Single Channel

Arbitrary Waveform Generator

Quick Guide

WWW.OWON.COM

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General Warranty

Lilliput warrants that the product will be free from defects in materials and workmanship for a period of 3 years (1 year for accessories) from the date of purchase of the product by the original purchaser from the Lilliput Company. This warranty only applies to the original purchaser and is not transferable to the third party. If the product proves defective during the warranty period, Lilliput either will repair the defective product without charge for parts and labor, or will provide a replacement in exchange for the defective product. Parts, modules and replacement products used by Lilliput for warranty work may be new or reconditioned to like new performance. All replaced parts, modules and products become the property of Lilliput.

In order to obtain service under this warranty, Customer must notify Lilliput of the defect before the expiration of the warranty period. Customer shall be responsible for packaging and shipping the defective product to the service center designated by Lilliput, and with a copy of customer proof of purchase.

This warranty shall not apply to any defect, failure or damage caused by improper use or improper or inadequate maintenance and care. Lilliput shall not be obligated to furnish service under this warranty a) to repair damage resulting from attempts by personnel other than Lilliput representatives to install, repair or service the product; b) to repair damage resulting from improper use or connection to incompatible equipment; c) to repair any damage or malfunction caused by the use of non-Lilliput supplies; or d) to service a product that has been modified or integrated with other products when the effect of such modification or integration increases the time or difficulty of servicing the product.

Please contact the nearest Lilliput's Sales and Service Offices for services or a complete copy of the warranty statement.

For better after-sales service, please visit www.owon.com and register the purchased product online.

Excepting the after-sales services provided in this summary or the applicable warranty statements, Lilliput will not offer any guarantee for maintenance definitely declared or hinted, including but not limited to the implied guarantee for marketability and special-purpose acceptability. Lilliput should not take any responsibilities for any indirect, special or consequent damages.

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1. General Safety Requirements

Before any operations, please read the following safety precautions to avoid any possible bodily injury and prevent this product or any other products connected from damage. In order to avoid any contingent danger, this product is only used within the range specified.

Check AC power input setting according to the standards in your own country (see Page 8, "AC Power Input Setting").

Only the qualified technicians can implement the maintenance.

To avoid Fire or Personal Injury:

- **Use Proper Power Cord.** Use only the power cord supplied with the product and certified to use in your country.
- **Product Grounded.** This instrument is grounded through the power cord grounding conductor. To avoid electric shock, the grounding conductor must be grounded. The product must be grounded properly before any connection with its input or output terminal.
- **Check all Terminal Ratings.** To avoid fire or shock hazard, check all ratings and markers of this product. Refer to the user's manual for more information about ratings before connecting to the instrument.
- **Do not operate without covers**. Do not operate the instrument with covers or panels removed.
- **Use Proper Fuse.** Use only the specified type and rating fuse for this instrument.
- **Avoid exposed circuit**. Do not touch exposed junctions and components when the instrument is powered.
- **Do not operate if in any doubt.** If you suspect damage occurs to the instrument, have it inspected by qualified service personnel before further operations.
- **Use your instrument in a well-ventilated area.** Make sure the instrument installed with proper ventilation, refer to the user manual for more details.
- **Do not operate in wet conditions.**
- **Do not operate in an explosive atmosphere.**
- **Keep product surfaces clean and dry.**

2. Safety Terms and Symbols

Safety Terms

Terms in this Manual. The following terms may appear in this manual:

Warning: Warning indicates the conditions or practices that could result in injury or loss of life.

Caution: Caution indicates the conditions or practices that could result in damage to this product or other property.

Terms on the Product. The following terms may appear on this product:

Danger: It indicates an injury or hazard may immediately happen.

Warning: It indicates an injury or hazard may be accessible potentially.

Caution: It indicates a potential damage to the instrument or other property might occur.

Safety Symbols

Symbols on the Product. The following symbol may appear on the product:

Hazardous Voltage

Refer to Manual

Protective Earth Terminal

Chassis Ground

Test Ground

3. General Characteristics

The series are multi-function generators which combine Arbitrary Waveform Generation and Function Generation. The product introduces Direct Digital Synthesizer (DDS) technology to provide stable, precise, pure and low distortion signal. The user-friendly interface design and panel layout bring exceptional user experience. Embedded USB Device, USB Host, LAN, support USB storage device. Provide more alternative solutions for users.

Features and benefits:

- 3.9 inch high resolution (480×320 pixels) TFT LCD display;
- Advanced DDS technology, Max.150MHz frequency output;
- Max. Sample rate: 400MSa/s, Frequency resolution: 1uHz;
- Vertical resolution: 14 bits, up to 1M waveform record length;
- Abundant waveform output: 5 basic waveforms and 26 built-in arbitrary waveforms output;
- 32 channels digital waveform (optional);
- Exponential rise, Exponential fall, Sin(x)/x, Staircase, etc. 26 built-in waveforms and user defined arbitrary waveform;
- Abundant modulation functions: AM, FM, PM, FSK, PWM along with output liner/logarithm sweep and pulse string waveform;
- Standard interface: USB Device, USB Host, LAN, COM etc.

4. Front/Rear Panel and User Interface

Front Panel

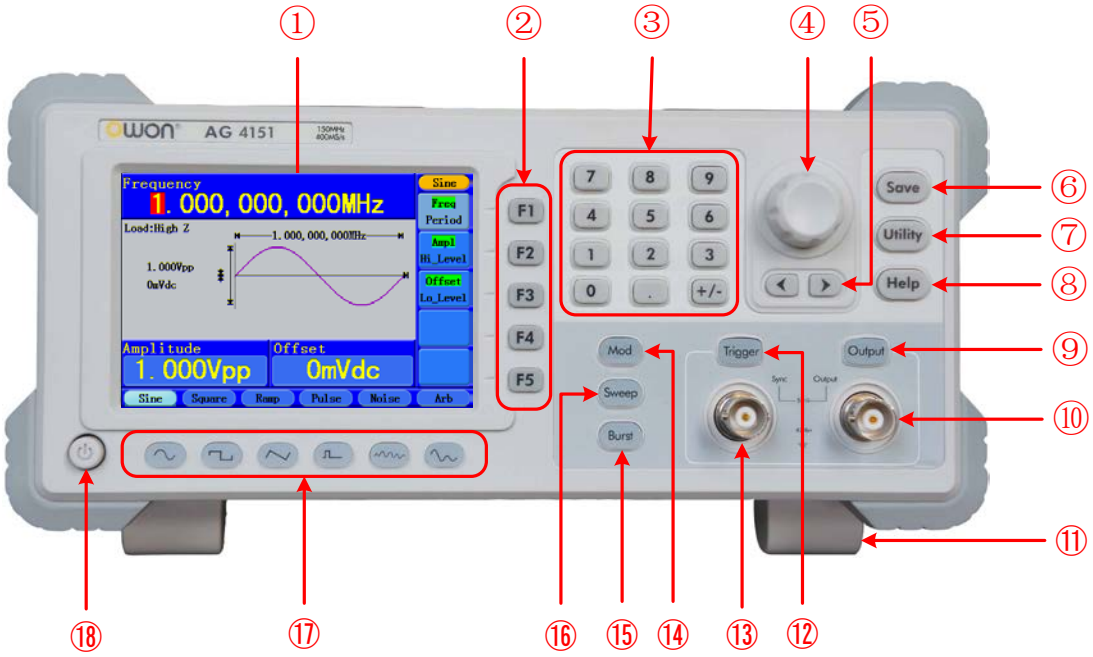

Figure 4-1 Front panel overview

①	**LCD**	Display the user interface
②	**Menu selection buttons**	Include 5 buttons: F1～F5, activate the corresponding menu
③	**Number keys**	Input parameters, include: number, point and plus/minus sign
④	**Knob**	Change the current highlighted number, also can be used to select file location or switch the character of the soft keyboard when entering file name.
⑤	**Direction key**	Move the cursor of the focused parameter or select the file locations
⑥	**Save**	Store/recall the user-defined arbitrary waveform data
⑦	**Utility**	Set the auxiliary system function
⑧	**Help**	View the build-in help information
⑨	**Output key**	Activate or deactivate the output signal
⑩	**Main output terminal**	Output main signal
⑪	**Foot stool**	Make the instrument to be tilted for ease of operation
⑫	**Trigger key**	In Sweep and N-Cycle Burst, if you choose Source as

		"Manual", every time you press this key, the generator will be triggered once.
⑬	**Sync output terminal**	Output sync signal
⑭	**Modulation**	Generate the Modulated waveforms
⑮	**Burst**	Generate burst for Sine, Square, Ramp, Pulse and Arbitrary waveform
⑯	**Sweep**	Sweep Sine, Square or Ramp waveform
⑰	**Waveform selection buttons**	Include: Sine, Square, Ramp, Pulse, Noise and Arbitrary waveform. When a waveform is selected, the backlight of the button turns on.
⑱	**Power button**	Turn on/off the generator

Rear Panel

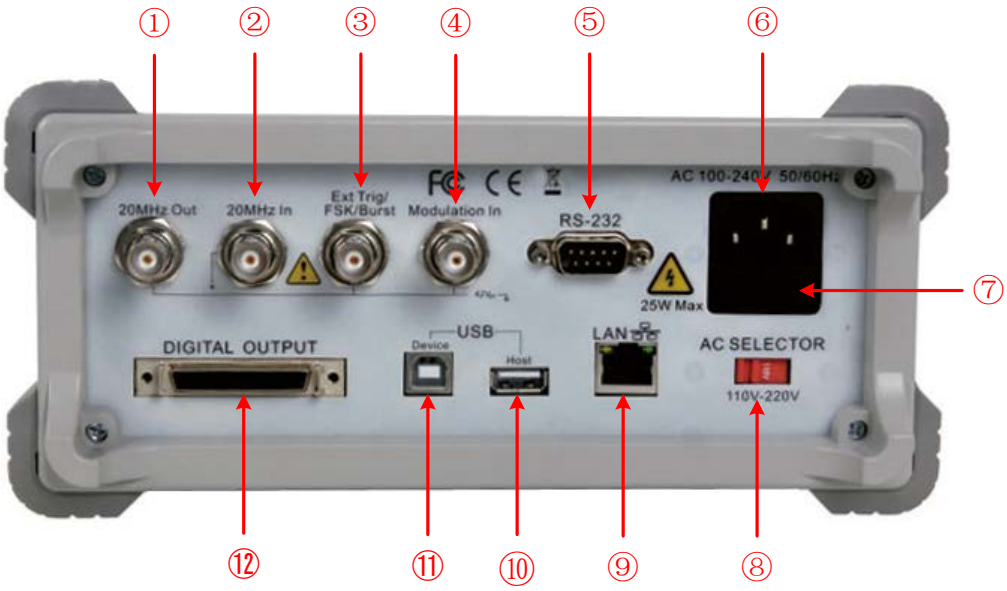

Figure 4-2 Rear panel overview

① ②	**20MHz reference output** **20MHz reference input**	These two connectors are used to synchronize generators. The connector [20MHz In] accepts an external 20 MHz clock signal, and the connector [20MHz Out] can output a 20 MHz clock signal generated by the crystal inside the generator.
③	**External Trigger /FSK/Burst**	This signal can be used as external signal source in Sweep, FSK and Burst mode.
④	**Modulation In**	Modulation waveform input, use it as external signal source
⑤	**RS232 port**	Through this interface, the generator can be connected to a PC and controlled via PC software.

⑥	**Power socket**	AC input connector
⑦	**Fuse**	Use the specified fuse according to the voltage scale.
⑧	**Power switch**	Switch between 110V and 220V.
⑨	**LAN port**	Through this interface, the generator can be connected to your local network and controlled via PC software.
⑩	**USB Host port**	Connect as a "host device" with an external USB device, such as connect a USB disk to the instrument.
⑪	**USB Device port**	Connect as a "slave device" with an external device, such as connected to a PC and controlled via PC software.
⑫	**Digital output**	Connect the generator with the logic signal output module (optional). Then, configure specific sequence digital signal in the generator and output the signal through the digital module.

User Interface

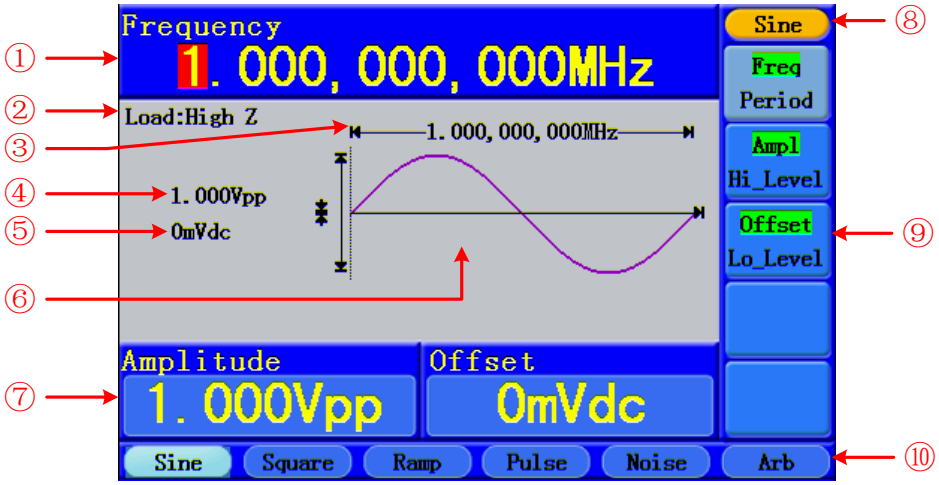

Figure 4-3 User interface (take Sine for instance)

①	Parameter bar 1, display parameters and edit the focused parameter
②	Load, High Z represents high resistance
③	Frequency/period, depends on the highlighted menu item on the right
④	Amplitude/high level, depends on the highlighted menu item on the right
⑤	Offset/low level, depends on the highlighted menu item on the right
⑥	Display current waveform
⑦	Parameter bar 2, display parameters and edit the focused parameter
⑧	Current signal type or mode
⑨	The setting menu of current signal or mode
⑩	Signal type

5. General Inspection

After you get a new Waveform Generator, it is recommended that you should make a check on the instrument according to the following steps:

1. **Check whether there is any damage caused by transportation.**

   If it is found that the packaging carton or the foamed plastic protection cushion has suffered serious damage, do not throw it away first till the complete device and its accessories succeed in the electrical and mechanical property tests.

2. **Check the Accessories**

   The supplied accessories have been already described in the "Appendix A: Enclosure" of this Manual. You can check whether there is any loss of accessories with reference to this description. If it is found that there is any accessory lost or damaged, please get in touch with the distributor of Lilliput responsible for this service or the Lilliput's local offices.

3. **Check the Complete Instrument**

   If it is found that there is damage to the appearance of the instrument, or the instrument can not work normally, or fails in the performance test, please get in touch with the Lilliput's distributor responsible for this business or the Lilliput's local offices. If there is damage to the instrument caused by the transportation, please keep the package. With the transportation department or the Lilliput's distributor responsible for this business informed about it, a repairing or replacement of the instrument will be arranged by the Lilliput.

Foot Stool Adjustment

Unfold the foot stools on the bottom of the generator, as ⑦ in *Figure 4-1*.

6. Power-On Check

AC Power Input Setting

This series adopt 110V/220V AC power source. Users should regulate the voltage scale of the **Power Switch** according to the standards in their own country (see *Figure 4-2*) at the rear panel and use an appropriate fuse.

Voltage	Fuse
110V	125 V, F4AL
220V	250 V, F2AL

To change the voltage scale of the instrument, do the following steps:

(1) Turn off the power button at the front panel and remove the power cord.

(2) Check if the fuse installed before leaving factory (250 V, F2AL) can match with the selected voltage scale; if not, pry the cover open using a straight screwdriver (see ⑦ in *Figure 4-2*), change the fuse.

(3) Regulate the **Power Switch** to the desired voltage scale.

Power On

(1) Connect the instrument to the AC supply using the supplied power cord.

Warning:
To avoid electric shock, the instrument must be grounded properly.

(2) Press down the **power button** at the front panel, the screen shows the boot screen.

7. Quick Start

To Set Basic/Arbitrary Signals

The following describes how to set and output Sine, Square, Ramp, Pulse, Noise and Arbitrary signals.

Press **Waveform selection buttons** on the front panel: Sine, Square, Ramp, Pulse, Noise, Arbitrary, to enter waveform setting interface. Different waveform has different parameters.

E.g.: Press button to call the user interface of Sine signal. Press **F1** button, the chosen menu item is highlighted, the focused parameter is displayed in Parameter bar 1. Press **F1** button to switch between Frequency/Period.

Two methods to change the chosen parameter:

- Turn the **knob** to change the value of cursor position in the Parameter bar. Press ◀ / ▶ direction key to move the cursor.
- Press a number key in the front panel, an input box will pop up; keep going to input the value. Press ◀ direction key to delete the last number. Press **F1** ~ **F3** to choose the unit, or press **F4** to go to next page and choose other units. Press **F5** to cancel the input.

Parameters of waveforms

Waveforms	Menu Items
Sine	Frequency/Period, Amplitude/High Level, Offset/Low Level
Square	Frequency/Period, Amplitude/High Level, Offset/Low Level, Duty
Ramp	Frequency/Period, Amplitude/High Level, Offset/Low Level, Symmetry
Pulse	Frequency/Period, Amplitude/High Level, Pulse Width/Duty, Edge Time
Noise	Amplitude/High Level, Offset/Low Level
Arbitrary	Frequency/Period, Amplitude/High Level, Offset/Low Level, Built-in Waveform, Editable Waveform

The User-Definable Waveform

Press button and press **F5** to select "Editable Wform".

Menu item	Instruction
Create Wform	Create a new waveform.
Select Wform	Select the waveform stored in internal storage (FLASH) or U disk (USBDEVICE).
Edit Wform	Edit the stored waveform.

How to Create a New Waveform

(1) **Enter the operation menu:** Press → Editable Wform → Create Wform.

(2) **Set the number of waveform points:** Press **F1** to select "Wform Points", turn the **knob** or press the number keys to input the desired value and choose the unit. X1, XK, XM respectively represent 1, 1000, 1000,000. The waveform points range is 2～1000,000.

(3) **Set the interpolation:** Press **F2** to switch between On/Off. If you choose On, the points will be connected with beelines; otherwise, the voltages between two consecutive points will not change, and the waveform looks like a step-up one.

(4) **Edit the waveform points**: Press **F3** to enter the operation menu.

- Press **F1** to choose "Points", input the number of the point to be edited.
- Press **F2** to choose "Voltage", input the voltage for the current point.
- Repeat the step above, set all the points to your needs.
- Press **F4** to choose "Store", enter the file system. If a U disk is connected, press ◀/▶ direction key to select the storage. "USBDEVICE" is the U Disk storage, "FLASH" is the internal storage. Choose Next level, enter the desired storage path, choose Save, an input keyboard pops up, input the file name, and then choose DONE.

How to Select a Stored Waveform

(1) **Enter the operation menu:** Press → Editable Wform → Select Wform.

(2) Enter the storage path of the desired waveform file. Turn the **knob** or press ◀/▶ direction key to select the desired waveform file.

(3) Choose Recall output.

How to Edit a Stored Waveform

(1) **Enter the operation menu:** Press → Editable Wform → Edit Wform.

(2) Enter the storage path of the desired waveform file. Turn the **knob** or press ◀/▶ direction key to select the desired waveform file.

(3) Choose Recall suppress.

How to Delete a Stored Waveform

(1) Press **Save** function button to enter the file system.

(2) Enter the storage path of the desired waveform file. Turn the **knob** or press ◀/▶ direction key to select the desired waveform file.

(3) Choose Delete.

To Generate the Modulated Waveform

Use the **Mod** button to generate modulated waveform. This series can modulate waveform using AM (Amplitude Modulation), FM (Frequency Modulation), PM (Phase Modulation), FSK (Frequency Shift Keying) and PWM (Pulse Width Modulation). To turn off the modulation, press the **Mod** button.

Parameters of modulated waveforms:

Types	Parameters
AM	Source Internal (Mod Shape, AM Frequency, Mod Depth) / Source External
FM	Source Internal (Mod Shape, Mod Frequency, FM Deviation) / Source External (FM Deviation)
PM	Source Internal (Mod Shape, PM Frequency, Phase Deviation) / Source External (Phase Deviation)
FSK	Source Internal (FSK Rate, Hop Frequency) / Source External (Hop Frequency)
PWM	Source Internal (Mod Shape, Mod Frequency, Duty Deviation) / Source External (Duty Deviation)

To Generate Sweep

In the frequency sweep mode, the generator "steps" from the start frequency to the stop frequency at the sweep rate you specify. Sweep can be generated by Sine, Square or Ramp Waveforms.

When the output signal is Sine, Square or Ramp waveform, press **Sweep** function button to enter the Sweep mode. The parameters as Sweep Time, Linear/Log, Start Frequency/Center Frequency, Stop Frequency/Frequency Span and Source are allowed to be set.

To Generate Burst

Using **Burst** function button can generate versatile waveforms in burst. Burst can last for certain times of waveform cycle (N-Cycle Burst), or to be controlled by external gated signals (Gated Burst). Bust can apply to Sine, Square, Ramp, Pulse and Arbitrary waveforms (Noise can not be used).
Parameters as Burst Period, Delay, Start Phase, Cycles/Infinite and Source are allowed to be set in N-Cycle mode; while Start Phase and Polarity are available in Gated mode.

Note:
For a burst, the maximum frequency of the used waveform is 25MHz. After pressing the **Burst** function button, if the frequency is greater than 25MHz, the generator will adjust it to 25MHz automatically.

To Save and Recall

Press **Save** function button to enter the file system.

To Use USB Storage

The storage location is divided into the internal storage (FLASH) and the U disk storage (USBDEVICE). When a U disk is connected, the storage menu will show "USBDEVICE" and "FLASH". Otherwise, the storage menu will show "FLASH" only.

(1) **Install the U disk**: insert a USB disk into the "⑩**USB Host port**" on the rear panel in *Figure 4-2*, and the screen will show "Detect USB device". Press **Save** function button to enter the file system, the storage menu will show "USBDEVICE" and "FLASH".

(2) **Enter the storage**: Turn the **knob** or press ◀/▶ direction key to choose the desired storage. Press **F1** to enter the chosen storage.

(3) **Remove the U disk**: Remove the U disk from the **USB Host port** on the rear panel. The system will inform you "The USB device is removed", and the "USBDEVICE" in the storage menu will disappear.

To Edit the File Name

In file system, the user can edit the name of a file or a folder. When the system needs the user to input a name, an input keyboard will appear.

(1) Turn the **knob** or press ◀/▶ direction key to move the cursor left and right in the keyboard. Press **F3** to switch between capital and small of the characters.

(2) Press **F1** to enter the current character. Press **F2** to delete the last character .

(3) Press **F4** to finish editing and save the file. Press **F5** to cancel the save operation.

Note: The length of file name is up to 15 characters.

To Set the Utility Function

Press **Utility** function key to enter the Utility Menu. You can set the parameters of the Generator such as: Display Parameter, Output Parameter, Interface Parameter and System Setting. Press **Utility** again to exit the Utility Menu.

Utility Menu items

Menu Item	Explanations
Display Setup	
Bright	Set the parameter of LCD brightness.
Separator	Set the separator of the displayed parameter.
Screen Saver	Time range is 1～999 minutes.
Output Setup	

Load	Used to match the displayed voltage with the expected one. The load range is 1Ω～10KΩ.
Sync On/Off	Enable/disable the Sync Signal on the Sync output terminal on the front panel.
DC	Turn on/off the DC output, you can set the DC voltage.
I/O Setup	
Band Rate	Switch the RS232 baud rate.
LAN	Set the network parameters when using LAN port
System	
Language	Switch display languages.
Power On	Switch between Default/Last
Set to Default	Set all the settings to default.
Beep	On is to activate the sound when the system informs you.
System Info	View the Version and Serial number.
Clock Source	Switch between Internal/External.

To Use Built-in Help

(1) Press **Help** function button, the catalog will display in the screen.

(2) Press **F1** or **F2** to choose help topic, or just turn the **knob** to choose.

(3) Press **F3** to view the details about the topic; press **F5** to go back to the catalog.

(4) Press **Help** again to exit the help, or just do other operations.

8. Communication with PC

This series support communications with a PC through USB, LAN or COM port. You can use the ultrawave communication software to set the parameters, control the output of the Waveform Generator, and synchronously display the screen of the Waveform Generator.

Here is how to connect with PC. First, install the ultrawave communication software on the supplied CD. Then there are several ways of connection to choose from.

Using USB Port

(1) **Connection:** Use a USB data cable to connect the **USB Device port** in the rear panel of the Waveform Generator to the USB port of a PC.

(2) **Install the driver:** When the Waveform Generator is turned on, a dialog will appear on the PC screen and guide you to install the USB driver. The driver is in the "USBDRV" folder under the directory where the ultrawave communication software is installed, such as "C:\Program Files\OWON\ultrawave\USBDRV".

(3) **Port setting of the software:** Run the ultrawave software; click "Communications" in the menu bar, choose "Ports-Settings", in the setting dialog, choose "Connect using" as "USB". After connect successfully, the connection information in the bottom right corner of the software will turn green.

Using LAN Port

Connect directly

(1) **Connection**. Plug in the LAN cable to the LAN port in the rear panel of the Waveform Generator; plug the other end into the interface of the computer.

(2) **Set the network parameters of the computer**. Since the Waveform Generator can not support obtaining an IP address automatically, you should assign a static IP address. Here we set the IP address to 192.168.1.71.

(3) **Set the network parameters of the ultrawave software.** Run the software on the computer, choose the "Ports-settings" of the "Communications" menu item. Set "Connect using" to LAN. About the IP, the first three bytes is same as the IP in the step (2), the last byte should be different. Here, we set it to 192.168.1.99. The range of the port value is 0～4000, but the port which under 2000 is always be used, so it is suggested to set it to the value above 2000. Here, we set it to 3000.

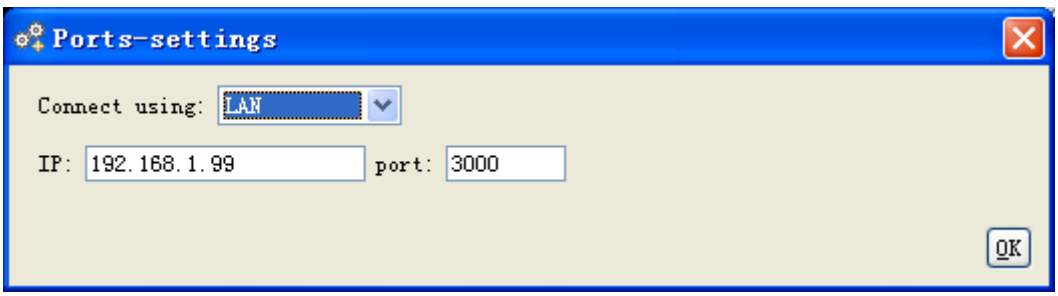

Figure 8-1: Set the network parameters of the ultrawave software

(4) **Set the network parameters of the Waveform Generator**. In the Waveform Generator, press **Utility** and choose **I/O Setup**, press **F2** to choose LAN, enter the submenu. Set the **IP Addr** and the **Port** to the same value as the "Ports-settings" in the software in step (3). After restarting the Waveform Generator, if you can get data normally in the ultrawave software, the connection is successful.

Connect through a router

(1) **Connection**. Use a LAN cable to connect the Waveform Generator with a router, the LAN port of the Waveform Generator is in the rear panel; the computer should be connected to the router too.

(2) **Set the network parameters of the computer**. Since the Waveform Generator can not support obtaining an IP address automatically, you should assign a static IP address. The Default gateway and Subnet mask should be set according to the router. Here we set the IP address to 192.168.1.71, Subnet mask is 255.255.255.0, Default gateway is 192.168.1.1.

(3) **Set the network parameters of the ultrawave software.** Run the software on the computer; choose the "Ports-settings" of the "Communications" menu item. Set "Connect using" to LAN. About the IP, the first three bytes is same as the IP in the step (2), the last byte should be different. Here, we set it to 192.168.1.99. The range of the port value is 0～4000, but the port which under 2000 is always be used, so it is suggested to set it to the value above 2000. Here, we set it to 3000.

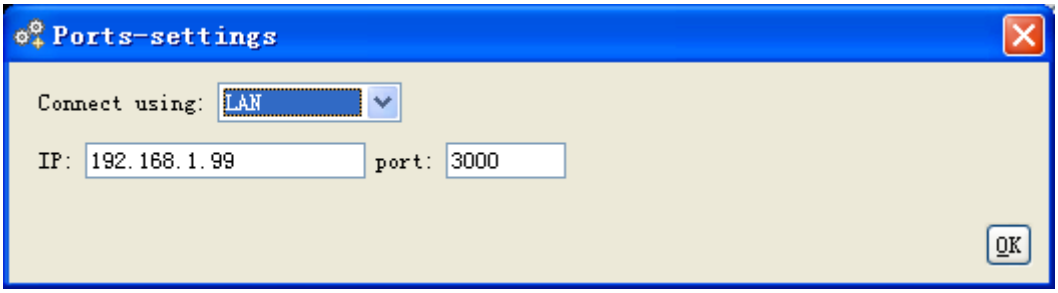

Figure 8-2: Set the network parameters of the ultrawave software

(4) **Set the network parameters of the Waveform Generator**. In the Waveform Generator, press **Utility** and choose **I/O Setup**, press **F2** to choose LAN, enter the submenu. Set the **IP Addr** and the **Port** to the same value as the "Ports-settings" in the software in step (3). The GateWay should be set according to the router. After restarting the Waveform Generator, if you can get data normally in the ultrawave software, the connection is successful.

Using COM Port

(1) **Connection**. Use a data cable to connect the **COM port** in the rear panel of the Waveform Generator, to the COM port of a PC.

(2) **Port setting of the software:** Run the ultrawave software; click "Communications" in the menu bar, choose "Ports-Settings", in the setting dialog, choose "Connect using" as COM.

To learn about how to operate the software, you can press F1 in the software to open the help document.

9. Appendix

Appendix A: Enclosure

Standard Accessories:

- A power cord that fits the standard of the destination country
- A USB cable
- A CD (PC link application software)
- A Quick Guide
- A BNC/Q9 cable

Appendix B: General Care and Cleaning

General Care

Do not store or leave the instrument where the liquid crystal display will be exposed to direct sunlight for long periods of time.

Caution: To avoid any damage to the instrument, do not exposed it to any sprays, liquids, or solvents.

Cleaning

Inspect the instrument as often as operating conditions require.
To clean the instrument exterior, perform the following steps:

1. Wipe the dust from the instrument surface with a soft cloth. Do not make any scuffing on the transparent LCD protection screen when clean the LCD screen.
2. Disconnect power before cleaning your instrument. Clean the instrument with a wet soft cloth not dripping water. It is recommended to scrub with soft detergent or fresh water. To avoid damage to the instrument, do not use any corrosive chemical cleaning agent.

Warning: Before power on again for operation, it is required to confirm that the instrument has already been dried completely, avoiding any electrical short circuit or bodily injury resulting form the moisture.