background

Via this option, to change the background color of previewed page.

Save Image

To save the current page from main display area into .png, .bmp or .gif format image, excluding function menu page.

Pause & Export

Based upon the current record length, to export the captured signal in certain format file, with format supports .zip, .csv.

Mouse-click III from right-bottom functions the same as pressing "Pause & Export" button.

Self Cal

Via "Self Cal" operation, the device may reach the best ideal working status within short time, which assures the most accurate measurement result accordingly.

This operation works the device at anytime when the best ideal working status is a must. When the working temperature change hits $\pm 5^{\circ}$ C, or exceeds $\pm 5^{\circ}$ C, the device should do this operation.

Before doing this operation, remove off all device-connected-items, including but not limited to working probes / leads / clamps, then press "Self Cal", until the full process ends.

Default

Mouse-click "Default" to enter the device to default factory settings.

Mouse-click (from right-bottom functions the same.

Network

Through LAN, or WiFi, the device communicates with PC. Please refer to "xiii. how to use LAN communication interface" and "xiv. how to work WiFi with PC software".

Tips Window

4 categories' contents covered -

"Channel", "Capture&Period", "Trigger" and "Keyboard Shortcuts".

Under certain category, mouse-click any place from the current page to check the contents from next page.

Check "Don't show again" from right-top of this window, to disable this window, and it will not come when starting the PC software next time, until unchecking "Don't show again".

About

Via this option, to know the PC software version, device firmware version, device serial no., and official website information.

xii. how to use main action button

Main action button includes (AutoSet), (Run/Stop), (Single Trigger), please refer to Item 6, 7, 8 under VI. Operation Interface of PC Software.

AutoSet

To set function items in certain value automatically, so as to generate more-suitable-for-observing waveform. Mouse-click \bigwedge , the device capture the signal automatically, and promptly. The involved function items is as follows -

Trigger				
Trigger Type	Edge, or Video, as per the input signal			
Trigger Mode	Auto			
Trigger Coupling	DC			
Trigger Slope	Rise			
Trigger Level	mid-point setting			
Channel				
Turn On / Off Channels	turn on the channel with signal input			
Zero Point Position	been adjusted to the proper position			
Vertical Scale	been adjusted to the proper division			
Horizontal Level	middle			
Horizontal Sale	been adjusted to the proper division			
Sampling				
Run/Stop Status	Run			
Acquisition Mode	current			
Display				
Display Format	ΥT			

Run/Stop

To start or stop sampling on input signals.

Single Trigger

To set trigger mode in "Single", under this trigger mode, when set condition met, the device will capture the input signal once, then stop signal capturing.

	Keyboard Shortcuts			
Ctrl + Enter	AutoSet			
F5	Run/Stop			

xiii. how to use socket connection

when the device communicates with PC by direct network cable

For the device, its default IP address / port goes in 192.168.1.172 / 8866.

When the device communicates with PC by direct network cable, the first 3 segments from the default IP address of PC should read the same as those from the device, giving an example, both of 2 parties read 192.168.1.xxx (the last segment "xxx" could be different).

Note: The IP address of the device could not be modified before successfully communicating with PC.

i) to check target PC's network setting giving an example, here we set IP address in 192.168.1.71

eneral						
	automatically if your network supports eed to ask your network administrator					
Obtain an IP address autor	natically					
Ose the following IP address	s:					
IP address:	192 . 168 . 1 . 71					
S <u>u</u> bnet mask:	255 . 255 . 255 . 0					
Default gateway:	192.168.1.1					
Obtain DNS server address	automatically					
() Use the following DNS serv	er addresses:					
Preferred DNS server:	192.168.1.1					
Alternate DNS server:						
Validate settings upon exit	Ad <u>v</u> anced					

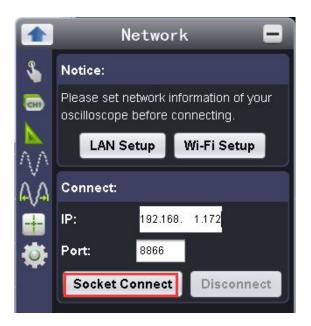
ii) to communicate device with PC

a. to power the device through adapter, or through USB connection cable via suitable USB communication interface;

- b. to communicate the device with PC via crossed network cable, each end connects each LAN port;
- c. to start PC software;
- d. to enter into "Utility" option, press "Network";



e. to activate "Socket Connect", so as to work the device with PC software



when the device communicates with PC by router connection

For device, its default IP address / port goes in 192.168.1.172 / 8866.

When device communicates with PC by direct LAN cable, the first 3 segments from the default IP address of PC should read the same as those from the device, giving an example, both of 2 parties reads 192.168.1.xxx (the last segment "xxx" could be different).

Note: The IP address of the device could not be modified before successfully communicating with PC.

i) to check target PC's network setting, its default Netmask and Gateway setting should read the same as the one for router, giving an example, provided the router / PC's network setting goes in -

IP Address:192.168.1.71Netmask:255.255.255.0Gateway:192.168.1.1

eneral					
	d automatically if your network supports need to ask your network administrator				
Obtain an IP address auto	omatically				
Ouse the following IP addre	ess:				
IP address:	192.168.1.71				
Subnet mask:	255 . 255 . 255 . 0				
Default gateway:	192.168.1.1				
Obtain DNS server addres	s automatically				
O Use the following DNS ser	ver addresses:				
Preferred DNS server:	192.168.1.1				
Alternate DNS server:					
🔲 Validate settings upon ex	it Ad <u>v</u> anced				

ii) to communicate device with PC

a. to power the device through adapter, or through USB connection cable via suitable USB communication interface;

b. to communicate the device with PC via same router, with respective network cable connects from LAN port to same router;

c. to start PC software;

d. to enter into "Utility" option, press "Network";



e. to activate "Socket Connect", so as to work the device with PC software

	Network 📃
\$	Notice:
CHD	Please set network information of your oscilloscope before connecting.
	LAN Setup Wi-Fi Setup
A A	Connect:
+	IP: 192.168. 1.172
1	Port: 8866
	Socket Connect Disconnect
×	

xiv. how to use LAN communication interface

Through LAN communication interface, the device may communicate with PC directly, or via router connection

the device communicates with PC by direct LAN

i) to check target PC's network setting giving an example, here we set IP address in 192.168.1.71

eneral	
	d automatically if your network supports need to ask your network administrator
Obtain an IP address auto	matically
Use the following IP addre	ss:
IP address:	192.168.1.71
S <u>u</u> bnet mask:	255 . 255 . 255 . 0
Default gateway:	192.168.1.1
Obtain DNS server address	s automatically
() Use the following DNS serv	ver addresses:
Preferred DNS server:	192.168.1.1
<u>A</u> lternate DNS server:	· · ·
Validate settings upon exi	it Advanced

ii) to set device's network via "Network" button under "Utility" option

a. to communicate device with target PC through USB connection cable via suitable USB communication interface, after the communication successful (please refer to <u>iv. to communicate device with PC</u> under V. How to Communicate Device with PC), press "Network" button under "Utility" option from function menu

b. mouse-click "LAN Setup" to to enter into "MachineNetSetting" -

IP address: total in 4 sections, to set the first 3 sections the same as the one mentioned in part i), say, 192.168.1, the 4th section should be different, here do it in 192.168.1.252 Port: could try any value ranges from 0 till 65535, here put 8866 MAC: provided any reminder of "physical address conflict", change its value

	Machi	neNetSetting 🗖
\$		
CHI	IP:	192.168. 1.252
\mathbf{A}	Netmask:	255.255.255. 0
$\mathbb{A}^{\mathbb{A}}$	Gateway:	192.168. 1. 1
\mathbb{P}	Port:	8866 (0~65535)
AA	MAC:	883F4A398D27
+		ок
O		

- c. press "OK" to finish the "MachineNetSetting"
- iii) to add NI network device

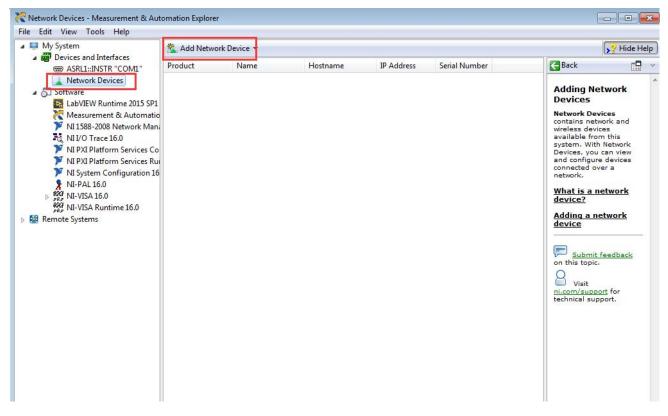
a. device powering. Either through AC adapter, or through USB connection cable, the device been powered, with indicator lights red for seconds.

b. LAN connection. To communicate device with target PC through LAN connection, via respective LAN communication interface.

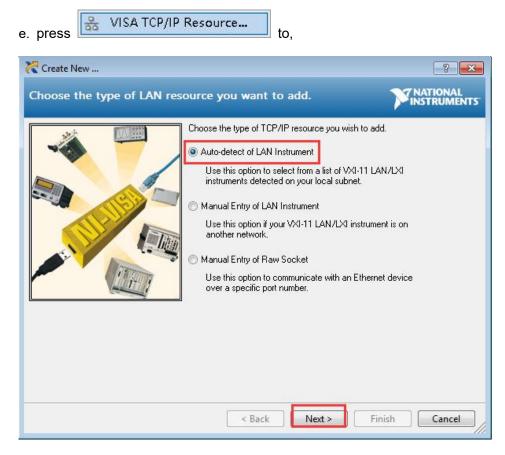
c. choose NI Max from Windows Start menu.



d. following page comes,



via "Devices and Interfaces", then "Network Devices", enter into "Add Network Device"



dot-tick "Auto-detect of LAN Instrument", then "Next"

f. to following window,

径 Create New	? ×
Select one or more LAN resources to add.	
Manually specify address information of LAN ins Select instrument(s) detected on local subnet Status: Some VXI-11 LAN/LXI instruments weil or more resources and click. 'Next' or F TOPIP0:192.168.1.252:(inst0:INSTR IOPIP0:192.168.1.253:(inst0:INSTR	re found. Select one
Include legacy non-488.2 devices when sea	rching De-select All
< Back Next > Fi	nish Cancel

dot-tick "Select instrument(s) detected on local subnet", to choose "TCPIP0::(the previous IP connection just added)::inst0::INSTR", then mouse-click "Finish".

g. back to PC software, to press TCPIP0::(the previous IP connection just added)::inst0::INSTR to communicate with PC software,

FC													
0		BFound					1						
F					Choose USB	Port of De	etected One:	and Cor	nnect:	[X]			
					TCPIP0::192.16	the hard statement of the statement of the	and the second se						
l					TCPIP0::192.16	8.1.253.:Ins	STULINSTR (2)			s Arrista		
2)-													
ļ				_									
8			: : :				<u>.</u>	:	:				
										м	200us /div	Trigger)	Force
٢		2								Т	0.0 ns	● <u></u> 1	
AC	500 mV /div 2.0divs		0 mV /div idivs							D	10k		

the device communicates with PC by router connection

i) to check target PC's network setting, the Netmask and Gateway setting should read the same as the one for router, giving an example, provided the router / PC's network setting goes in -

IP Address:	192.168.1.71
Netmask:	255.255.255.0
Gateway:	192.168.1.1

Subnet mask: Default gateway: Obtain DNS server address an Output the following DNS server Preferred DNS server:	
 Default gateway:	192 . 168 . 1 . 1
_ Default gateway:	192.168.1.1
Subnet mask:	255 . 255 . 255 . 0
<u>I</u> P address:	192 . 168 . 1 . 71
• Ose the following IP address:	-
Obtain an IP address automa	atically
You can get IP settings assigned a this capability. Otherwise, you nee for the appropriate IP settings.	ed to ask your network administrator

ii) to set device's network via "Network" button under "Utility" option

 a. to communicate device with target PC through USB connection cable via suitable USB communication interface, after the communication successful (please refer to
 <u>iv. to communicate device with PC</u> under V. How to Communicate Device with PC), press "Network"
 button under "Utility" option from function menu

b. mouse-click "LAN Setup" to to enter into "MachineNetSetting" IP address: total in 4 sections, to set the first 3 sections the same as the one mentioned in part i), say, 192.168.1, the 4th section should be different, here do it in 192.168.1.252
Netmask: the same as the one for router
Gateway: the same as the one for router
Port: could try any value ranges from 0 till 65535, here put 8866
MAC: provided any reminder of "physical address conflict", change its value

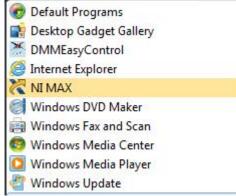
	Machi	neNetS	etting 🗖
3			
CHI	IP:	192.168.	1.252
\mathbf{A}	Netmask:	255.255.2	55. 0
$\wedge \wedge$	Gateway:	192.168.	1. 1
\mathbb{P}	Port:	8866	(0~65535)
A/A	MAC:	883F4A3	98D27
			ок

- c. press "OK" to finish the "MachineNetSetting"
- iii) to add NI network device

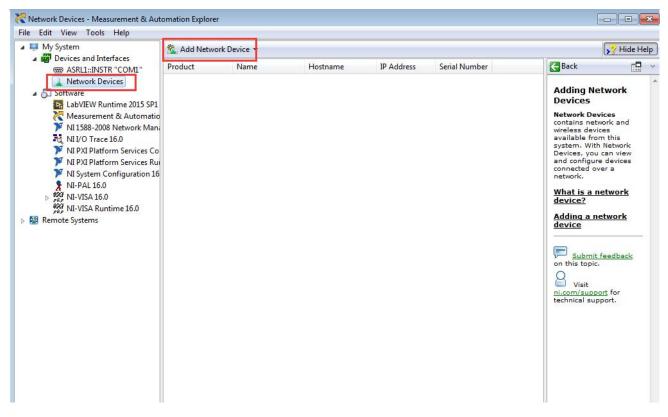
a. device powering. Either through AC adapter, or through USB connection cable, the device been powered, with indicator lights red for seconds.

b. LAN connection. To communicate device with target PC through LAN connection, via respective LAN communication interface.

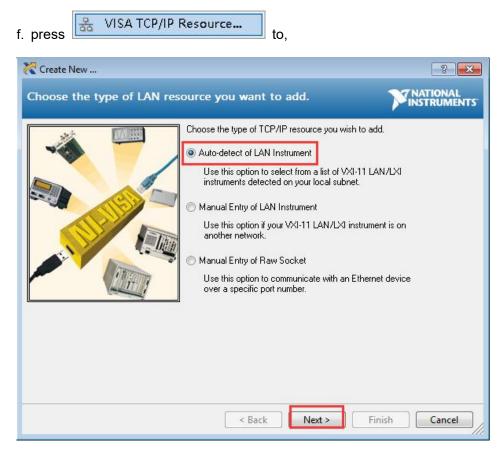
c. choose NI Max from Windows Start menu.



e. following page comes,



via "Devices and Interfaces", then "Network Devices", enter into "Add Network Device"



dot-tick "Auto-detect of LAN Instrument", then "Next"

g. to following window,

Create New	? 💌
Select one or more LAN resources to add.	
Manually specify address information of LAN ins Select instrument(s) detected on local subnet Status: Some VXI-11 LAN/LXI instruments we or more resources and click 'Next' or 'P ICPIP0::192.168.1.252:iinst0::INSTR ICPIP0::192.168.1.253:iinst0::INSTR	ere found. Select one
Include legacy non-488.2 devices when sea	arching De-select All
< Back Next > F	inish Cancel

dot-tick "Select instrument(s) detected on local subnet", to choose "TCPIP0::(the previous IP connection just added)::inst0::INSTR", then mouse-click "Finish".

h. back to PC software, to press TCPIP0::(the previous IP connection just added)::inst0::INSTR to communicate with PC software,

PC															×
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F. t. t. t.				Choose	USB Po	rt of De	etected	Ones a	nd Conn	ect:	[X]				
ŧ				TCPIP0::	192.168.1	252::ins	st0::INST	R (1)							
İ				TCPIP0::											
2															
	1 1												İ.		
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6		2									М	200us /div	Trigg		Force
	00 m∨ /div		00 m∨ /div								Т	0.0 ns	• 1	-1.0	00 V
	.0divs		0divs								D	10k			

xv. how to work WiFi with PC software

Note: Only the device equipped with optional WiFi module gets this function.

to work WiFi with PC software through device hotspot

The target PC should support WiFi communication, and the optional WiFi module should be inserted into USB host communication interface.

i) to set device's network via "Network" button under "Utility" option

a. to communicate device with target PC through USB connection cable via suitable USB communication interface, after the communication successful (please refer to <u>iv. to communicate the device with PC</u> under V. How to Communicate Device with PC), press "Network" button under "Utility" option from function menu.

b. in "Network", mouse-click "WiFi Setup" to "WiFiSetting", choose "AP" as "Connect Type", to set "SSID" and "Password", "IP" here fill 192.168.100.1, "Port" here use 8866 (could be any value, ranging from 0 till 65536).



c. press "OK" to confirm the "WiFiSetting".

ii) to add NI network device

a. device powering. To disconnect the USB communication between the device and target PC, with AC adapter get through power source, then power the device, with indicator lights red for seconds.

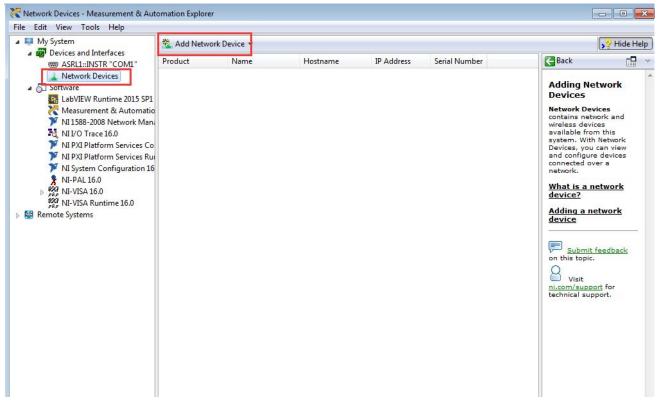
b. WiFi communication. To communicate the device with target PC through WiFi hotspot set onto device, as per correct SSID and Password.

Note: Provided not possible to auto-switch between WiFi and LAN connection onto target PC, disable LAN. Dot-tick "Obtain an IP address automatically" for the IP address onto target PC, or use the same first 3 sections of IP address set as point b. under i) part, say, 192.168.100

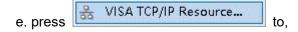
c. choose NI Max from Windows Start menu.

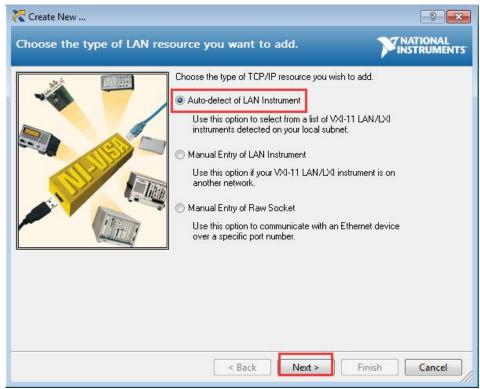


d. following page comes,



via "Devices and Interfaces", then "Network Devices", enter into "Add Network Device"





dot-tick "Auto-detect of LAN Instrument", then "Next"

f. to following window,

Create New	3
Select one or more LAN resources to add.	5
Manually specify address information of LAN instrument Select instrument(s) detected on local subnet	
Status: Some VXI-11 LAN/LXI instruments were found. Select one or more resources and click 'Next' or 'Finish'.	
Include legacy non-488.2 devices when searching	
Refresh List Select All De-select All	
< Back Next > Finish Cancel]

dot-tick "Select instrument(s) detected on local subnet", to choose "TCPIP0::(the previous IP connection just added)::inst0::INSTR", then mouse-click "Finish".

g. back to PC software, to press TCPIP0::(the previous IP connection just added)::inst0::INSTR to communicate with PC software,

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T.		<u></u>			Choose	USB Port o	f Detected	Ones a	nd Conne	ct:	[X]				
Į.,					TCPIP0::1	92.168.1.252	2::inst0::INS	FR (1)							
Ŧ					TCPIP0::1	92.168.1.253	3::inst0::INS	rr (2)							
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2)															
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AC	500 m∨ /div 2.0divs	AC	500 mV /div 2.0divs								D	10k			

to work WiFi with PC software through device station

The target PC should support WiFi communication, and the optional WiFi module should be inserted into USB host communication interface.

i) to set device's network via "Network" button under "Utility" option

a. to communicate device with target PC through USB connection cable via suitable USB communication interface, after the communication successful (please refer to <u>iv. to communicate the device with PC</u> under V. How to Communicate Device with PC), press "Network" button under "Utility" option from function menu.

b. in "Network", mouse-click "WiFi Setup" to "WiFiSetting" choose "STA" as "Connect Type", to set "SSID" and "Password", "Port" here use 8866 (could be any value, ranging from 0 till 65536).

	WifiSetting 📃							
\$								
	Connect Type: STA 🔽							
	SSID: OWON1909003							
${\rm AV}$	Password:	OWON19	09003					
₽	IP:	127. 0.	0. 1					
AA	Port:	8866	(0~65535)					
+		Re	fresh OK					
Ø								

c. input correct "SSID" and "Password" from WiFi router, here we use one available WiFi router - SSID in OWONTM, Password in lilliputowon, press "OK" to confirm the setting, after the step, "WiFiSetting" menu will be off. Re-enter "WiFiSetting" menu, press "Refresh" to update the IP address.



ii) to add NI network device

a. device powering. To disconnect the USB communication between the device and target PC, with AC adapter get through power source, then power the device, with indicator lights red for seconds.

b. WiFi communication. To communicate the device with target PC through WiFi hotspot set onto device, as per correct SSID and Password.

- Note -

Provided not possible to auto-switch between WiFi and LAN connection onto target PC, disable LAN. Dot-tick "Obtain an IP address automatically" for the IP address onto target PC, or use the same first 3 sections of IP address set as point b. under i) part, say, 192.168.100

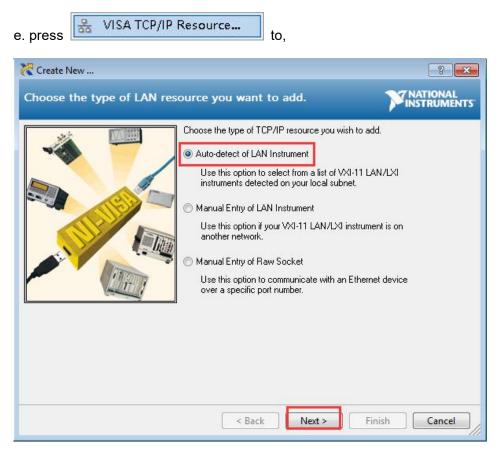
c. choose NI Max from Windows Start menu.



d. following page comes,

File Edit View Tools Help	, Add Network D	Device				2 Hida L
Devices and Interfaces	₄ Add Network D	Name	Hostname	IP Address	Serial Number	Adding Network Devices Network Devices Contains network and wireless devices available from this system. With Network Devices, you can view and configure devices connected over a network. What is a network device? Adding a network device? Adding a network device Submit feedback on this topic. Visit nicom/support for technical support.

via "Devices and Interfaces", then "Network Devices", enter into "Add Network Device"



dot-tick "Auto-detect of LAN Instrument", then "Next"

f. to following window,

Create New	? 🔀
Select one or more LAN resources to add.	
Manually specify address information of LAN instrume Select instrument(s) detected on local subnet	ent
Status: Some VXI-11 LAN/LXI instruments were for or more resources and click 'Next' or 'Finish TCPIP0::192.168.1.252::inst0::INSTR	
Include legacy non-488.2 devices when searching	Ig
Refresh List Select All	De-select All
< Back Next > Finish	Cancel

dot-tick "Select instrument(s) detected on local subnet", to choose "TCPIP0::(the previous IP connection

just added)::inst0::INSTR", then mouse-click "Finish".

g. back to PC software, to press TCPIP0::(the previous IP connection just added)::inst0::INSTR to communicate with PC software,

FG		
		A 11 🐔
	Choose USB Port of Detected Ones and Connect: TCPIP0::192.168.1.252::inst0::INSTR (1) TCPIP0::192.168.1.253::inst0::INSTR (2)	[X]
2		
19		
€ 200 mV /div 2.0divs 2.0divs		M 200us /div T 0.0 ns D 10k Trigger Force T.000 ∨ -1.000 ∨

VIII. Technical Specifications

i. Set the probe compensation at x10 for physical probe;

ii. Under suitable operation temperature, work the device for 30+ minutes without interval;

iii. Provided the environment temperature gets 5 degrees more, or less, to self-calibrate the device through Utility menu, via "Self Cal" option (please refer to <u>Self Cal</u>).

The following technical specifications been measured on the basis of above operation,

Oscilloscope Part -

		VDS6102	100MHz				
Bandwidth			8-bit mode	100 MHz			
Bandwidth			12-bit mode	100 MHz			
		VDS6102P	14-bit mode	20 MHz			
Vertical Resolution (A/D)		VDS6102	8 bits				
		VDS6102A VDS6102P	8 bits / 12 bits /	14 bits			
Channel Q'nty	Channel Q'nty						
Mode		sample, peak detec	t, average				
Acquisition		VDS6102	2-CH working	500 MS/s			
	Sampling Rate	VDS6102	1-CH working	1 GS/s			
		VDS6102A VDS6102P		8-bit mode	500 MS/s		
			2-CH working	12-bit mode	250 MS/s		
				14-bit mode	125 MS/s		
				8-bit mode	1 GS/s		
			1-CH working	12-bit mode	500 MS/s		
				14-bit mode	125 MS/s		
	Input Coupling	DC, AC, ground		•			
	Input Impedance	1 M Ω ± 2%, in para	llel with 15 pF ± 5	5 pF			
	Supported Probe	x1, x10, x100, x100	0)			
Input	Max Input Voltage	40V (DC + AC Peak)					
	Bandwidth Limit	20MHz, or fullband					
	Channel Isolation	100 : 1 @ 50Hz; 40	: 1 @ 10MHz				
	Time Delay Between Channel (typical)	150 ps					

$\begin{tabular}{ c c c c c } \hline VDS6102 & VDS$	VDS61021-CH workinSampling Rate $VDS6102A$ VDS6102P2-CH workinHorizontal SystemInterpolation $sin (x)/x$ Horizontal SystemRecord Length $VDS6102A$ VDS6102A10MRecord Length $VDS6102P$ VDS6102P1-CH workinScanning Speed (s/div)2 ns/div - 100 s/div sampling Rate / Relay Time Accuracy2 ns/div - 100 s/div single: ±(1 interval Average=16: ±1(1 interval Average=16: ±(1 interval Average=16: ±(1 interval Average=16: ±(1 interval Average=16: ±(1 interval Average=16: ±(1 interval Average=16: ±0 V (100 mV/div ± 40 V (1 V/div - 5 V)Vertical SystemSensitivity2 mV/div - 5 V/div ± 2 V (2 mV/div - 5 V) Analog BandwidthVertical SystemLow Frequency (at input, AC coupling, -3dB)≥10 HzRise Time (at input, typical)≤ 3.5 ns $VDS6102P$ DC AccuracyVDS6102 VDS6102P±3% v VDS6102P	0.5.50/0.50	00 MSo/o				
Sampling Rate working 0.5 Sa/s - 1 GSA/s VDS6102A VDS6102P 2-CH working 8-bit mode 0.5 Sa/s - 250 MSa/s 14-bit mode 0.5 Sa/s - 125 MSa/s 14-bit mode 0.5 Sa/s - 125 MSa/s 14-bit mode 0.5 Sa/s - 125 MSa/s 14-bit mode 0.5 Sa/s - 125 MSa/s 14-bit mode 0.5 Sa/s - 125 MSa/s 12-bit mode 0.5 Sa/s - 125 MSa/s Interpolation sin (x)/x 8-bit mode 0.5 Sa/s - 125 MSa/s Interpolation sin (x)/x 10M 0.5 Sa/s - 125 MSa/s Record Length VDS6102 VDS6102P 10M 12-bit mode 100M 12-bit mode 50M 14-bit mode 50M 12-bit mode 50M 14-bit mode 50M 14-bit mode 50M 12-bit mode 50M 12-CH working 8-bit mode 100M 12-bit mode 50M 12-CH working 8-bit mode 100M 12-bit mode 100M 12-CH working 8-bit mode 100M 12-bit mode 100M 12-CH working 8-bit mode 100M <	Interpolationsampling Rateworking VDS6102A VDS6102P2-CH working 1-CH workingHorizontal SystemInterpolationsin (x)/x1-CH workingInterpolationsin (x)/x10MRecord LengthVDS6102A VDS6102A10MRecord LengthVDS6102P VDS6102A10MScanning Speed (s/div)2 ns/div - 100 s/div sampling Rate / Relay Time Accuracy2-CH workingScanning Speed (s/div)2 ns/div - 100 s/div sampling Rate / Relay Time Accuracy2-CH workingInterval (Δ T) Accuracy (DC - 100MHz)2 ns/div - 100 s/div single: ±(1 interval Average>16: ±(1 interval Average>16: ±(1 interval Average>16: ±(1 interval Average>16: ±(1 interval 	ng 0.5 Sa/s - 50	0.5 Sa/s - 500 MSa/s				
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Vertical Image: Semigrame term 1-CH working 12-bit mode 100M 14-bit mode 100M 14-bit mode 100M Scanning Speed (s/div) 2 ns/div - 100 s/div, step by 1 - 2 - 5 Sampling Rate / Relay Time Accuracy ±25ppm (typical, Ta = +25°C) Interval (\triangle T) Accuracy (DC - 100MHz) Single: ±(1 interval time + 25ppm x reading + 0.6ns); Average>16: ±(1 interval time + 25ppm x reading + 0.4ns) Sensitivity 2 mV/div - 5 V/div Displacement ± 2 V (2 mV/div - 50 mV/div) ± 20 V (100 mV/div) ± 20 V (100 mV/div - 500 mV/div) ± 40 V (1 V/div - 5 V/div) Analog Bandwidth 100 MHz Vertical System Low Frequency (at input, AC coupling, -3dB) Rise Time < 3.5 ns	Vertical SystemSensitivity $2 \text{ ns/div} - 100 \text{ s/div}$ Vertical SystemScanning Speed (s/div) $2 \text{ ns/div} - 100 \text{ s/div}$ Sampling Rate / Relay Time Accuracy $\pm 25 \text{ppm}$ (typical, Take $\pm 25 \text{ppm}$ (typical, Take Average>16: $\pm (1 \text{ interval})$ Interval ($\triangle T$) Accuracy (DC - 100MHz)Single: $\pm (1 \text{ interval})$ Sensitivity $2 \text{ mV/div} - 5 \text{ V/div}$ $2 \text{ mV/div} - 5 \text{ V/div}$ $\pm 2 \text{ V} (2 \text{ mV/div} - 5 \text{ V/div})$ $2 \text{ mV/div} - 5 \text{ V/div}$ $\pm 2 \text{ V} (2 \text{ mV/div} - 5 \text{ V/div})$ 4nalog Bandwidth 100 MHz 100 MHz $\pm 40 \text{ V} (1 \text{ V/div} - 5 \text{ V/div})$ 4nalog Bandwidth 100 MHz 100 MHz $\pm 3.5 \text{ ns}$ $10 \text{ C} \text{ Accuracy}$ $\forall \text{DS6102} \pm 3\% \text{ VDS6102} \pm 2\% \text{ VDS6102P}$	•	50M				
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Displacement ± 20 V (100 mV/div - 500 mV/div) ± 40 V (1 V/div - 5 V/div) Analog Bandwidth 100 MHz Low Frequency (at input, AC coupling, -3dB) ≥10 Hz Rise Time ≤ 3.5 ns	Displacement $\pm 20 \vee (100 \text{ mV/div})$ $\pm 40 \vee (1 \vee/div - 5 \vee)$ Analog Bandwidth100 MHzLow Frequency (at input, AC coupling, -3dB) $\geq 10 \text{ Hz}$ Rise Time (at input, typical) $\leq 3.5 \text{ ns}$ DC Accuracy $\vee DS6102 \pm 3\% \times$ $\vee DS6102P \pm 2\% \times$						
Vertical Low Frequency System (at input, AC coupling, -3dB) Rise Time ≤ 3.5 ns	Vertical SystemLow Frequency (at input, AC coupling, -3dB)≥10 HzRise Time (at input, typical)≤ 3.5 nsDC AccuracyVDS6102 VDS6102P±3% v ±2% v	± 20 V (100 mV/div - 500 mV/div)					
System (at input, AC coupling, -3dB) 210 HZ Rise Time < 3.5 ns	System (at input, AC coupling, -3dB) ≥10 HZ Rise Time (at input, typical) ≤ 3.5 ns DC Accuracy VDS6102 ±3% v VDS6102P ±2% v	,					
	(at input, typical)≤ 3.5 nsDC AccuracyVDS6102±3% vVDS6102A VDS6102P±2% v	>10 Hz					
	DC Accuracy VDS6102A VDS6102P ±2% v	≤ 3.5 ns					
VDS6102 $\pm 3\%$ when $\ge 2mV$	VDS61027 ±2% v	±3% when ≥ 2mV					
$\sqrt{1000102}$ (1) $\frac{1000102}{100000000000000000000000000000$							
DC Accuracy (average) the voltage difference of any 2 points from the captured signal, after taking the average from \geq 16 captured signals (\triangle V): ±(2% rdg + 0.05 div)	DC Accuracy (average) signal, after taking	the average fro					
	waveform inverted ON / OFF						

Measurement	Cursor Measurement	riangle V and $ riangle T$ between Cursor 1 and Cursor 2	
	Automatic Measurement	Vpp, Vmax, Vmin, Vtop, Vbase, Vamp, Vavg, Vrms, Overshoot, Preshoot, Frequency, Period, Rise Time, Fall Time, Delay A→B ᠊ , Delay A→B ᡶ, +Width, -Width, +Duty, -Duty	
	Lissajous Figure	Bandwidth	full bandwidth
		Phase Difference	±3 degrees
Communication	USB device (type-C), USB host (Wi-Fi extension supported), LAN		tension supported), LAN
Interface	Wi-Fi module available in option		
Frequency Counter	supported		

Trigger

пудег		
Trigger Level Range	Internal	±5 divisions from the screen center
Trigger Level Accuracy (typical)	Internal	±0.3 division
Trigger Displacement	on the basis of record length and time base	
Trigger Hold-off Range	100ns - 10s	
Edge Trigger	Slope	rising, falling
Pulse Trigger	Trigger Condition	positive pulse: >, <, = negative pulse: >, <, =
	Pulse Width Range	30ns - 10s
Video Triggor	Modulation	supported standard: NTSC, PAL and SECAM broadcast systems
Video Trigger	Line Number Range	NTSC: 1 - 525; PAL / SECAM: 1 - 625
Slope Trigger	Trigger Condition	positive pulse: >, <, = negative pulse: >, <, =
	Time Setting	30ns - 10s

Function Generator Part -

Standard Waveform	sine, square, ramp and pulse
Frequency Output	5 MHz
Sampling Rate	25 MSa/s
Channel Q'nty	1
Vertical Resolution	10 bits
Output Impedance	50 Ω (typical)

Frequency

Resolution	0.1 Hz, or 5-digit effective value
Stability	±50 ppm at 0 ℃ - (+40 ℃)
Aging Rate	±50 ppm per year

Sine	0.1 Hz - 5 MHz
Square	0.1 Hz - 200 kHz, with rising or falling time < 200ns
Ramp	1 Hz - 10 kHz, with rising or falling time $\ge 5\mu s$
Pulse	1 Hz - 10 kHz, with pulse width ≥ 5μ s

Amplitude (default load at 50Ω unless otherwise noted)

Output Amplitude	10mVpp - 5Vpp (≤5MHz) @ High Z
Amplitude Accuracy	±(1% of setting + 1 mVpp) (typical, 1kHz sine, 0V offset)
Amplitude Resolution	10 mVpp
DC Offset Range (AC+DC)	±(2.5 Vpk - amplitude Vpp/2)
DC Offset Accuracy	±(1 % of setting + 1 mV + amplitude Vpp x 0.5%)
DC Offset Resolution	10 mVpp

General Part -

Communication Interface	USB Device, USB Host (hi-speed USB 2.0), LAN (10/100Mbits)
Programming Language	SCPI
Compatibility	USBTMC, LXI, SOCKET

Power

Power Source	5V - 15V DC / 1.2A
Power Consumption	≤ 8W

Environment

Temperature	working temperature: 0 ℃ - (+40 ℃) storage temperature: (-20 ℃) - (+60 ℃)
Relative Humidity	≤ 90%
Height	operating: 3,000 m non-operating: 15,000 m
Cooling Method	air convection (cross-ventilation)

Mechanical

Device Dimension	w/h/d 190 x 120 x 18 mm
Weight	0.38 kg

Device Calibration Time Interval

After the device been operated for every 12 natural months (calculated from the first operation day), better to calibrate it one time.

IX. Appendix

Appendix A. Device Accessory List

Accessories -

- 2 x passive probe
- 1 x USB connection cable (type-C)
- 1 x hard copy quick guide
- 1 x AC-DC adapter
- 1 x BNC/Q9 cable
- 1 x PC software / user manual CD

Optional Accessories -

- 1 x Wi-Fi module
- 1 x soft case

Note: Optional accessories is subject to extra purchasing.

Appendix B. Device Maintenance

Storage

To avoid any possible damage to the device, and probe, keep these items FAR AWAY from sprays, liquids, or solvents.

Surface Cleaning

As per the operation condition requirements, DO check the device and probe surface from time to time.

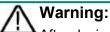
When cleaning the device / probe surface, please follow up with operation steps as follows -

i. Before the surface cleaning, making sure the device been powered off, without any accessory / outer facility connected; making sure probe not working with device / outer facility.

ii. Use non-electrostatic soft cloth to remove the surface dust.

iii. For further surface cleaning, recommend to use a wet-but-no-water-dripping soft cloth, or soft detergent.

Note: To avoid permanent damage to the surface of device and probe, DO NOT introduce any corrosive chemical cleaner / detergent.



After device surface cleaning, before working the device for next time, please confirm that the device surface in a relative dry condition, so as to avoid any short circuit risk, or possible human body injury caused by electric conduction from the wet surface.

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