



NuDC-4U

User Manual

Foreword

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Contact Information

Xtramus Technologies

E-mail: sales@xtramus.com

Website: www.xtramus.com

Tel: +886-2-8227-6611

Fax: +886-2-8227-6622

Revision History

Date	USM Version	History
August, 2009	1.0	First draft version
August, 2010	2.0	Changing manual format, adding new features, and revising all previous manual.
August, 2010	2.1	Applying new warranty in Foreword section. Adding notifications regarding about NuDC-4U's Parallel Connection Mode.
2010/10/25	2.1	1. Change Revision History Date Format. 2. Remove the "Draft" watermark.

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1. NuDC-4U Overview

1.1. General Description of NuDC-4U

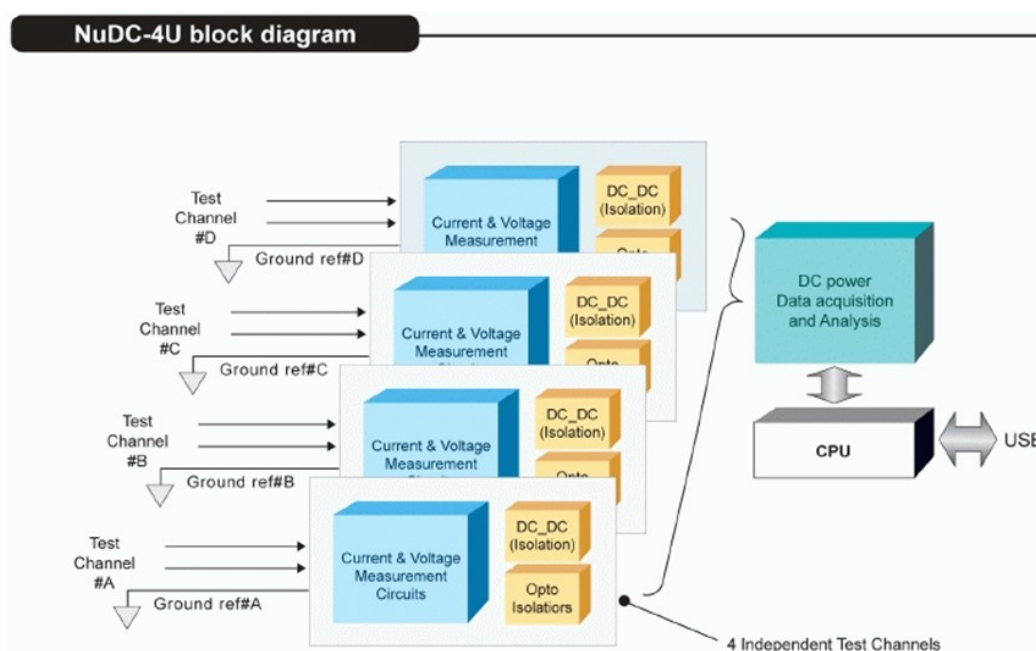
NuDC-4U is an innovative product that provides better solution for power probing. Common DC power statistics including voltage, ampere and even the watt can be read instantly via NuDC-4U. Moreover, up to 4 sets of individual powers can be monitored simultaneously and the LCD screen can also display the maximum and minimum value of the current power during the test.



Besides displaying real-time power status, NuDC-4U can also record all variation of power status and export it to PC via mini-USB port. When conducting long-time tests, NuDC-4U can automatically and periodically save test logs to the folder in PC that users defined previously. Therefore, no testing data will be lost during long testing periods. If the hardware fails, problems can be tracked down and analyzed easily. Also, NuDC-4U can send e-mails to the user-defined e-mail address whenever an error occurs, making it less likely for engineers to miss any crucial test results in a long testing time.

NuDC-4U has the ability to record 4,000 sample data within a second. However, in order to prevent PC crash or lag caused by the enormous data flow, users can define the Display Rate with the utility software. By defining Display Rate, users can set how many data should be sampled within 4,000 sample data generated per second. Not only preventing PCs from crashing or lagging, but this feature also provides more accurate maximum, minimum, and average values of the test.

For different testing requirements, NuDC-4U also has various optional accessories available. These optional accessories include: USB interface for testing USB device power status, DC jack interface for various sizes of the DC jack connectors, PoE interface for devices support Power over Ethernet, bare wire connections for devices with no DC connectors, and mini daughter boards for PCB and SMD.



1.2. Key Features & Main Applications of NuDC-4U

Key Features of NuDC-4U:

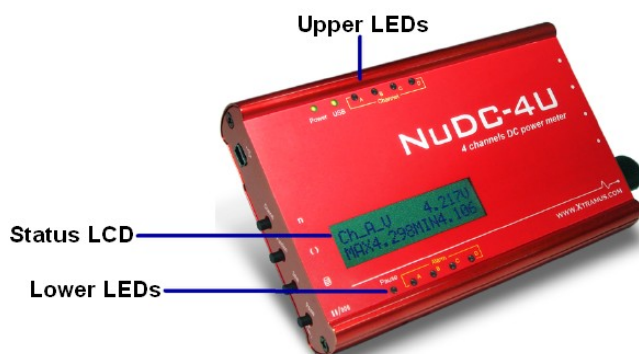
- Monitor 4 DC power sources channels simultaneously
- Voltage and current in each channel can be monitored at the same time
- Using mini-USB port as power source, as well as interface for accessing logs and utilities on PCs
- Utility softwares with oscilloscope-like user-interface with advanced functions such as split-screen, curve select switch, resizing and overlapping
- When connecting to PC via mini-USB port, GUI utility softwares can provide long-time statistics in diagrams
- LCD screen embedded on NuDC-4U with real-time statistic displaying function
- Various instant-readiness optional accessories
- E-mail notification by pre-defined alarm criteria from users
- High speed and accurate measurement of voltage, current and watt
- High speed and precise digitizing capture of power status
- Detection range from $\pm 0.1V$ to $\pm 70V$, 10mA to 8A and 0.001W to 560W
- Detection current is up to 16A if circuits are connected in parallel by ASSY-DC SC4S accessory board

Main Applications of NuDC-4U:

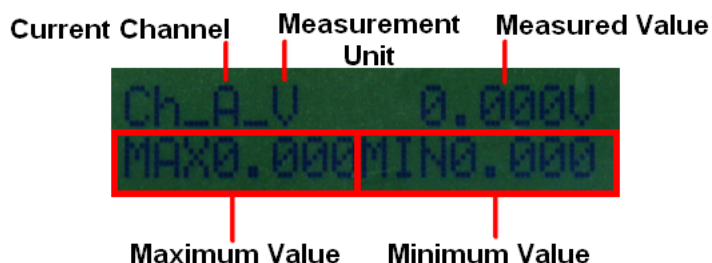
- Debug DC power problem of circuit board
- Long term monitoring of DC power supply
- Warning of unstable DC power supply
- Trace specified power status events
- Compare variation of the same test circuit design on different DUT.
- Detect degradation of electronic component.

1.3. NuDC-4U Panel Functions Overview

Front Panel



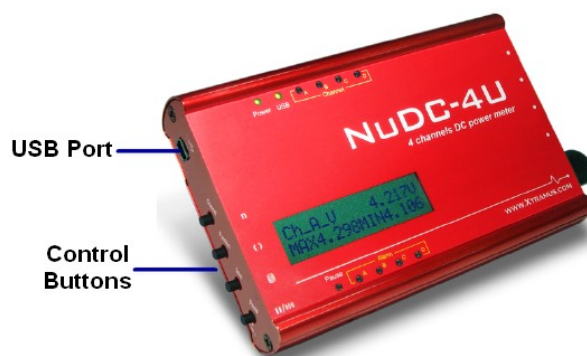
LEDs	Label	Status	Description
Upper LEDs	Power	ON	NuDC-4U is power on and ready for tests
		OFF	NuDC-4U is power off
	USB	ON	NuDC-4U is connected to PC via USB cable
		OFF	NuDC-4U is NOT connected to PC via USB cable
	Channel A ~ D	Yellow	Channel A/B/C/D is connected to a power-on DUT
		Green	Channel A/B/C/D is connected to a power-off DUT
Blinking Green		Channel A/B/C/D is connected to a power-off DUT, and Power Status of channel A/B/C/D are displayed on LCD	
Lower LEDs	Pause	ON	Pausing current Power Status readings displayed on LCD
		OFF	Power Status readings is displaying on LCD in real-time
	Alarm A ~ D	ON	Current power status of channel A/B/C/D exceeds pre-set alarm criteria
		OFF	Current power status of channel A/B/C/D is under pre-set alarm criteria, or no alarm criteria is not configured





NuDC-4U is embedded with a 2x16 characters LCD for displaying NuDC-4U system and power status.

Item	Mark	Description
Current Channel	Ch_X	Show power status of current channel. "X" represents the 4 channels of NuDC-4U: A, B, C, and D
Measurement Unit	-V / -I / -W	Unit of power status: <ul style="list-style-type: none"> ➤ V: Voltage ➤ I: Ampere ➤ W: Watt
Measured Value		Current value in Volt, Ampere or Watt
Maximum Value	MAX	Maximum value during the test period
Minimum Value	MIN	Minimum value during the test period

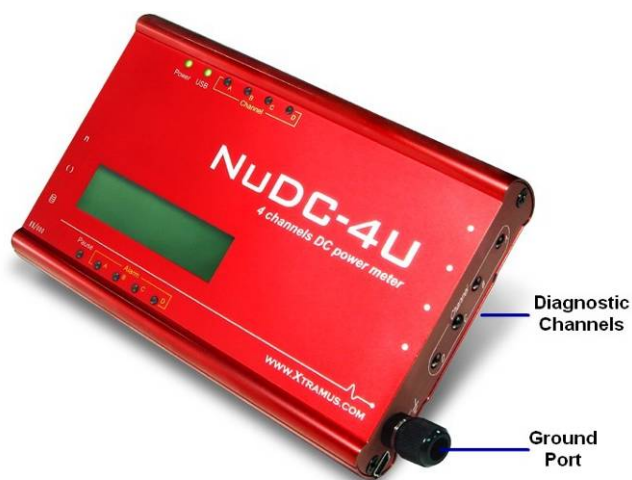
Left Panel




Button	Action	Description
n	Press (Once or more)	Channel selection button: Select the channel (A/B/C/D) status that will be shown on LCD. To switch channel A/B/C/D, pressing this button multiple times until your choice is displayed on LCD.
()	Press (Once or more)	Function selection button: Switch value between voltage, ampere or watt on LCD. To switch voltage/ampere/watt, pressing this button multiple times until your choice is displayed on LCD.
	Press Once	Save maximum and minimum power status of all 4 channels
/000	Press Once	Pause/Clear button: Pause reading on LCD of all channels
	Hold 2 Seconds	Pause/Clear button: Clear maximum and minimum value of selected channel

Port	Label	Description
Mini-USB		Serve as NuDC-4U's power source and data transmitting/receiving port.

Right Panel



Port	Label	Description
Diagnostic Channel A ~ D	A/B/C/D	Channel A/B/C/D diagnostic port. There are two cords inside each diagnostic channel and works with ground port (mentioned below) as a pair.
Ground port		Ground port to DUT that work with diagnostic port as a pair.

2. DUT Power Status Measurement

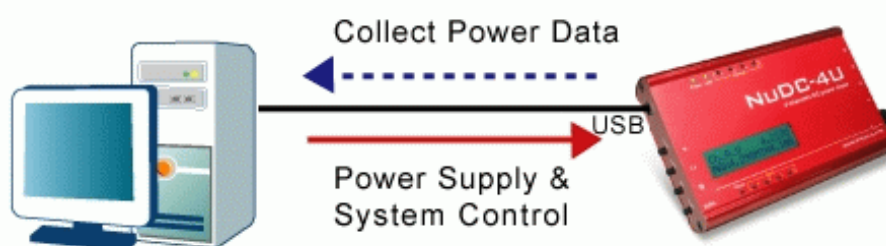
The following chapter will guide you with wiring/connecting your DUT with NuDC-4U and performing DUT power status measurement.

Hardware Installation

There are several accessories provided for the connection to most of DC powered device. Please read the instruction below.

2.1. Connecting NuDC-4U with PC

Connect USB port of NuDC-4U to PC or external power adaptor. If it is connected to PC, PC can control and also provides power to the NuDC-4U.



2.2. Connecting NuDC-4U with PCB

Connect USB port of NuDC-4U to PC or external power adaptor. If it is connected to PC, PC can control and also provides power to the NuDC-4U.

➤ Connection of ground pole

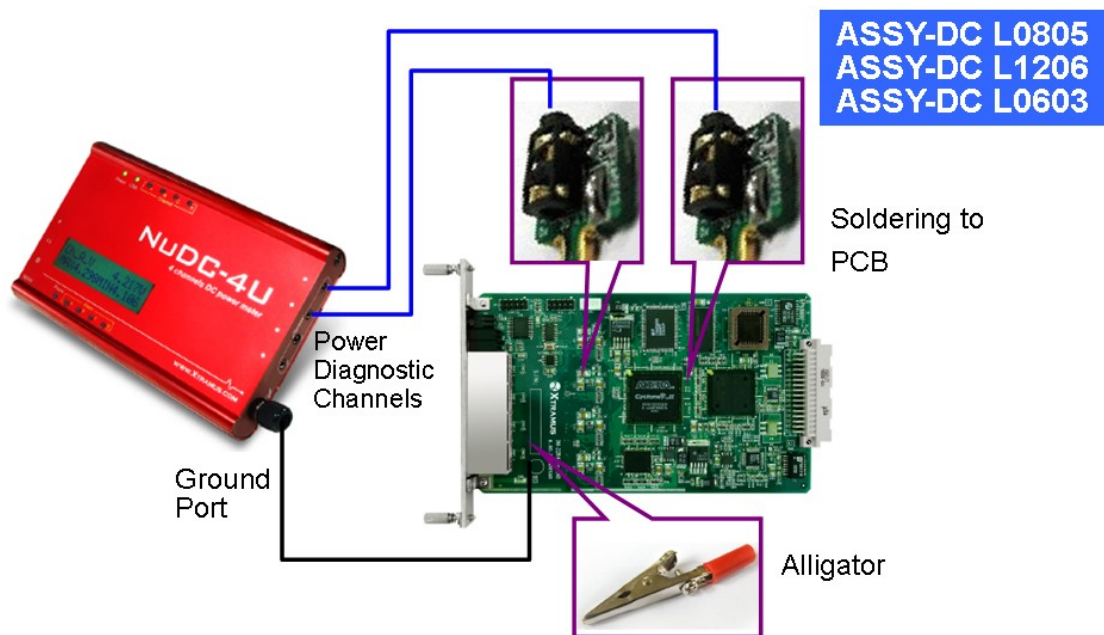
In the design of PCB, it should have ground PIN for the test purpose. All components use the same ground (negative pole) and all ground conductors are linked together electronically. Connect the ground (negative pole) to the ground connector of NuDC-4U. Several accessory daughter boards can be soldered on the same PCB and use the same ground PIN.

➤ Connection of diagnostic channel

There are two conductors inside a channel port. Solder the two conductors (C&B) to the both side (Y&Z) of the component under test by optional accessories. There is no difference if user swaps the sequence of wire. For example, solder wire C to Y location and solder wire B to Z location.

ASSY-DC L0805, L1206, and L0603 are mini daughter boards with two soldering conductors for soldering on PCB (printed circuit board). Two conductors of the accessory can be soldered on the surface of PCB. The three accessories have different conductor width for testing on PCB with different width of soldering points.

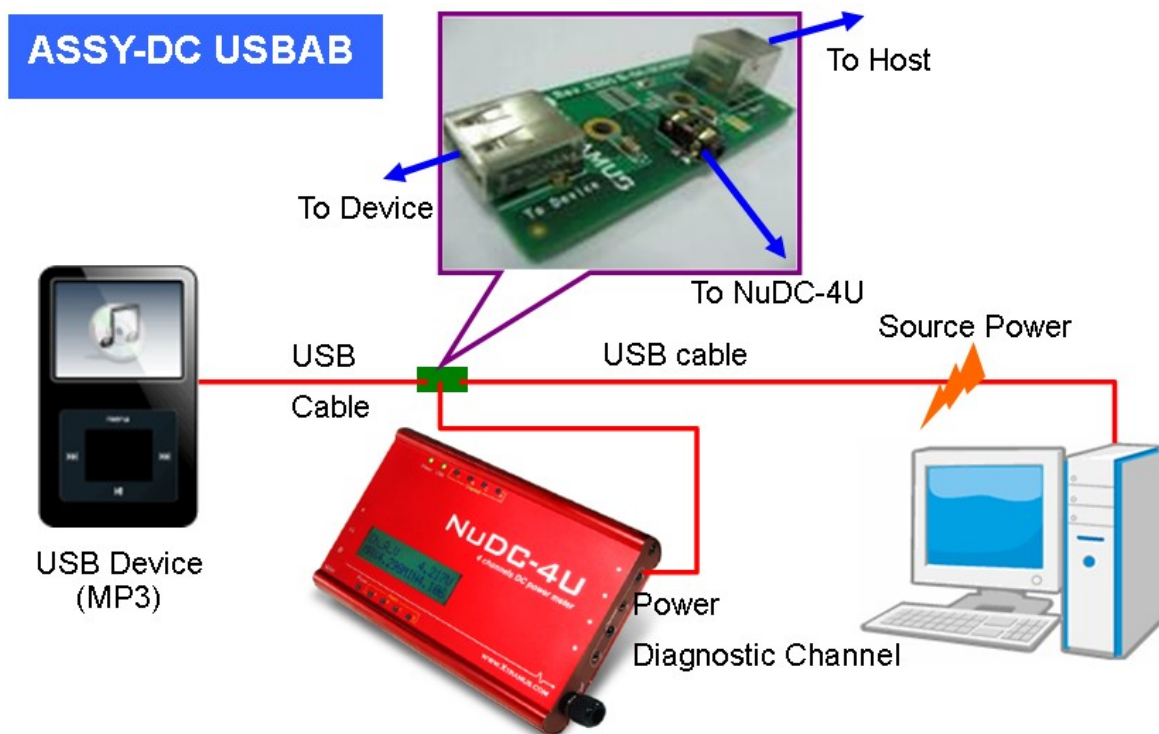
Up to 4 channel of measurement points can be measured simultaneously.



2.3. Connecting NuDC-4U with USB Device

For USB device, Xtramus provides optional accessory ASSY-DC USBAB for the test. It is a connection board for monitoring the power status of USB device. Ports of ASSY-DC USBAB are all female ports.

Connecting ASSY-DC USBAB between the PC (or a USB power adaptor) and the USB device. After that, connect NuDC-4U in order to monitor the power status.

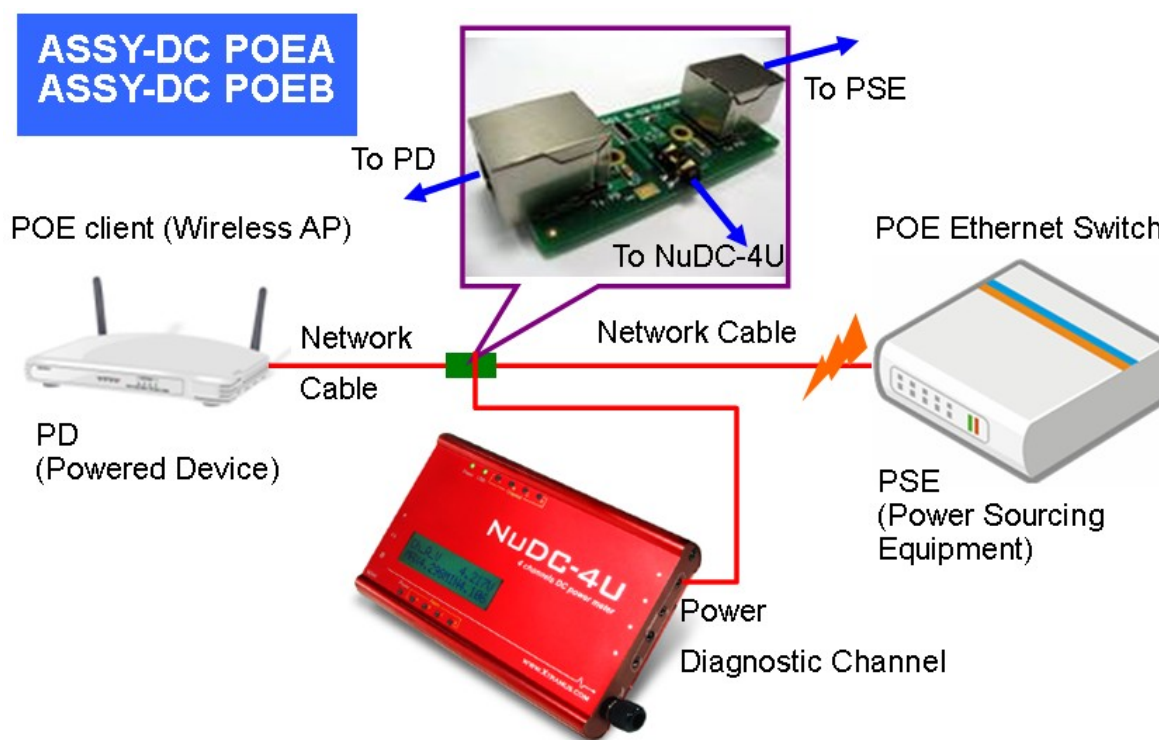


2.4. Connecting NuDC-4U with PoE (Power over Ethernet) Device

For PD device of PoE, Xtramus provides optional accessories ASSY-DC POEA, ASSY-DC POEB for the test. It is a connection board for monitoring the power status of PSE device.

- **PoE (Power over Ethernet):** Power over Ethernet or PoE technology (commonly referred as IEEE 802.3af) describes a system able to transfer electrical power, along with data, to remote devices over standard twisted-pair cable in an Ethernet network.
- **PSE (Power Sourcing Equipment):** Power Sourcing Equipment is a device (Ethernet Switch for instance) that will be the power source in a PoE structure.
- **PD (Powered Device):** A powered device is a device powered by a PSE.

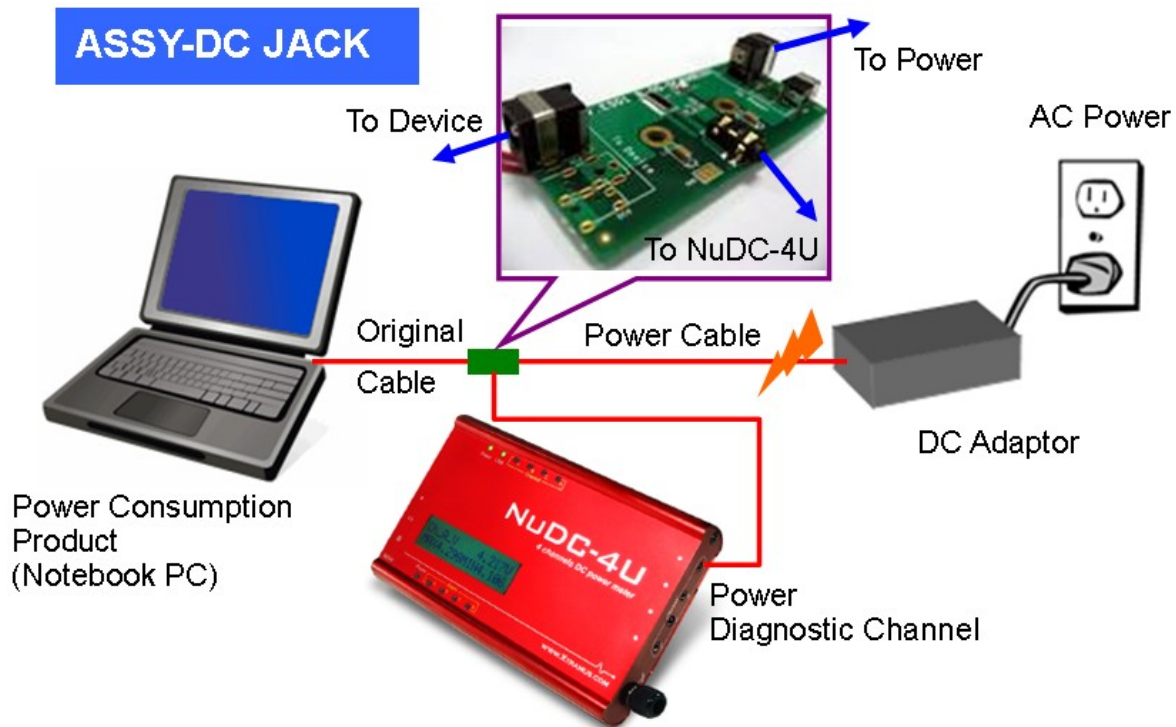
Connect this board between PoE switch and the PD device. After that, connect NuDC-4U in order to monitor the power status.



2.5. Connecting NuDC-4U with DC Plug Socket Device

For DC powered device that has DC plug socket, Xtramus provides optional accessories ASSY-DC JACK for the test. ASSY-DC JACK is a connection board for monitoring the power status of devices with DC jacks. The specifications of DC jacks may be different in core diameters. Before connecting ASSY-DC JACK to the testing device, please be sure that the size of the DC jacks are matched.

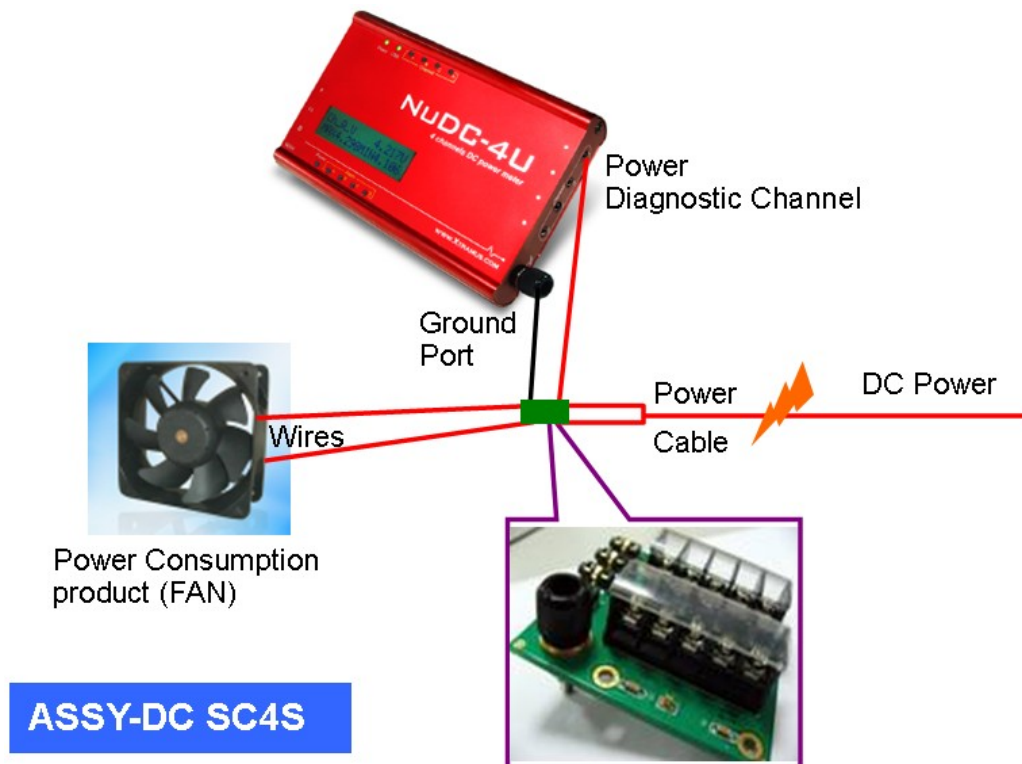
Connect this board between power adaptor and the device that consume DC power. After that, connect NuDC-4U in order to monitor the power status.



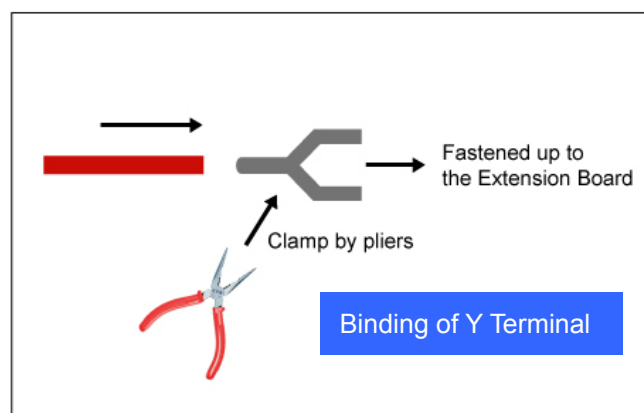
2.6. Connecting NuDC-4U with Other DC Powered Device

For other devices powered by DC, their connectors may be varied. It is difficult to have power analysis equipment that has all connectors for all DUT. To solve the problem, fasten up the wire to the extension board ASSY-DC SC4S directly is the simple way.

ASSY-DC SC4S is a connection board for monitoring the power status of DC powered device. Connect this extension board between the DC power source and the power consumption device. After that, connect NuDC-4U for monitoring the power status.



The simplest way is to fasten up the wire to the extension board directly. Also, clamping the Y-shape terminal and then fasten it up to the extension board can fasten the wire tighter and more stable.



2.7. Other Testing Gadgets

Users can make their own power testing tools with most common gadgets listed below:

➤ Alligator Clip

With its spring-loaded jaws, an alligator clip can grip DUT's conductor firmly. However, please be sure that both of the alligator clip's jaws are gripping DUT's conductors properly before performing power tests. If the alligator clip's jaws are not gripping DUT's conductors properly, short circuit might occur.



➤ Detection Probe

Commonly used for DVM, detection probes can also be used on NuDC-4U. You can hold the detection probes and probe DUT's conductors when performing power tests. However, please make sure that do not cross the metal part of two detection probes during DUT power test. Doing so might cause short circuit, and should be avoided.



3. Install/Uninstall NuDC-4U

NuDC-4U comes with GUI (graphic user interface) utility software for setting test criteria and system management. When NuDC-4U is connected with PC via a USB cable, you can set test criteria, save/view testing logs, and upgrade NuDC-4U's firmware/FPGA with NuDC-4U's utility software.

However, before using NuDC-4U utility's features and functions, you have to install it on your PC first. Please see the table down below for PC's system requirement for NuDC-4U Utility:

System Requirement for NuDC-4U Utility Software

OS	Windows XP	Windows Vista
CPU	800MHz CPU	1.6 GHz, 32 bits (x86) CPU
RAM	256MB RAM	1GB RAM
HDD	20MB available space	20MB available space

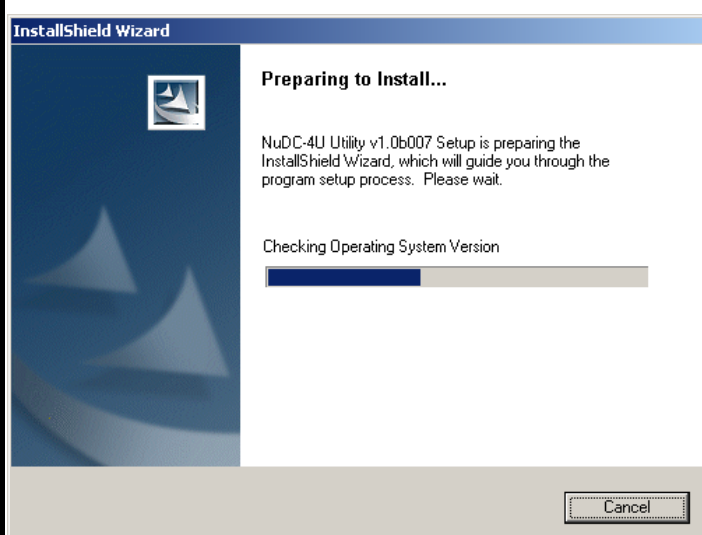
NuDC-4U's driver is contained in NuDC-4U's utility software. Both NuDC-4U's driver and utility software will be installed at the same time. Please note that DO NOT connect your NuDC-4U to the PC via USB cable before the installation.

Please follow the steps down below to install both NuDC-4U's driver and utility software.

NuDC-4U Utility Software Installation

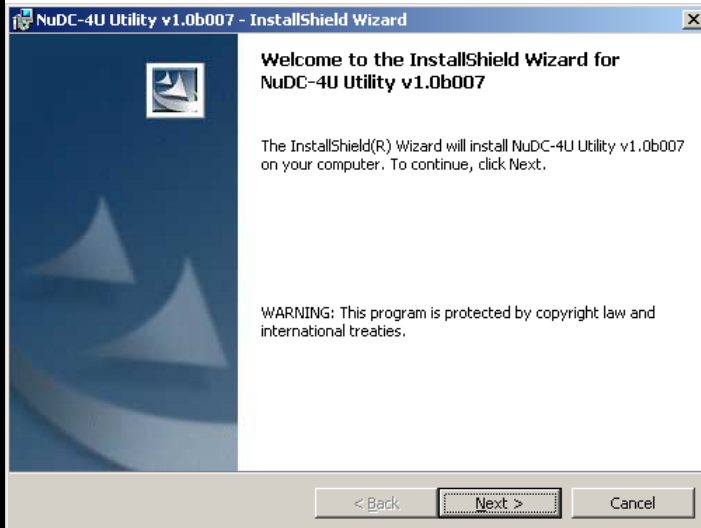


1. Double-click NuDC-4U installation program and start the installation process.



2. InstallShield Wizard is starting to install NuDC-4U. If you would like to cancel installation, click "**Cancel**".

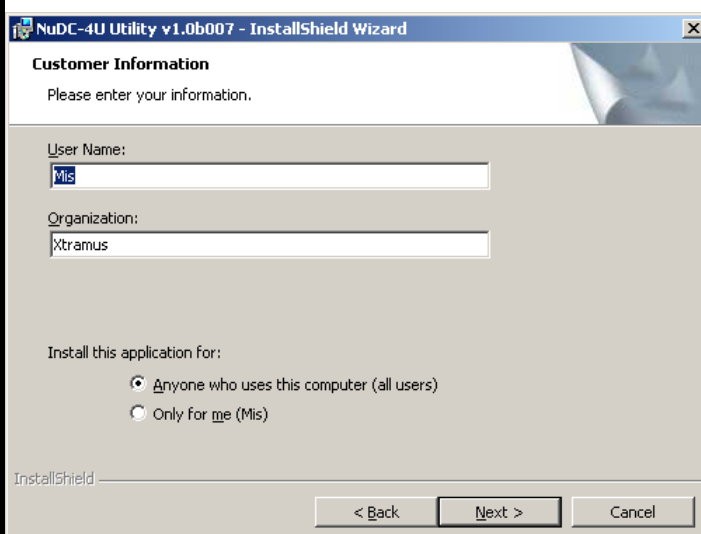
NuDC-4U Utility Software Installation



3. Click **"Next"** to continue installation.

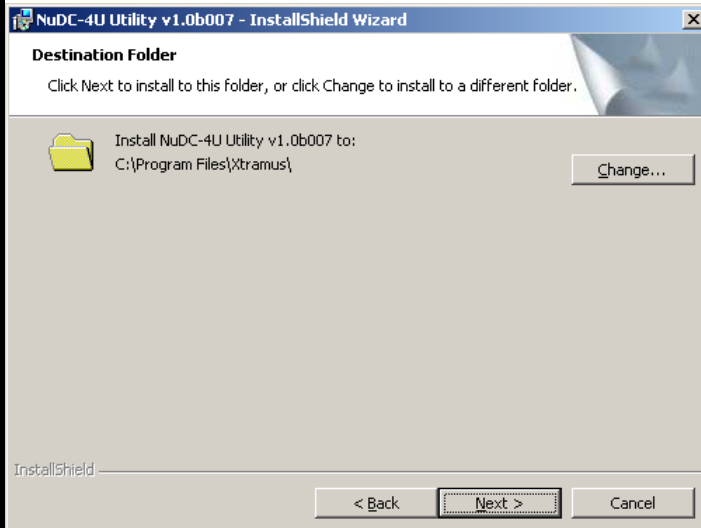


4. Click **"I accept the terms in the license agreement"**, and click **"Next"** to continue.

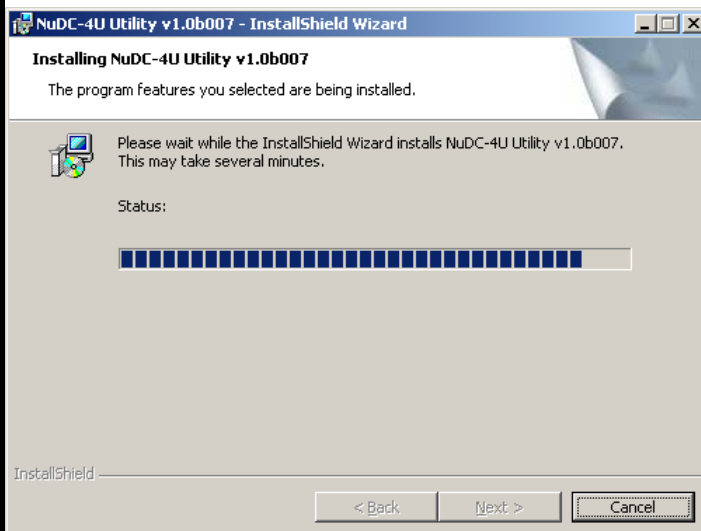


5. Input customer information (user name and name of organization) and click **Next** for next step.

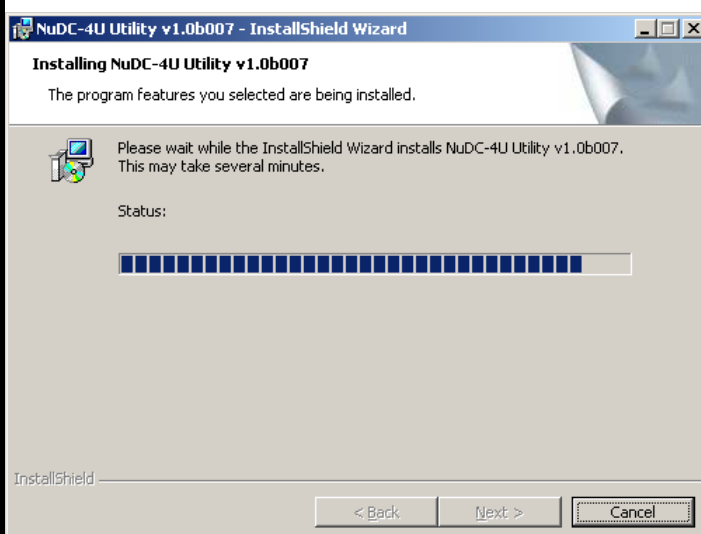
NuDC-4U Utility Software Installation



6. Click the **Change...** button to install the program to another folder, or click **Next** button to install the program into the default destination folder, and then continue next step. Click **Back** button to go back to the previous step to modify.

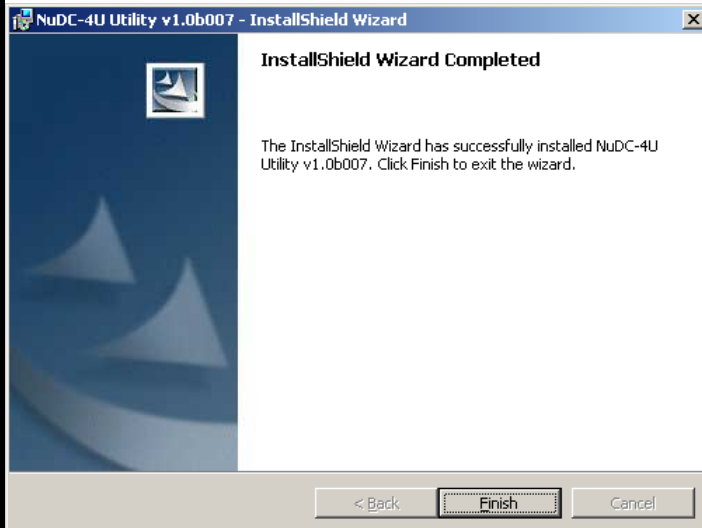


7. NUDC-4U InstallShield Wizard will start installing momentarily. Click **Install** button if the information is correct.



8. InstallShield Wizard is installing NUDC-4U.

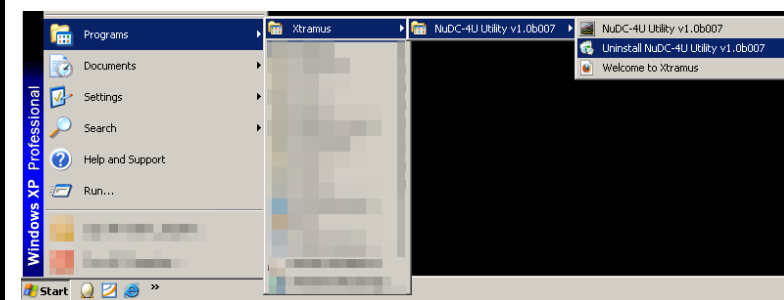
NuDC-4U Utility Software Installation



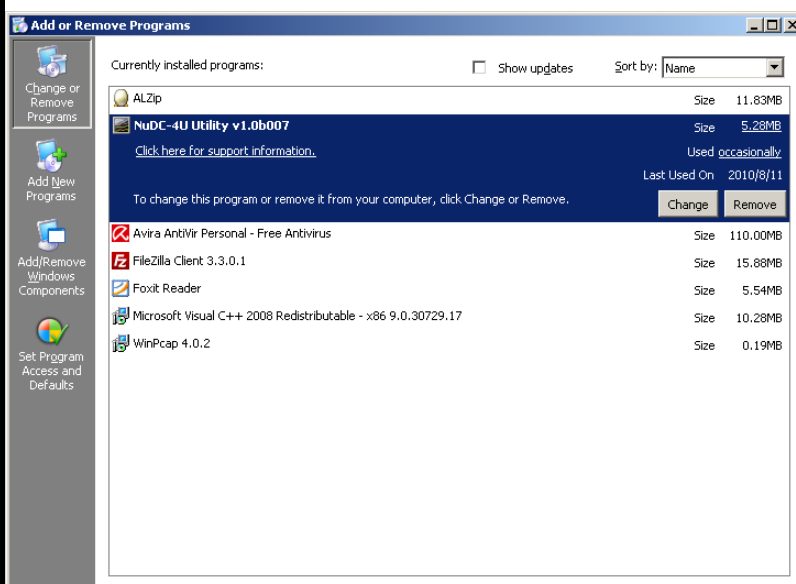
9. NUDC-4U installation completes. Click **Finish** button to exit.

There are two ways to uninstall NuDC-4U utility software:

NuDC-4U Utility Software Un-installation



- Click **Start** → **Programs** → **Xtramus** → **NUDC-4U Utility** → **Uninstall NUDC-4U Utility**.

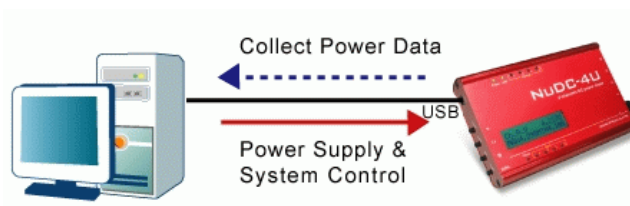


- Go to the **Control Panel**, choose **NUDC-4U Utility** from installed program list, and click **"Remove"** to uninstall.

4. NuDC-4U Utility Overview


4.1. Starting NuDC-4U Utility

Before starting NuDC-4U utility, please be sure that NuDC-4U is connected to your PC via a USB cable as shown in the figure down below:

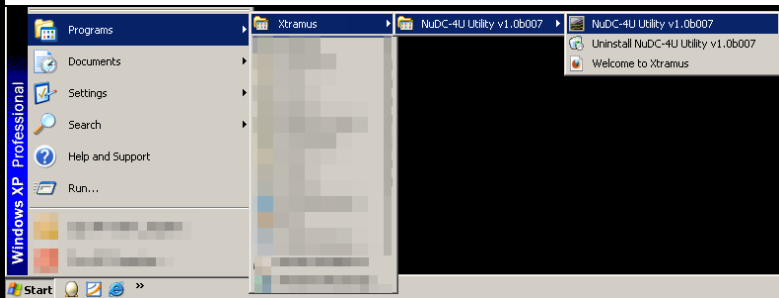


To start NuDC-4U utility, you can:

Starting NuDC-4U

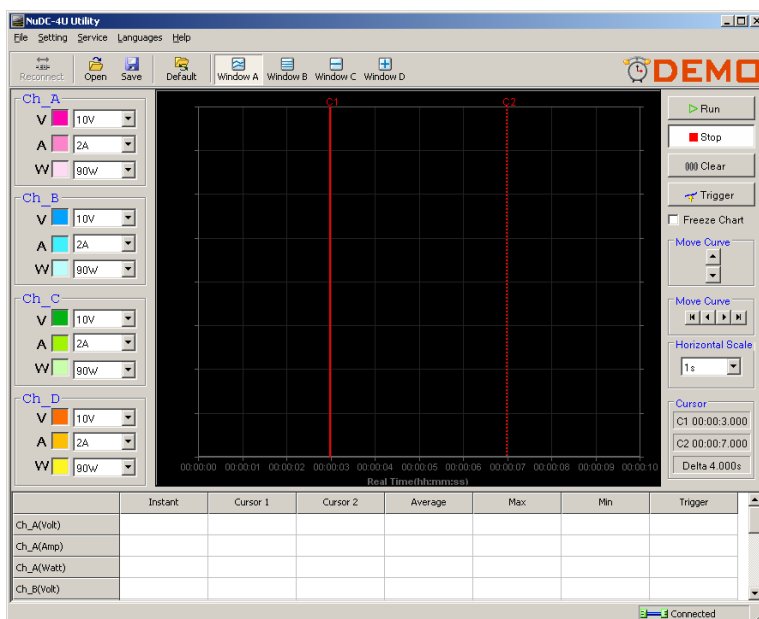


- Double-click NuDC-4U Utility icon located on your PC's desktop



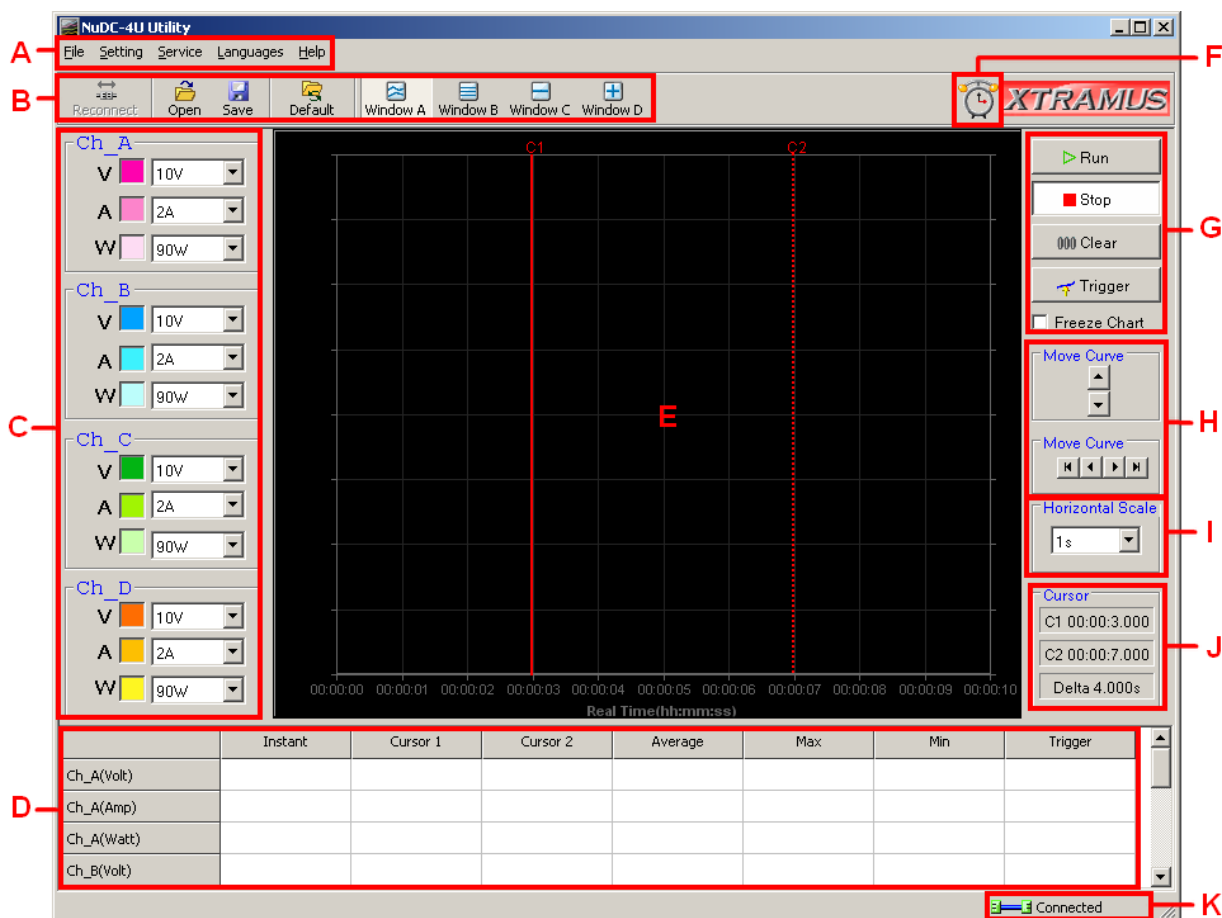
- Click **Start** → **Programs** → **Xtramus** → **NUDC-4U Utility** → **NUDC-4U Utility**.

If your PC is not connected with NuDC-4U, you can still run NuDC-4U utility under Demo Mode. Almost all NuDC-4U's functions are available under Demo Mode. However, please note that **Demo Mode is for system demo purposes only**, and does not serve any testing purposes at all.



4.2. NuDC-4U Main Window Overview

NuDC-4U Main Window



NuDC-4U Utility Functions Overview

A	Menu Bar	The Menu Bar allows you to make settings about test criteria, view/save test log, change language displayed, and update NuDC-4U's firmware/FPGA.
B	Quick Launch Buttons	The Quick Launch Buttons allow you to reconnect your PC to NuDC-4U, open/save test logs, and switching Main Display Screen display mode.
C	Power Measuring Scale	You can set the display scale (Voltage, Ampere, and Watt) for Channel A/B/C/D.
D	Real-time Statistic Table	Statistics regarding to the power test will be displayed here in this table.
E	Main Display Screen	Power test status will be displayed here in this chart.
F	Power Test Status	This icon will indicate if alarm happens during the test.
G	Test Control Buttons	The Test Control Buttons allow you to control the process of tests.
H	Curve Moving Buttons	You can move selected curve line displayed in Main Display Screen up/down/right/left.
I	Horizontal Scale Adjust	You can set the scale for the X-Axis of the Main Display Screen .
J	Cursor Time	This section shows the Cursor Time of C1/C2, and the time duration in-between C1 and C2.
K	USB Connection Status	This icon shows the connection status between your PC and NuDC-4U.

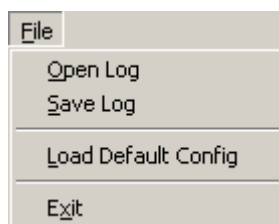
5. NuDC-4U Utility Functions

5.1. Menu Bar

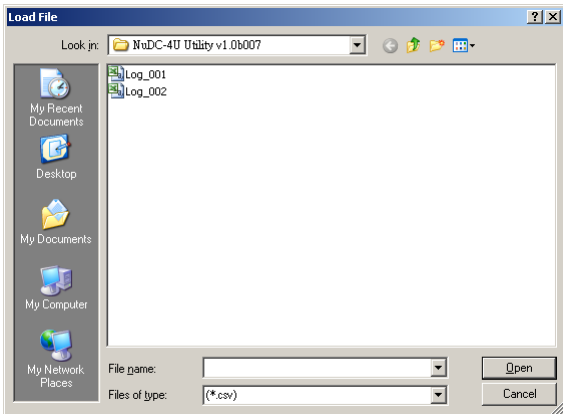
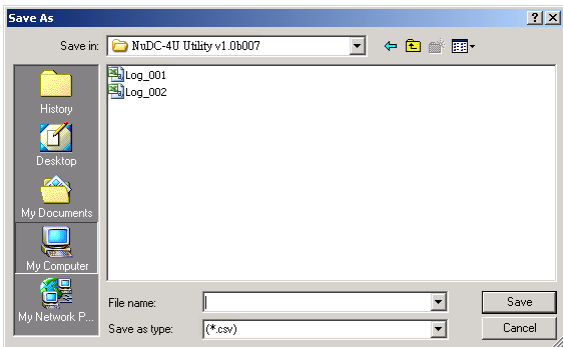
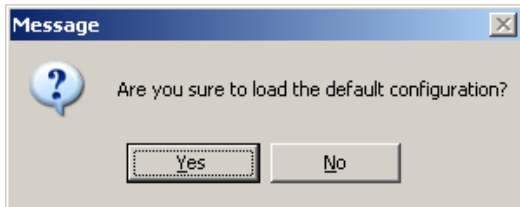
File Setting Service Languages Help

NuDC-4U utility software's **Menu Bar** contains configuration options such as **File**, **Setting**, **Service**, **Language**, and **Help**. Please refer to the sections down below for detail information regarding to each configuration option.

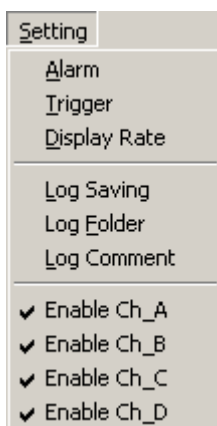
5.1.1. File



Function Descriptions – File

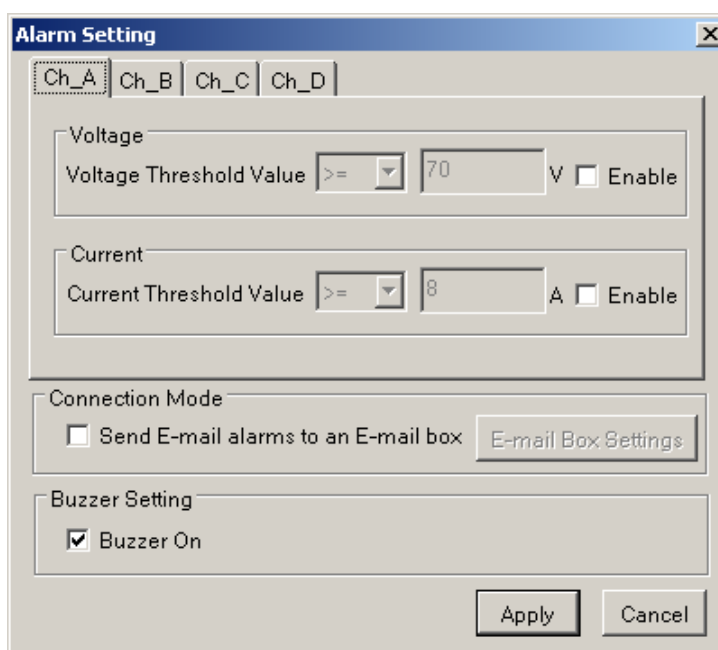
<p>Open Log</p>	<p>You can open previously saved log files with the Open Log function. All statistics regarding to the test log you chose will be displayed on D. Real-time Statistic Table and E. Main Display Screen.</p> <p>The default file path where all the test logs are saved is: "C:\NuDC-4U Utility.log".</p>	
<p>Save Log</p>	<p>You can save the current test result on your PC. All test logs are saved in the format of "*.csv".</p> <p>The default file path where all the test logs are saved is: "C:\NuDC-4U Utility.log".</p>	
<p>Load Default Config</p>	<p>The Load Default Config function allows you to set all NuDC-4U's settings to default value. Click YES to load NuDC-4U's default value, or click NO to cancel.</p>	
<p>Exit</p>	<p>A prompt pop-up window will ask if you are sure to exit APMPT-4. Click YES to exit NuDC-4U utility software, or click NO to cancel.</p>	

5.1.2. Setting



Function Descriptions – Setting

Alarm



When clicking **Alarm** on the **Menu Bar**, an **Alarm Setting** window will pop up, allowing you to make test alarm configurations.

- **Ch_A/B/C/D:** Clicking the **Ch_A/B/C/D** menu tabs allows you to switch alarm setting pages of Channel A/B/C/D.
- **Voltage/Current:** These two fields allow you to set alarm criteria for DUT's **voltage** (Volt) and **current** (Ampere). Click **Enable** check-box to start configuring alarm criteria. Click the scroll-down menu to set the condition for the voltage/current threshold value you input:
 - **>=:** If DUT's voltage/current value is greater or equal to the value you set here, system will issue an alarm.
 - **<=:** If DUT's voltage/current value is lesser or equal to the value you set here, system will issue an alarm.

Function Descriptions – Setting

Alarm (Continued)

E-Mail Setting

POP3 Server Address:

E-mail Box Account:

E-mail Box Password:

Sender's E-mail Address:

Destination E-mail Address:

E-mail Sending Interval (min):

- **Connection Mode:** NuDC-4U utility soft ware can send you e-mails if you enable “**Send E-mail alarms to an E-mail box**” function. If you click the “**E-mail Box Settings**” button after enabling this function, an **E-mail Setting** window will pop up. Please note that your PC must have Internet access to send alarm e-mails.
 - **POP3 Server Address:** Please input the POP3 server address of your e-mail here in this field.
 - **E-mail Box Account/Password:** Please input your e-mail’s account /password here in these fields.
 - **Sender’s E-mail Address:** Please input your e-mail address here.
 - **Destination E-mail Address:** Please input the e-mail address that you would like to send the alarm e-mails to.
 - **E-mail Sending Interval (min):** You can set the time interval between alarm e-mails here.
- **Buzzer Setting:** Click the **Buzzer On** check-box, NuDC-4U will buzz whenever the DUT’s voltage/current meets the alarm criteria you set.

*** Please note that when switching NuDC-4U's connection mode under Parallel Connection Mode, all Alarm settings will be DISABLED.**

Trigger

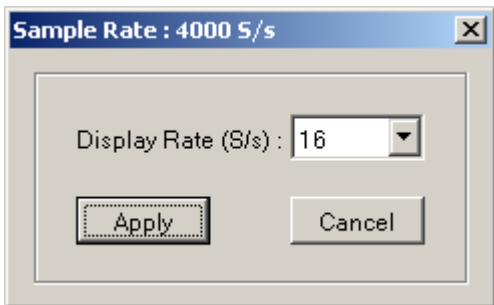
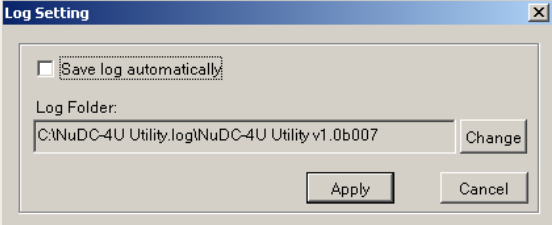
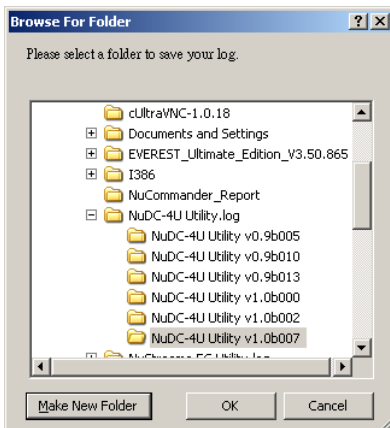
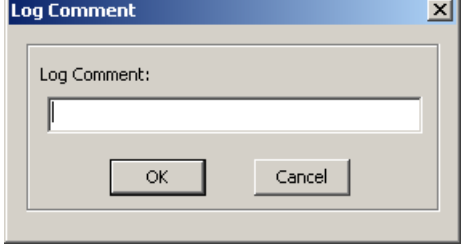
You can configure several sets of trigger condition with NuDC-4U utility for tracing certain cases or errors. Either Voltage, Current (ampere) or Power (watt) can be configured as a trigger condition. When the device under test meets these conditions (or in others words, equal to the value configured in the trigger condition), the trigger condition occurrence time will be recorded in the log.

[illegible]

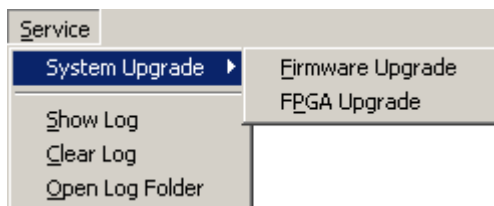
- **A:** Click the scroll-down menu to choose Channel A/B/C/D.
- **B:** Click the scroll-down menu to choose Voltage, Current, or Power.
- **C:** Click the scroll-down menu to set the condition (\geq or \leq) for the criteria value you set in **D**.
- **D:** You can set the criteria value here.
- **E:** Click **Add** to add the setting you've set to the **Trigger Table F** down below; or choose a trigger listed in **Trigger Table F**, and click **Delete** to delete it.
- **F:** The **Trigger Table**. All the criteria you've set will be displayed here.

Click **OK** to apply all the changes you've made, or click **Cancel** to exit.

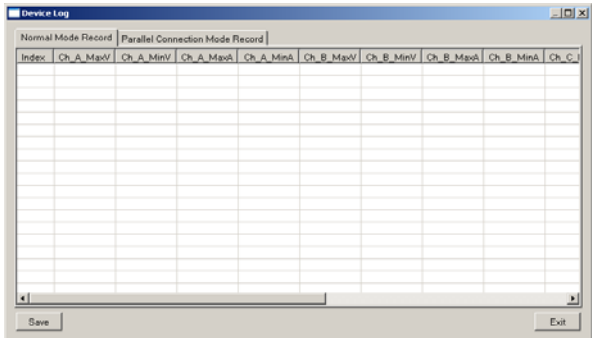
Function Descriptions – Setting

Display Rate	<p>When clicking Display Rate on the Menu Bar, a Sample Rate window will pop up, allowing you to set the display rate of the real-time chart on Main Display Screen.</p>	 <p>The Sample Rate dialog box shows the current display rate as 4000 S/s. It includes a dropdown menu for 'Display Rate (S/s)' with the value 16 selected. There are 'Apply' and 'Cancel' buttons at the bottom.</p>
Log Saving	<p>When clicking Log Saving on the Menu Bar, a Log Setting window will pop up. You can set if you would like to Save log automatically by clicking the check box, or change the file folder for saving test logs by clicking the Change button.</p> <p>For more information regarding to changing log folder, please refer to Log Folder section listed down below.</p>	 <p>The Log Setting dialog box has a checkbox for 'Save log automatically'. Below it is a text field for 'Log Folder' containing 'C:\NuDC-4U Utility.log\NuDC-4U Utility v1.0b007'. There are 'Change', 'Apply', and 'Cancel' buttons.</p>
Log Folder	<p>When clicking Log Folder on the Menu Bar, a Browse for Folder window will pop up. You can set the folder for saving test logs here in this window.</p> <ul style="list-style-type: none"> • Make New Folder: Click this button to create a new folder in the current file path. • OK/Cancel: Click OK to apply all the changes you've made, or click Cancel to exit this window without changing anything. 	 <p>The Browse for Folder dialog box shows a file explorer view with various folders. At the bottom, there are 'Make New Folder', 'OK', and 'Cancel' buttons.</p>
Log Comment	<p>You can enter comments for the current test in the pop-up Log Comment window.</p>	 <p>The Log Comment dialog box has a text area for 'Log Comment:' and 'OK' and 'Cancel' buttons at the bottom.</p>
Enable Ch_A/B/C/D	<p>You can set to enable/disable Channel A/B/C/D by clicking Enable CH_A/B/C/D. Channels that are enabled have a check mark "✓" before it.</p>	

5.1.3. Service



Function Descriptions – Service

System Upgrade	<p>You can upgrade NuDC-4U's firmware or FPGA (Field Programmable Gate Array) with System Upgrade function.</p> <p>For detail information regarding to updating NuDC-4U's firmware or FPGA, please refer to 6.2. Upgrading NuDC-4U's Firmware/FPGA.</p>
Show Log	 <p>All test statistics will be displayed in the pop-up Device Log window. You can click the Normal Mode Record or Parallel Connection Mode Record menu tabs to view test logs.</p>
Clear Log	Clear all the statistics listed in Device Log .
Open Log Folder	Open the folder where all test logs are saved.

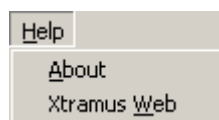
5.1.4. Languages



Function Descriptions – Languages

English	Switch NuDC-4U utility software's language display to English .
Simplified Chinese	Switch NuDC-4U utility software's language display to Simplified Chinese .

5.1.5. Help



Function Descriptions – Help

About	An " About " window will pop up and show detailed system information.
Xtramus Web	Access Xtramus Website (www.xtramus.com).

5.2. Quick Launch Buttons





5.2.1. Reconnect

Function Descriptions – Reconnect



If the USB connection between your PC and NuDC-4U is down, a **“Disconnected”** icon  will be shown in **“USB Connection Status”**.



Press **Reconnect** button  to re-establish the connection between your PC and NuDC-4U. If the connection has been established successfully, the **“USB Connection Status”** will be shown as **“Connected”** .

5.2.2. Open

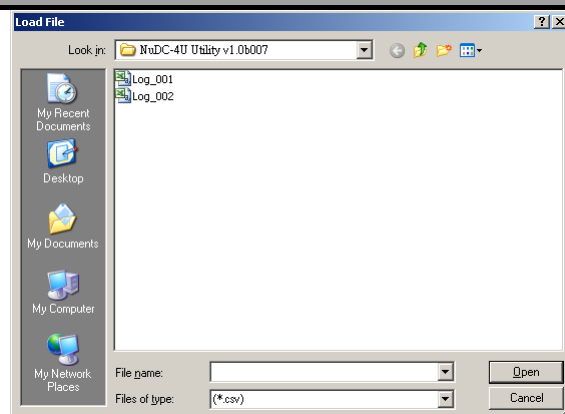
Function Descriptions – Open



The **Open** button serves the same functions as **Open Log** function on the **Menu Bar**.

You can open previously saved log files with the **Open Log** function. All statistics regarding to the test log you chose will be displayed on **D. Real-time Statistic Table** and **E. Main Display Screen**.

The default file path where all the test logs are saved is: **“C:\NuDC-4U Utility.log”**.



5.2.3. Save

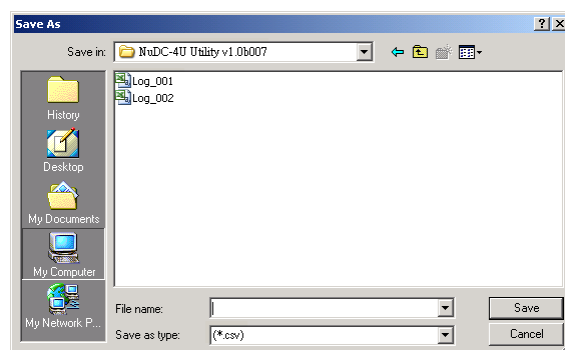
Function Descriptions – Save



The **Save** button serves the same functions as **Save Log** function on the **Menu Bar**.

You can save the current test result on your PC. All test logs are saved in the format of **“*.csv”**.

The default file path where all the test logs are saved is: **“C:\NuDC-4U Utility.log”**.



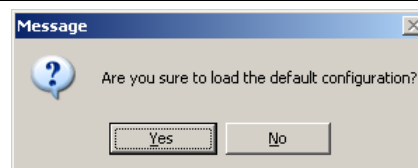
5.2.4. Default

Function Descriptions – Default



Default

Click this button to set all criteria you set to the default value. A message window will pop up. Click **YES** to set all criteria to the default value, or click **NO** to cancel.



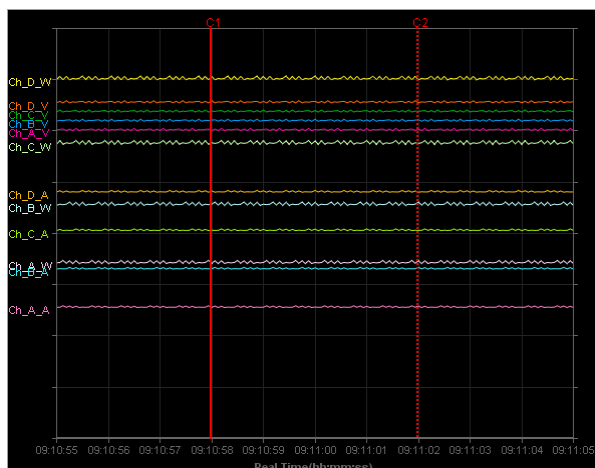
5.2.5. Window A/B/C/D

Function Description – Window A/B/C/D

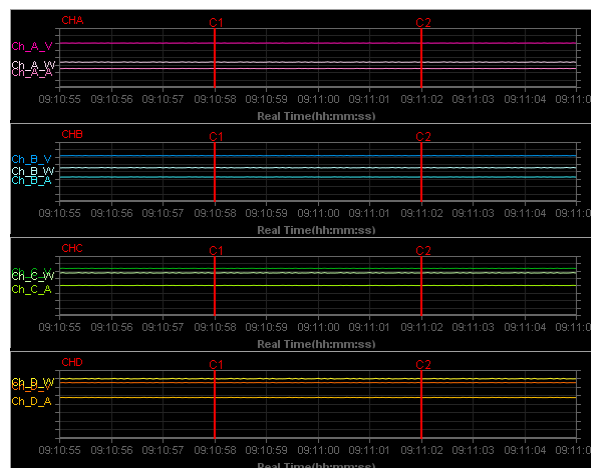


By clicking these four buttons (**Window A/B/C/D**), you can set different display mode for the **Main Display Screen**.

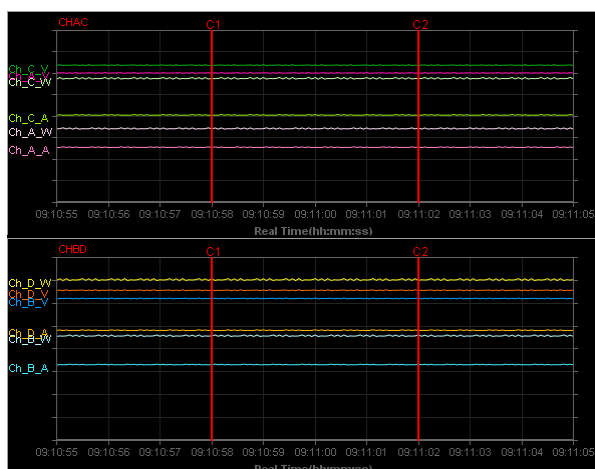
One Chart Mode: Display statistics of Window A Channel A/B/C/D in the same chart.



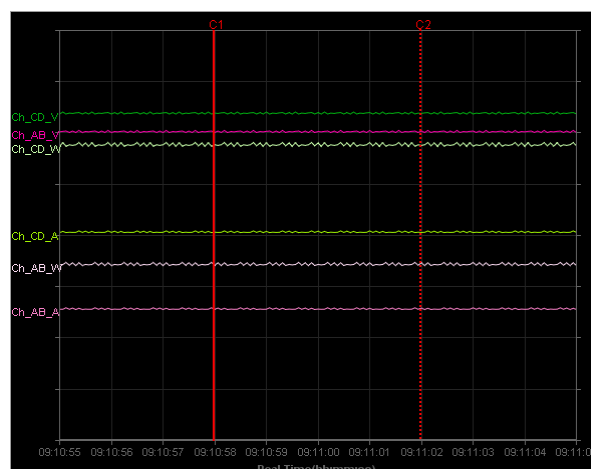
Four Charts Mode: Display statistics of Window B Channel A/B/C/D in 4 different charts.



Two Charts Mode: Display statistics of Window C Channel A/C and B/C in two different charts.



Parallel Connection Mode: Display two pair of connections in the same chart. *

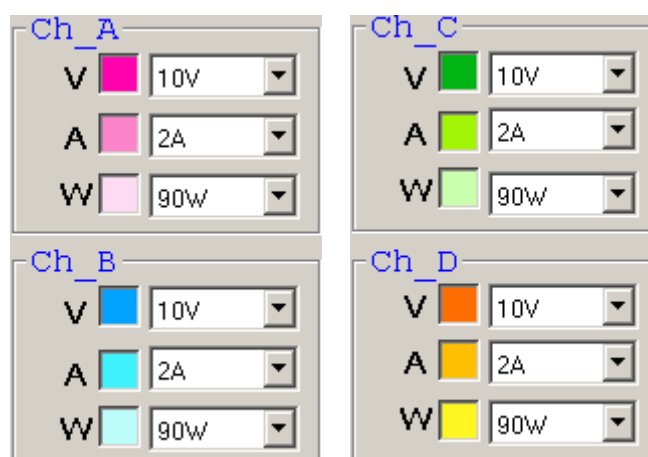


* Please note that due to NuDC-4U's hardware limitations, NuDC-4U's Alarm LEDs and LCD will only display Ch_A status under Parallel Connection Mode.













5.3. Power Measuring Scale



NuDC-4U has 4 ports that serve as Diagnostic Channels A/B/C/D. In corresponding to these Diagnostic Channels, NuDC-4U utility software's **Power Measuring Scale** contains separate sections for changing Channel A/B/C/D displaying scale as shown in the figures down below:



You can set the display scale of DUT's Voltage (V), Ampere (A), and Watt (W) with the scroll-down menu here in these fields. Each Channel's Voltage (V), Ampere (A), and (Watt) curves displayed on the **Main Display Screen** are represented with different colors as shown in the table down below:

Channel A (Ch_A)	Channel C (Ch_C)
 Channel A, Voltage	 Channel C, Voltage
 Channel A, Ampere	 Channel C, Ampere
 Channel A, Watt	 Channel C, Watt
Channel B (Ch_B)	Channel D (Ch_D)
 Channel B, Voltage	 Channel D, Voltage
 Channel B, Ampere	 Channel D, Ampere
 Channel B, Watt	 Channel D, Watt

The display scales for Voltage (V), Ampere (A), and (Watt) can be set with the scroll-down menu in these fields. Display scales available for Voltage (V), Ampere (A), and (Watt) are shown in the table down below:

Voltage (V)	100mV, 200mV, 500mV, 1V, 2V, 5V, 10V, 20V
Ampere (A)	100mA, 200mA, 500mA, 1A, 2A, 5A
Watt (W)	100mW, 200mW, 500mW, 1W, 2W, 5W, 10W, 20W, 50W, 70W, 90W

If you set the display scale of Voltage (V), Ampere (A), or (Watt) to a larger scale, the corresponding curve displayed on the **Main Display Screen** will be smoother than the curves with smaller scale, as shown in the figures down below:



Ch_A_V Curve: Set as 1V



Ch_A_V Curve: Set as 5V

You can choose specific curve displayed on the **Main Display Screen**. The curve you chose will be thicker and highlighted in white as shown in the figures down below:

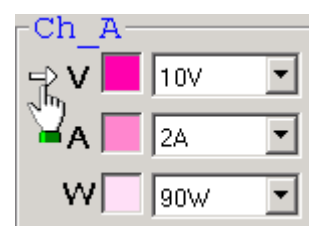


Ch_A_V Curve: Not chosen

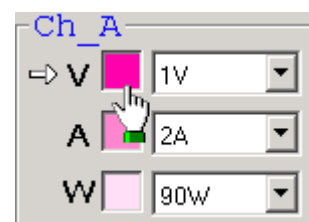


Ch_A_V Curve: Chosen and Highlighted

To select a curve, please click the empty space in front of the curve you would like to choose. An arrow icon ➡ will appear when a curve is chosen. You can move the curve you've chosen with **Curve Moving Buttons** as well.



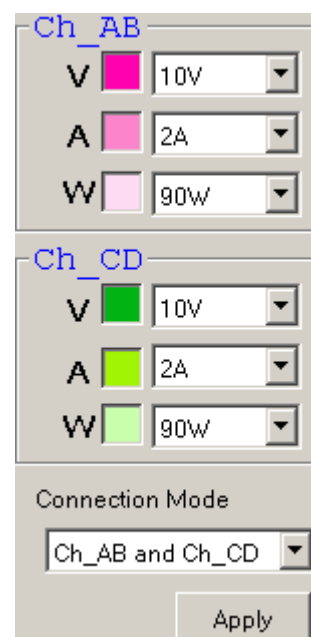
Also, you can choose which curve shall be displayed on the **Main Display Screen** by clicking the colored square in front of it, as shown in the figure at right. The curve you've chosen this way will only be hidden. Tests regarding to that curve will still be running. The colored square that represents the curve will be replaced by a grave square icon ■ if it is hidden.



If you set the **Main Display Screen's** display mode to **Parallel Connection Mode** by clicking the **Window D** button on the **Quick Launch Buttons**, the **Power Measuring Scale** will be as shown in the figure at right.

Under **Parallel Connection Mode**, NuDC-4U's Channels are paired and will be displayed in the same chart. Click the **Connection Mode** scroll-down menu to choose how you would like to pair these 4 channels.

- **Ch_AB and Ch_CD:** Channel A and Channel B will be paired, while Channel C and Channel D will be paired.
- **Ch_AC and Ch_BD:** Channel A and Channel C will be paired, while Channel B and Channel D will be paired.
- **Ch_AD and Ch_BC:** Channel A and Channel D will be paired, while Channel B and Channel C will be paired.
- **Apply:** Click this button to apply the changes you've made.



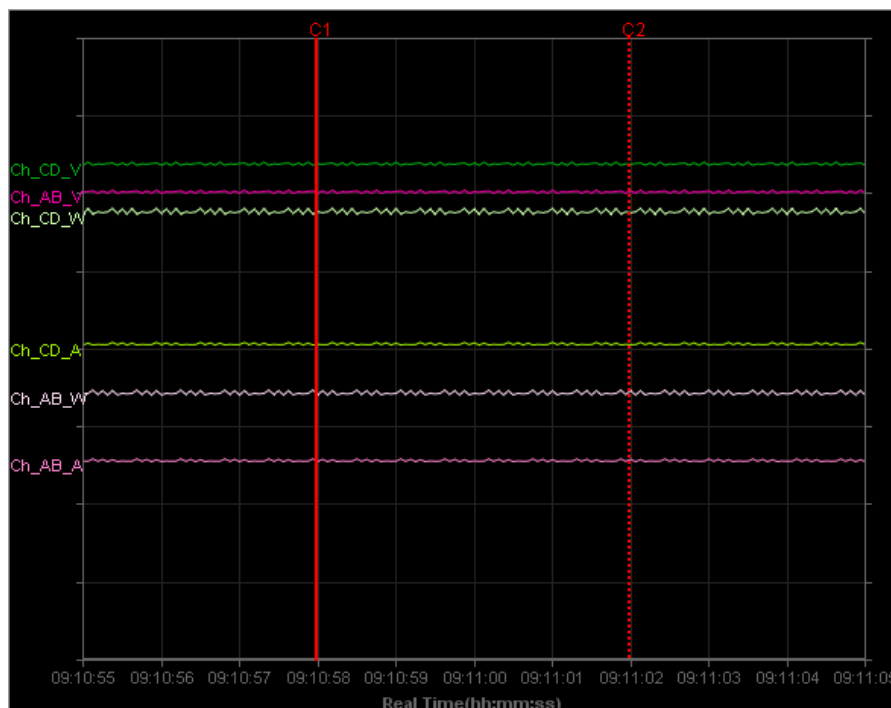
5.4. Real-Time Statistic Table

	Instant	Cursor 1	Cursor 2	Average	Max	Min	Trigger
Ch_A(Volt)	60.478	60.324	60.376	60.121	60.478	60.113	60.366
Ch_A(Amp)	5.158	5.124	5.176	5.111	5.176	5.113	5.166
Ch_A(Watt)	311.946	309.100	312.506	307.278	312.506	307.358	311.851

All test statistics will be shown here in real-time. Statistics listed here in the **Real-Time Statistic Table** include:

Statistics	Description
Instant	Current power status.
Cursor 1/2	Power status value at Cursor 1/2 vertical line. You can change the position of Cursor 1/2 on the Main Display Screen .
Average	The average power status value of the channel.
Max	The maximum power status value of the channel.
Min	The minimum power status value of that channel.
Trigger	The power status value when the power status value you've set is triggered during the test.

5.5. Main Display Screen





The **Main Display Screen** displays real-time power status in curves, while Voltage/Ampere/Watt serves as each curve's Y-Axis, and time as its X-Axis. There are four different modes for the **Main Display Screen**, which are: **One Chart Mode**, **Four Charts Mode**, **Two Charts Mode**, and **Parallel Connection Mode**. For more information, please refer to “5.2.5. Window A/B/C/D”.

You can change the location of **Cursor 1** and **Cursor 2** on the **Main Display Screen**. Move the mouse on the cursor you would like to move. Your mouse will change to “←→” icon as shown in the figure at right. Left-click and hold your mouse so you can move **Cursor 1** or **Cursor 2** to the location you wants.





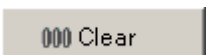

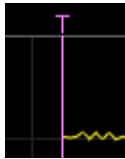
5.6. Power Test Status

The **Power Test Status** icon located on the upper-right part of NuDC-4U utility software changes whenever alarm has occurred during power test as shown in the table down below:

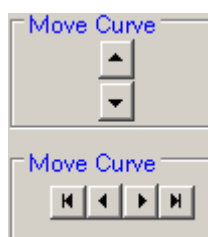
	No alarm has occurred.
	An alarm has occurred.

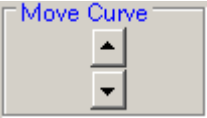
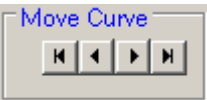


5.7. Test Control Buttons



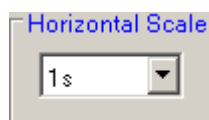
Button	Description
	Click the Run button to start the test. Statistics of the power test will be shown on the Real-Time Status Table and curves will start be generated on the Main Display Screen .
	Click the Stop button to stop the test. Statistics of the power shown on the Real-Time Status Table and curves generated on the Main Display Screen will stop as well.
	Click the Clear button to clear all the statistics of the power shown on the Real-Time Status Table and curves generated on the Main Display Screen .
	Click the Trigger button BEFORE the test, a purple trigger line will appear on the Main Display Screen when the values set as trigger are met during test. 
<input type="checkbox"/> Freeze Chart	Click the Freeze Chart check box and the curves generated on the Main Display Screen will freeze while the power test is still running.

5.8. Curve Moving Buttons



Button	Description
	Move the selected cursor on the Main Display Screen up/down. To select a cursor, please refer to “ 5.3. Power Measuring Scale ”.
	Move all the cursors on the Main Display Screen left/right. To move all the cursors to the far left/right, click  or  buttons.

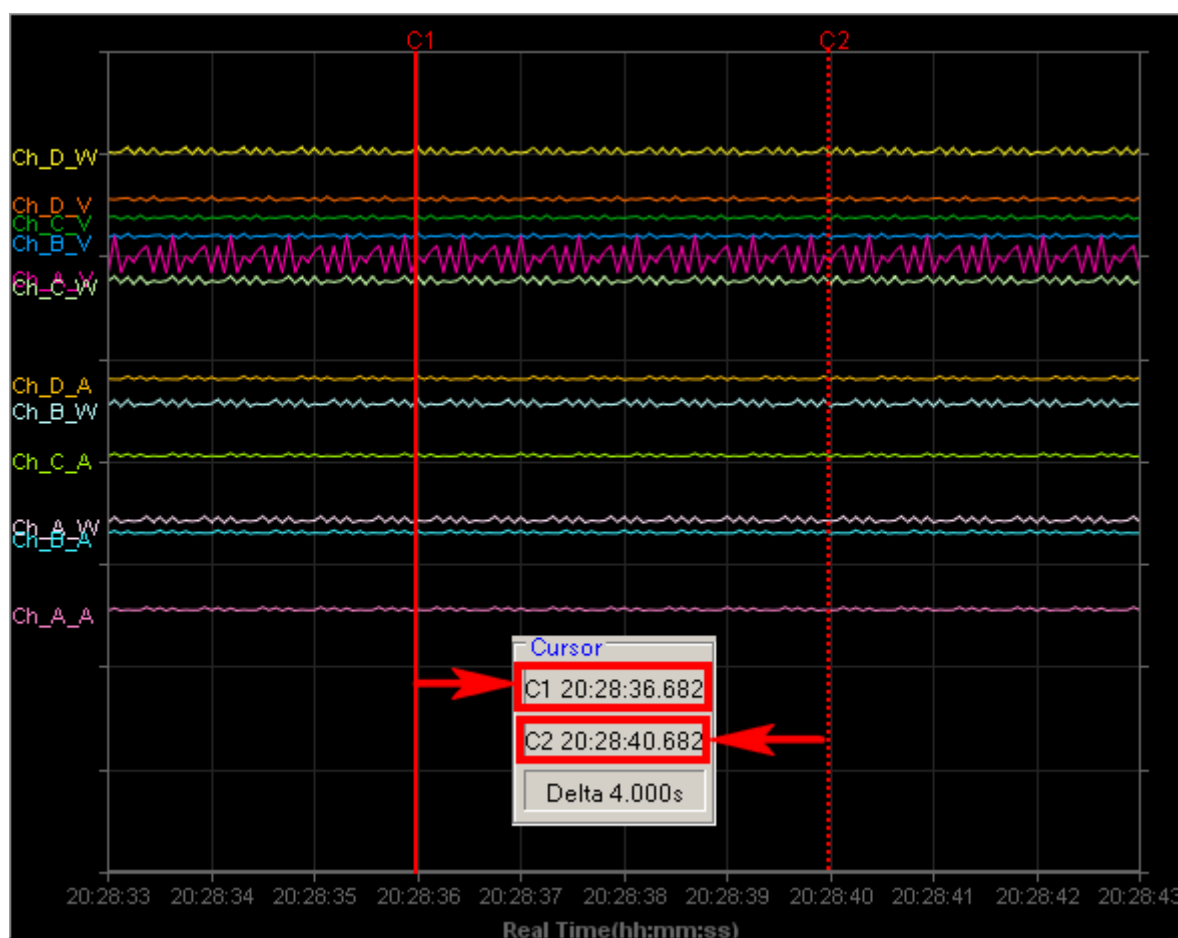
5.9. Horizontal Scale Adjust



The **Horizontal Scale** menu bar allows you to adjust the X-Axis of the chart displayed on the **Main Display Screen**. You can set the X-Axis of the chart from 100ms to 1 hour.

5.10. Cursor Time

As shown in the figure down below, **Cursor 1** and **Cursor 2** are two vertical lines that located on the **Main Display Screen**. The **Cursor Time** table shows the time of **Cursor 1** and **Cursor 2**.








The **Delta Time** on the **Cursor Time** is the time duration in-between the time of **Cursor 1** and **Cursor 2**. You can change the time of **Cursor 1** and **Cursor 2**. For more information regarding to change the time of **Cursor 1** and **Cursor 2**, please refer to "5.5. Main Display Screen."

6. NuDC-4U Accessories/Maintenance

6.1. NuDC-4U Accessories

NuDC-4U has many different accessories available for different testing tasks. These accessories include:

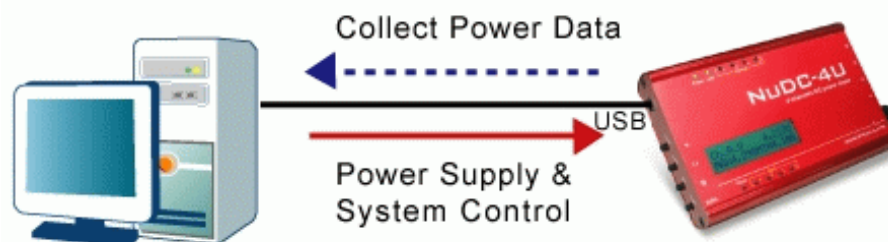
NuDC-4U Accessories	
 <p>Bare Wire Connection</p>	<p>ASSY-DC SC4S: Extension board for connecting DC devices with no connector. The detection range of the current can be doubled if wires are fastened in parallel.</p>
 <p>PoE Device</p>	<p>ASSY-DC POEA: Connection board for monitoring the power status of PD (Powered Device) of PoE. (Power via Pin 1, 2, 3, 6) - Mode A</p> <p>ASSY-DC POEB: Connection board for monitoring the power status of PD (Powered Device) of PoE. (Power via Pin 4, 5, 7, 8) - Mode B</p>
 <p>USB Device</p>	<p>ASSY-DC USBAB: Connection boards for monitoring USB devices' power status</p>
 <p>DC Jack Device</p>	<p>ASSY-DC JACK: Connection boards for monitoring power status of devices with different kinds of DC Jacks. Models for different sizes of DC Jack are shown below:</p> <ul style="list-style-type: none"> ➤ ASSY-DC JACK065: ψ0.65mm ➤ ASSY-DC JACK165: ψ1.65mm ➤ ASSY-DC JACK235: ψ2.35mm ➤ ASSY-DC JACK13: ψ1.3mm ➤ ASSY-DC JACK20: ψ2.0mm ➤ ASSY-DC JACK25: ψ2.5mm
 <p>PCB and SMD</p>	<p>ASSY-DC: Mini daughter board with two soldering conductors for soldering on PCB. Models with different widths of conductors are shown below:</p> <ul style="list-style-type: none"> ➤ ASSY-DC L1206 ➤ ASSY-DC L0805 ➤ ASSY-DC L0603

Please note that, for the convenience of performing power tests, the accessory boards mentioned above are not covered with outer cases. Due to this reason, it is important to handle NuDC-4U's accessory boards with care when performing power tests. Also, please

- Static electricity might cause damages to NuDC-4U's accessory boards, and should be avoided.
- When plugging cable connectors into sockets, please do so in a vertical angle to prevent damaging the core and pins inside the socket.
- Please hold the connector when removing cable. Removing the cable by pulling it out from its socket might cause damages.
- When holding NuDC-4U's accessory boards, please hold the edge of the accessory boards without touching any components on the accessory boards.
- DC jacks soldered on PCB are disposable when damaged. Please contact your distributor for purchasing new DC jacks if you would like to replace your damaged DC jacks.
- When using probes or alligator clips, please be aware of short circuit.
- Before connecting NuDC-4U and its accessory boards, please make sure that all the wiring/connection is correct.
- NuDC-4U's detection ranges for voltage/ampere/watt are **0.1V to 55V DC, 10mA to 8A and 0.001W to 440W. Performing tests on DUT that's beyond NuDC-4U's voltage/ampere/watt detection ranges will damage your NuDC-4U, and should be avoided.**

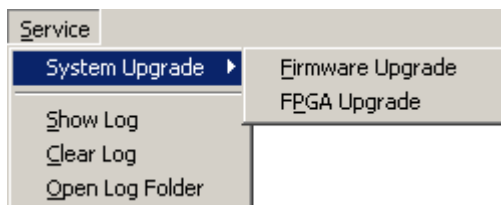
6.2. Upgrading NuDC-4U's Firmware/FPGA

Before upgrading NuDC-4U's firmware/FPGA, please be sure that your NuDC-4U is connected to PC via a USB cable as shown in the figure down below:

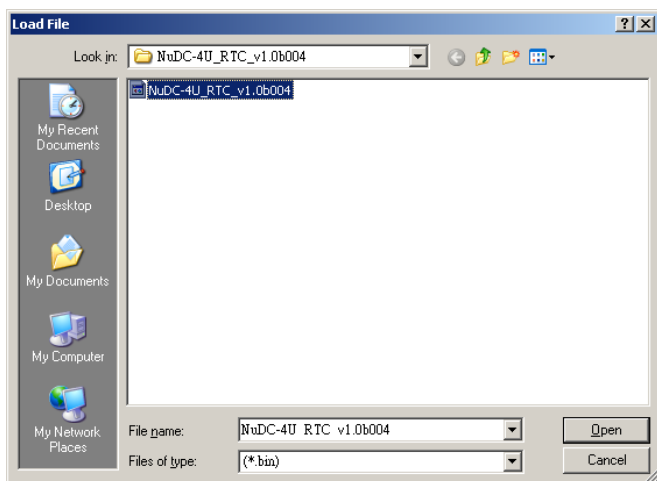


The following instructions are for upgrading NuDC-4U's firmware. The process for upgrading NuDC-4U's FPGA is identical to upgrading NuDC-4U's firmware, and can be related.

Upgrading NuDC-4U's Firmware/FPGA

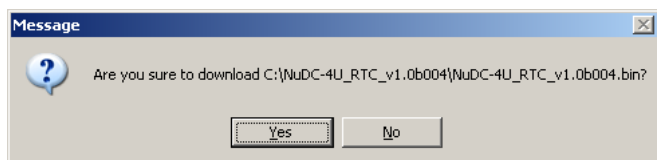


Click **Service** on the **Menu Bar**, and then choose **System Upgrade** → **Firmware Upgrade/FPGA Upgrade**.



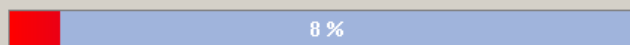
A **Load File** window will pop up. Choose the firmware/FPGA file you would like to upgrade, and click **Open**.

Please note that both NuDC-4U's firmware and FPGA are in "***.bin**" format.



Click **YES** to continue, or click **NO** to cancel firmware/FPGA upgrading process.

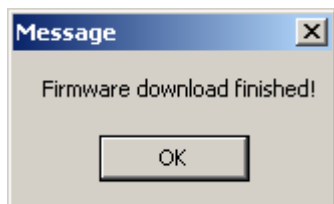
Upgrading will take 1 minutes. While upgrading,
The device's power must be ALWAYS ON during the upgrading process.



NuDC-4U utility software will start uploading the firmware/FPGA you chose to NuDC-4U.

Please note that NuDC-4U's power must be ALWAYS ON during this process.

Upgrading NuDC-4U's Firmware/FPGA



Firmware/FPGA upgrade complete! Click **OK** to finish the upgrading process.

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