N3600 Series Wide Range Programmable DC Power Supply

User Manual

TOYOTECH

Contents

1 Preface

Dear Customers,

First of all, we greatly appreciate your choice of N3600 series DC power supply (N3600 for short). We are also honored to introduce our company, Hunan Next Generation Instrumental T&C Tech. Co., Ltd.

About Company

TOYOTECH is a professional manufacturer of intelligent equipment and test & control instruments, committed to developing, manufacturing battery simulators, power supplies, electronic loads, and many more instruments. The products can be widely used in the industries of battery, power supply, fuel cell, consumer electronics, new energy vehicle, semiconductor, etc.

TOYOTECH maintains close cooperation with many universities and scientific research institutions, and maintains close ties with many industry leaders. We strive to develop high-quality, technology-leading products, provide high-end technologies, and continue to explore new industry measurement and control solutions.

About User Manual

This manual is applied to N3600 series DC power supply, including installation, operation, specifications and other detailed information. The copyright of the manual is owned by TOYOTECH. Due to the upgrade of instrument, this manual may be revised without notice in future versions.

This manual has been reviewed carefully by TOYOTECH for the technical accuracy. The manufacturer declines all responsibility for possible errors in this operation manual, if due to misprints or errors in copying. The manufacturer is not liable for malfunctioning if the product has not correctly been operated.

To ensure the safety and correct use of N3600, please read this manual carefully, especially the safety instructions.

Please keep this manual for future use.

Thanks for your trust and support.

2 Safety Instructions

In the operation and maintenance of the instrument, please strictly comply with the following safety instructions. Any performance regardless of attentions or specific warnings in other chapters of the manual may impair the protective functions provided by the instrument.

TOYOTECH shall not be liable for the results caused by the neglect of those instructions.

2.1 Safety Notes

➢ **Confirm the AC input voltage before supplying power**.
➢ **Reliable grounding**: Before operation, the instrument must be reliably grounded to avoid the electric shock.
➢ **Confirm the fuse**: Ensure to have installed the fuse correctly.
➢ **Do not open the chassis**: The operator cannot open the instrument chassis. Non-professional operators are not allowed to maintain or adjust it.
➢ **Do not operate under hazardous conditions**: Do not operate the instrument under flammable or explosive conditions.
➢ **Confirm the working range**: Make sure the DUT is within N3600's rated range.

2.2 Safety Symbols

Please refer to the following table for definitions of international symbols used on the instrument or in the user manual.

Table 1

Symbol	Definition	Symbol	Definition
⎓	DC (direct current)	N	Null line or neutral line
∼	AC (alternating current)	L	Live line
≈	AC and DC	I	Power-on
3∼	Three-phase current	O	Power-off
⏚	Ground	⏻	Back-up power
⏚	Protective ground	▭	Power-on state
⏚	Chassis ground	▢	Power-off state
⏛	Signal ground	⚡	Risk of electric shock
WARNING	Hazardous sign	⚠	High temperature warning
Caution	Be careful	⚠	Warning

3 Product

3.1.1 Brief Introduction

N3600 series is developed based on TOYOTECH's years of experience in test for battery fluctuation simulation, battery charger, high voltage diode, electrolytic capacitor, electromechanical control, ATE test system, etc. It is a high- voltage wide- range programmable DC power supply. According to different test environments in the fields of lab test, system integration test, and mass production line, TOYOTECH has made a number of optimization designs based on the international advanced technology. N 3600 series is a market leader in similar products in terms of reliability, maintainability and safety.

3.1.2 Features

- Voltage up to 1000V

- Different models available in high voltage or high current

- Equipped with LCD screen, numeric buttons and knob to support local operation

- Safety terminals

- Editable waveform of voltage & current variation in SEQ function

- Remote sense

- Intelligent fan control

- Standard 19-inch 2U/4U/6U, available for benchtop or rack installation

- Built-in RS232/LAN communication interface

- Multiple devices operation in cascade mode

- Dual knobs for adjusting voltage and current separately

- Convenient HMI (human-machine interaction) interface on LCD screen

- Editable rise/fall slew rate

- Analog programming (APG) interface, current monitoring interface, remote trigger function to realize complex function control and monitoring

- Multiple protections: OCP, OVP, UVP, OTP, OPP, peripheral control communication error alarm, cascade error alarm

- External dissipater to protect the power supply and DUT

■ Built-in RS485 interface for parallel communication

3.2 Overview

3.2.1 N3600 Series Lineup

Table 2

Model	Specification	Model	Specification
N3608-080-060	800W/80V/60A	N3618-800-015	1800W/800V/15A
N3612-080-060	1200W/80V/60A	N3618-1000-010	1800W/1000V/10A
N3612-240-030	1200W/240V/30A	N3630-016-500	3000W/16V/500A
N3618-016-250	1800W/16V/250A	N3630-080-120	3000W/80V/120A
N3618-080-120	1800W/80V/120A	N3630-240-060	3000W/240V/60A
N3618-240-060	1800W/240V/60A	N3630-360-035	3000W/360V/35A
N3618-360-035	1800W/360V/35A	N3630-600-020	3000W/600V/20A
N3618-600-005	1800W/600V/5A	N3630-800-015	3000W/800V/15A
N3618-600-020	1800W/600V/20A	N3630-1000-010	3000W/1000V/10A
N3660-016-1000	6000W/16V/1000A	N3690-016-1500	9000W/16V/1500A
N3660-080-240	6000W/80V/240A	N3690-080-360	9000W/80V/360A
N3660-240-120	6000W/240V/120A	N3690-240-180	9000W/240V/180A
N3660-360-070	6000W/360V/70A	N3690-360-105	9000W/360V/105A
N3660-600-040	6000W/600V/40A	N3690-600-060	9000W/600V/60A
N3660-800-030	6000W/800V/30A	N3690-800-045	9000W/800V/45A
N3660-1000-020	6000W/1000V/20A	N3690-1000-030	9000W/1000V/30A

3.2.2 Package Contents and Accessories

After receiving N3600, please check the instrument according to the following steps:
1. Check whether the instrument is damaged during transportation. If any severe damage to the package, please contact our authorized distributor or TOYOTECH.
2. Check accessories.
3. Make sure the the following accessories are attached.

Table 3

N3600 Accessories	Instructions
Power cord	For AC power connection
Connector	For PROG Interface connection
Ethernet cable	For Ethernet connection
RS232 cable	For RS232 communication

USB flash drive	Software, technical information, user manual
Test report	Test result before delivery

If any loss or damage, please contact our authorized distributor or TOYOTECH.

4.Check the whole instrument. If N3600 chassis is damaged or has abnormal operation, please contact our authorized distributor or TOYOTECH.

3.2.3 Appearance & Dimension
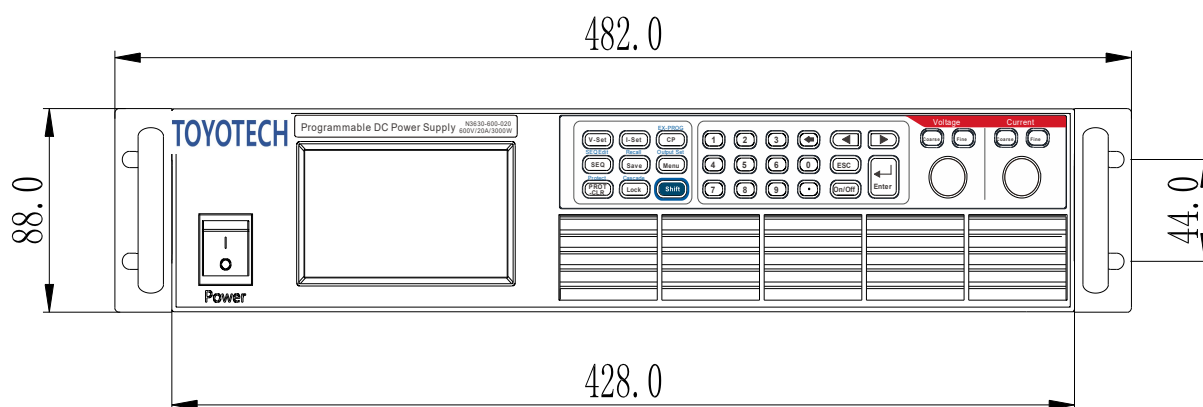

Figure 1   Front Panel Dimension(mm)
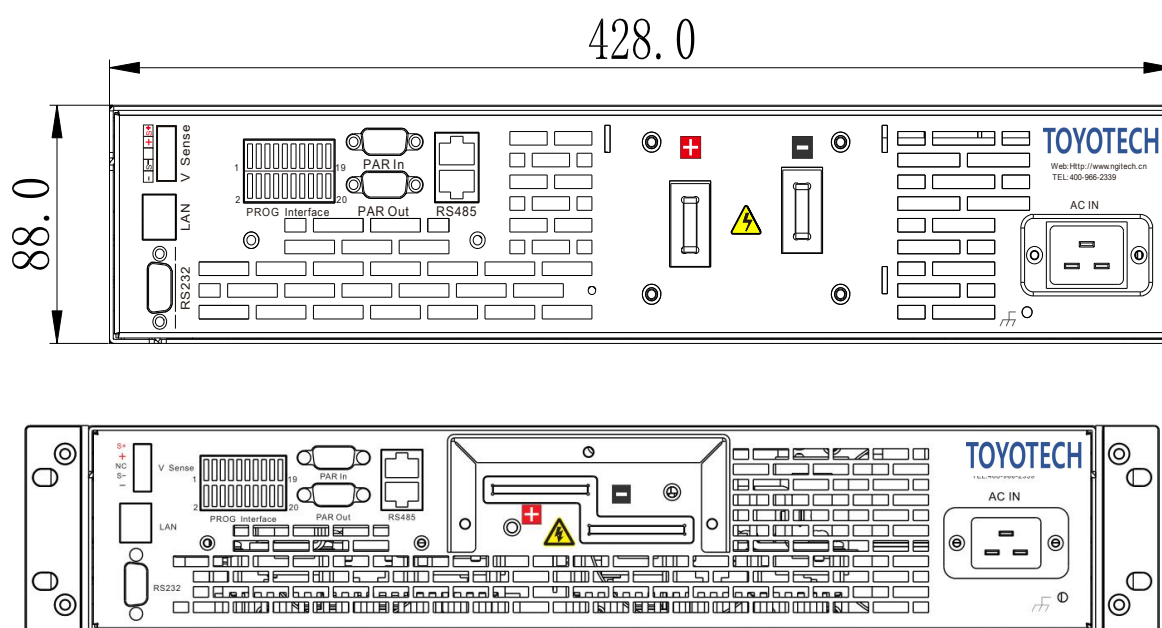
Figure 2   Rear Panel Dimension(mm)
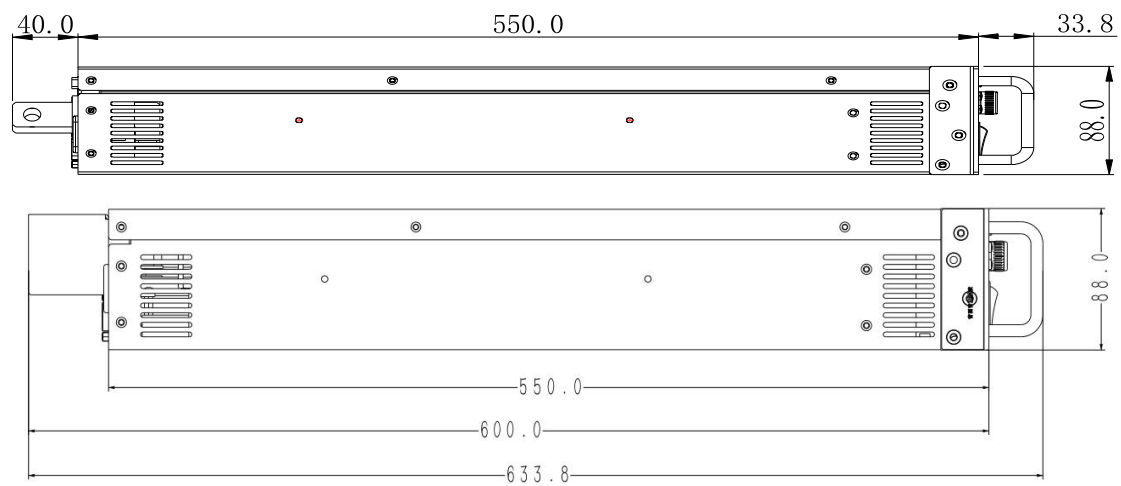
Figure 3   Side Dimension(mm)
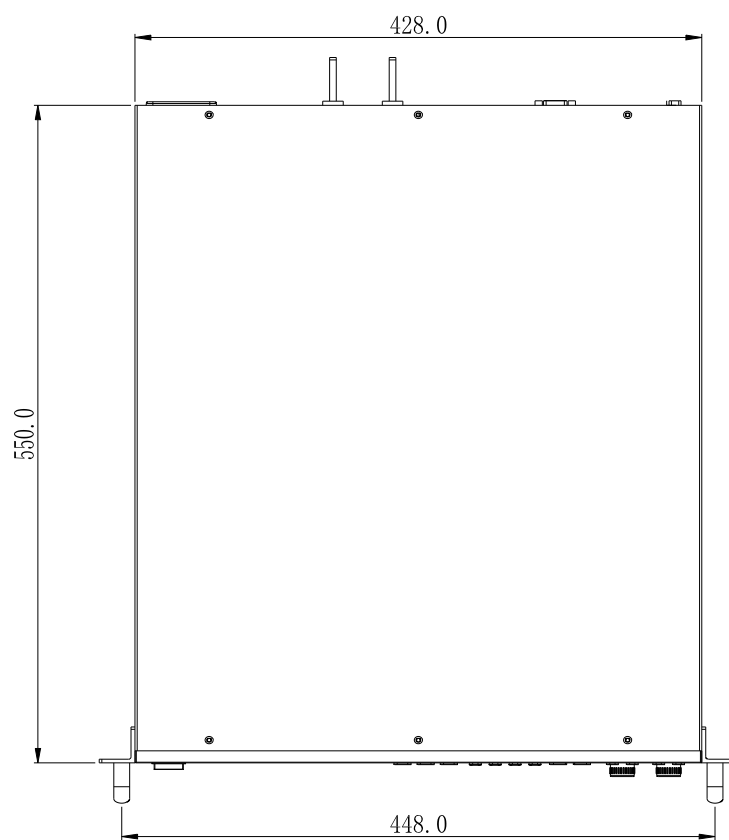
Figure 4   Top Dimension(mm)

4 External Dissipater

4.1 Introduction

When using N3600 to supply power to inductive loads such as motors, press ⬭(On/Off) on N3600's front panel to stop power supply. At this time, the motor may return a voltage greater than the set value to the power supply, which is likely to damage N3600 and the motor.

Users can connect a load to N3600 as a dissipater. The set voltage of the load must be an increment higher than the set voltage of N3600. When the set voltage of the load is higher than the set voltage of N3600, the load will not work. If the voltage returned by the motor is exceeding the set voltage of the load, the load starts to work to protect N3600 and the motor. Voltage increment can be set under **Peripheral** on N3600's menu.

4.1.1 Operating Procedure

1) Connect the positive polarities of N3600 and the load, and the negative polarities of N3600 and the load.
2) Connect RS232 interfaces of N3600 and the load by RS232 cable.
3) Power on N3600 and the load.
4) Set the same baud rate and communication protocol for N3600 and the load. It is recommended to select 19200 for baud rate. The communication protocol should be MODBUS.
5) Enter **Peripheral** on N3600, set the voltage increment and select ON for

Peripheral Control. If the communication is succeeded, icon 🖧 will be displayed at bottom right corner. By this time, N3600 and the dissipater have been successfully connected. Users can connect N3600 to DUT for test.
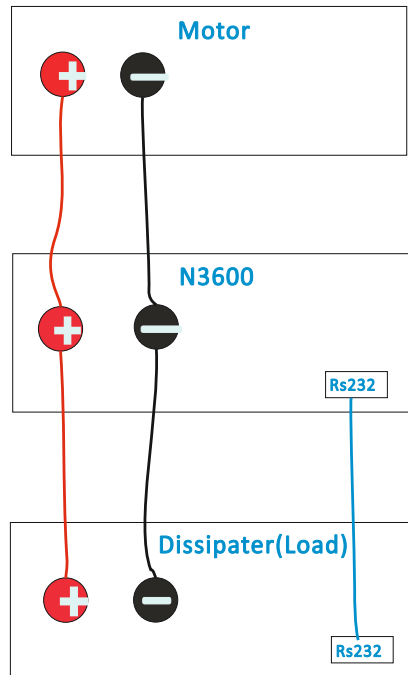
Figure 5   Dissipater Wiring Diagram

Note: Baud rate and communication protocol can be set under **System** on N3600's screen.

Figure 6   Baud Rate & Protocol Setting

4.1.2 Protection

N3600 provides protection in case there is abnormality during the connection and use of the dissipater.

1. If N3600 and the load are not properly connected or set, N3600 and the load will not communicate. There will be a prompt PERIPHERAL COMM ERROR on the screen. Please refer to **Operating Procedure** for proper connection and setting.

2. After N3600 and the load are successfully communicated, please press [On/Off] on the front panel. N3600 starts to output and the set value of the load changes accordingly. In the course of use, if communication is interrupted, it will not have any impact on the function of dissipater. At this time, users cannot adjust the voltage. To adjust the voltage, users need to press [On/Off] to stop the output and repair the communication.

> Note: Please press [PROT CLR] to clear the prompt when PERIPHERAL COMM ERROR occurs.

4.2 Peripheral Control

Steps to enter **Peripheral Control**:

1. Press [Menu].

2. Rotate ◯ to select **Peripheral** and press [Enter].

After entering Peripheral, the following interface will be displayed.
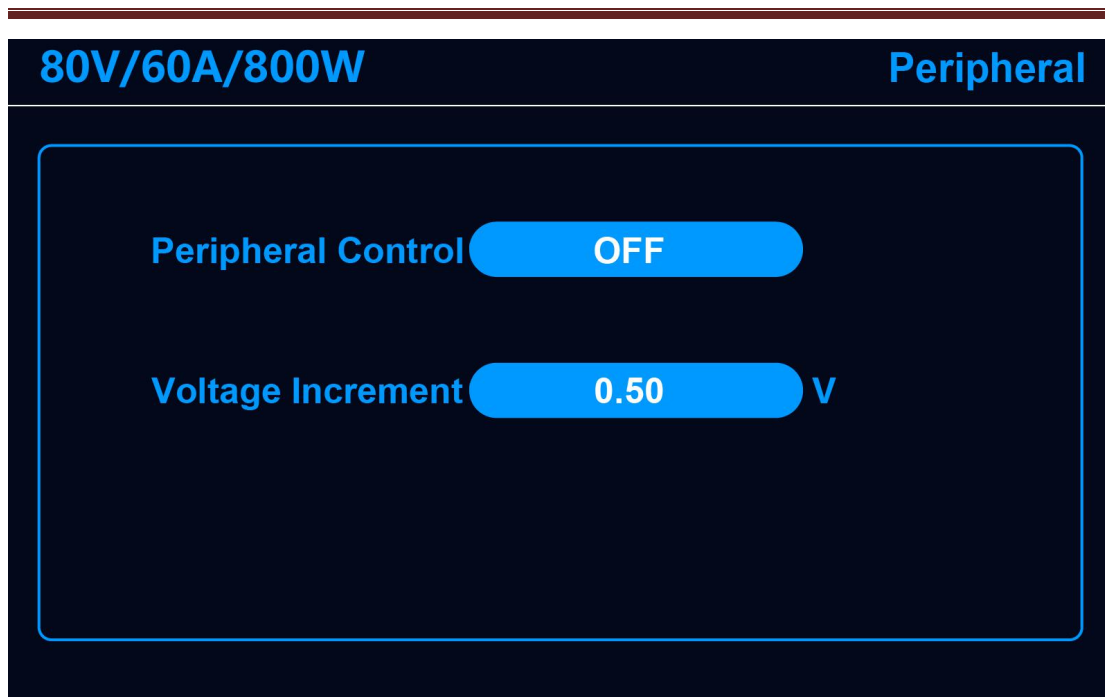
Figure 7　Peripheral Control

Peripheral control can be turned on/off by setting ON/OFF. Voltage increment is related to the load. After the increment is set, the load setting value will change accordingly with N3600 setting value. It is not necessary to set again on the load.

Note: Load setting voltage= N3600 setting voltage + voltage increment.

For example, if voltage increment is set to 1V, and N3600 output voltage is set to 10V, the load voltage will be automatically set to 11V.

5 Power-on Test

Power-on test includes two parts: power-on inspection and output inspection.
This test is to ensure N3600 can be started and used properly in the initialized state.

5.1 Power-on Inspection

5.1.1 Switching on the instrument

If N3600 cannot start up after switch-on, please check whether the power cord is properly connected and whether N3600 is supplied with AC power supply.

5.1.2 System Self-test

After pressing power switch, N3600 will start self-test.
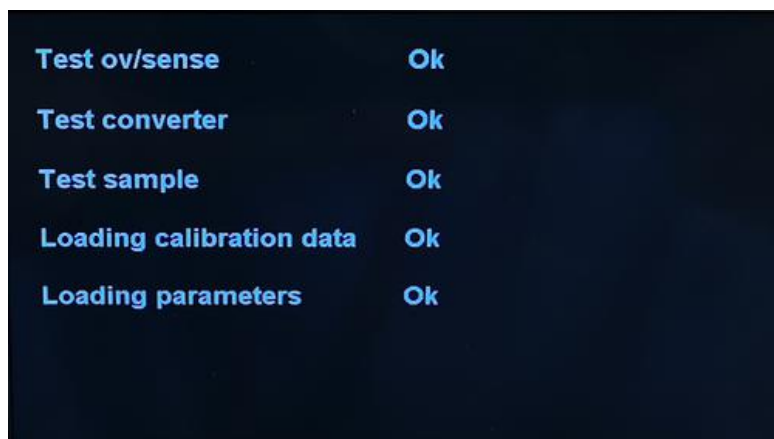
Figure 8   System Self-test

The following items will be checked.
◆ Check if the over-voltage protection component is OK.
◆ Check if the converter is OK.
◆ Check if the sense module is OK.
◆ Check if the calibration data are complete.
◆ Check if the parameters are complete.

The test items and results will be displayed on the screen. After all passed, it will automatically enter application interface. If not passed, it will display "Press Enter key to continue". Please note down the error information on the screen and contact

TOYOTECH for solution. Without affecting the use, users [Enter icon] to enter the can press

application interface.

5.2 Output Inspection

5.2.1 Output Voltage Inspection

Steps to verify N3600's basic voltage function without connecting to a load:
1. Press the power switch.
2. Set voltage to 1V.

3. Press ⬭ to output.

4. Check if the readback voltage is close to 1V.
5. Check if the voltage can be set from 0V to full range.

5.2.2 Output Current Inspection

Steps to verify N3600's basic function during output short-circuit:
1. Press the power switch.
2. Make sure the output is OFF.
3. Connect an insulated wire to short circuit the positive and negative electrodes at the output of N3600. The wire used should be able to bear the maximum output current of N3600.
4. Set current to 1A.

5. Press ⬭ to output.

6. Check if the readback current is close to 1A.
7. Check if the current can be set from 0A to full range.

6   Product Introduction

6.1   Front Panel Introduction
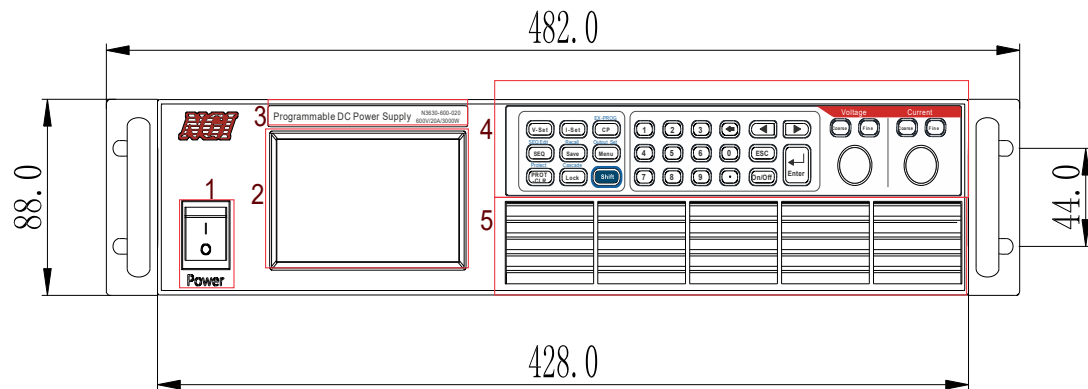
Figure 9   Front Panel

Table 4

Number	Name	Function
1	Power switch	Power control
2	Screen	Displaying data
3	Device model	Displaying model number
4	Buttons	Operation mode and parameter setting
5	Air outlet	Exhaust outlet, cooling

6.1.1 Button

N3600 front panel mainly includes a screen and buttons.
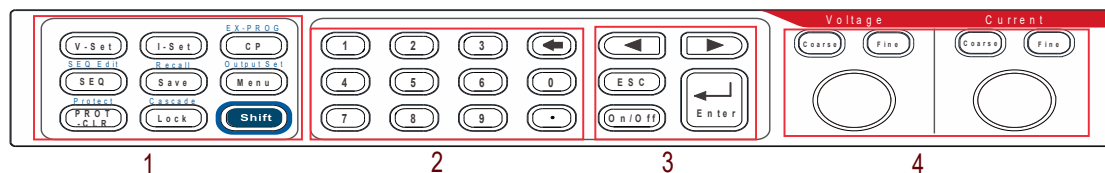
Figure 10   Buttons

Table 5

Number	Name
1	Function button
2	Numeric button

3	Power button, Selection button
4	Coarse/fine button for voltage and current, knob

6.1.1.1 Function Button
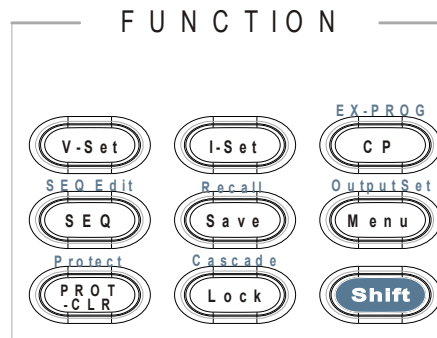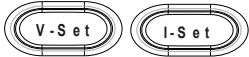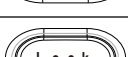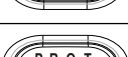
Figure 11   Function Button

Table 6

Button	Function
V-Set I-Set	To enter V/I mode
C P	To enter CP mode
S E Q	To enter SEQ test interface
S a v e	To enter save interface
M e n u	To enter the main menu
L o c k	To lock/unlock
P R O T -C L R	To clear the protection
Shift	Compound button

6.1.1.2 Numeric Button
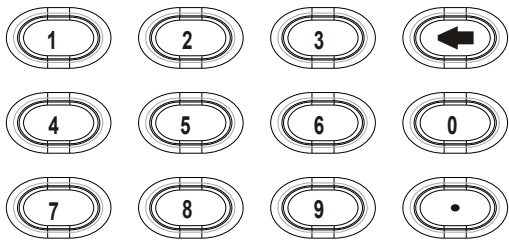
Figure 12   Numeric Button

Table 7

Button	Function
0 ~ 9 , •	To input digits
←	To delete

6.1.1.3 Power Button & Selection Button
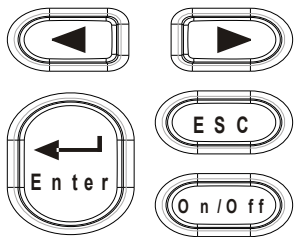
Figure 13   Power Button & Selection Button

Table 8

Button	Function
◄ ►	1. To shift or select the required parameter 2. To control the cursor scrolling when setting parameter
Enter	To enter the required parameter, confirm the input, exit from setting
ESC	To exit from setting or the present page
On/Off	To turn on/off the output

6.1.1.4 Knob
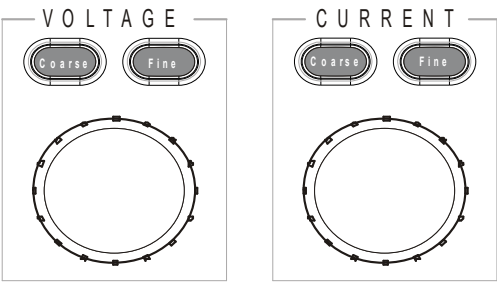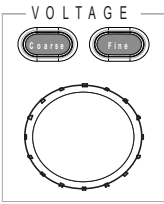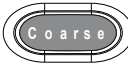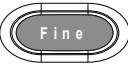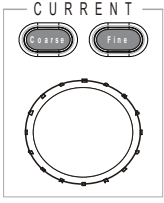
Figure 14　Knob

Table 9

Knob	Function
	Press and then rotate ◯ to roughly or slightly adjust the voltage
	Press and then rotate ◯ to roughly or slightly adjust the current

6.1.2　Screen

N3600 series adopts a 4.3 inch LCD with resolution 480*272.
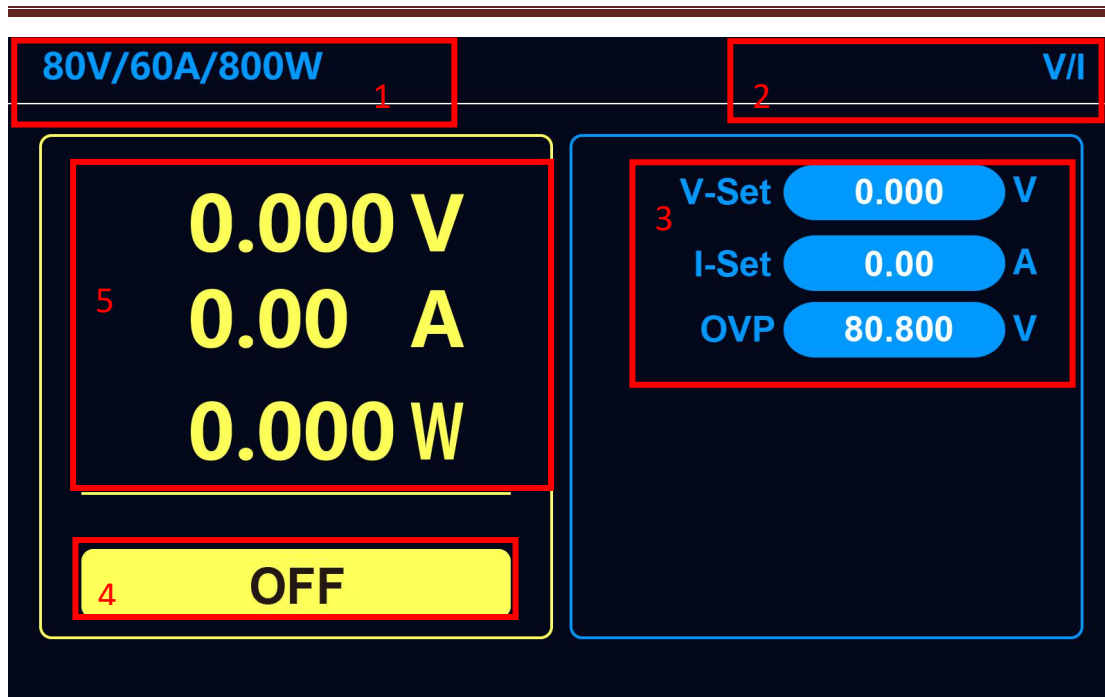
Figure 15   Screen

Table 10

Number	Name
1	Device specification
2	Operation mode
3	Parameter setting area
4	Status information area
5	Readback area

6.1.2.1 Status Information

Figure 16   Status Information

The status information will be displayed according to the operation mode. This design can reduce the amount of information processing for the user and improve the efficiency of human-machine interaction.

Table 11

Information	Definition
Parallel/Series	Cascade mode
APG-I/APG-V/APG-VI	Analog programming
OVP/OPP/OCP	Protection type
CV/CC	Present operation mode
ON/OFF	Present output state

6.1.2.2 Menu

Users can press to enter the main menu, then press or rotate to view the below items, press to access the required item and press to return to previous page.
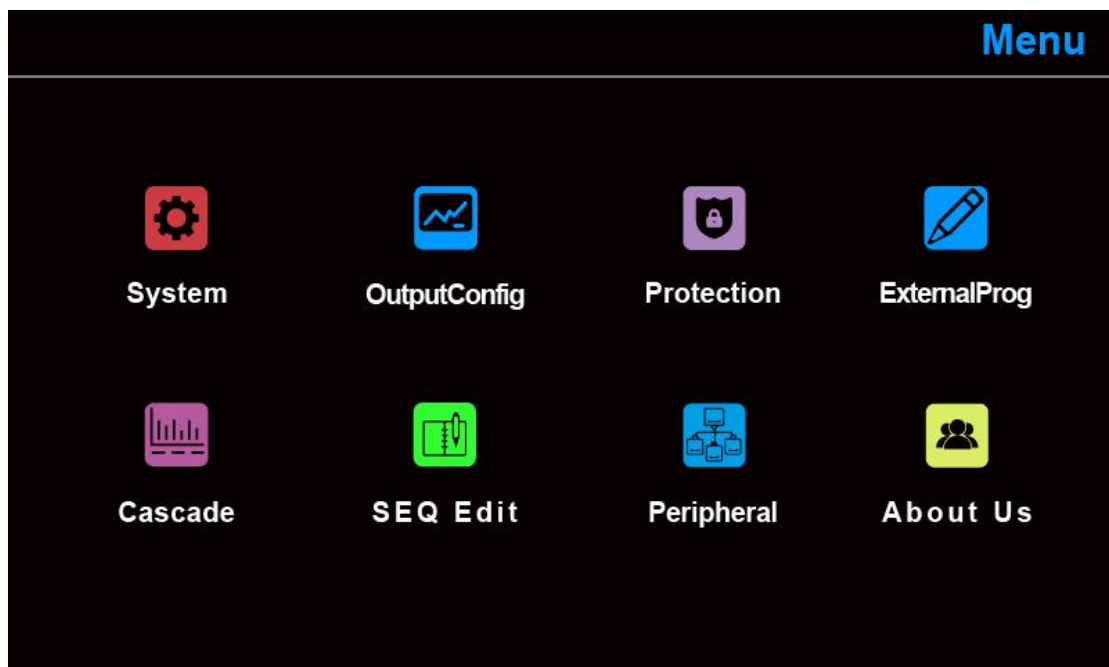
Figure 17   Menu Page One

Table 12

Item	Function
System	System settings
Output Config	Maximum/minimum output setting
Protection	Protection parameter settings
External Prog	Output control & analog programming
Cascade	Master/slave cascade parameter
SEQ Edit	SEQ test file editing
Peripheral	Load connection and voltage increment setting
About Us	Manufacturer information
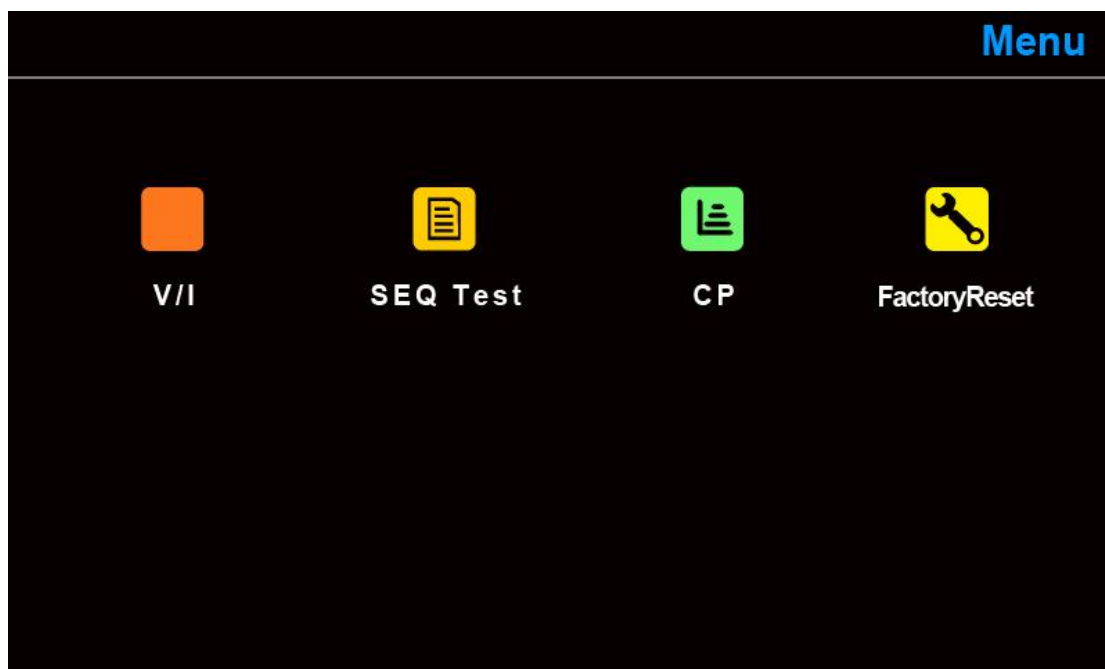
Figure 18   Menu Page Two

Table 13

Item	Function
V/I	Current & voltage setting
SEQ Test	Sequence test mode
CP	Constant power mode
Factory Reset	Restore factory setting

6.2 Rear Panel Introduction
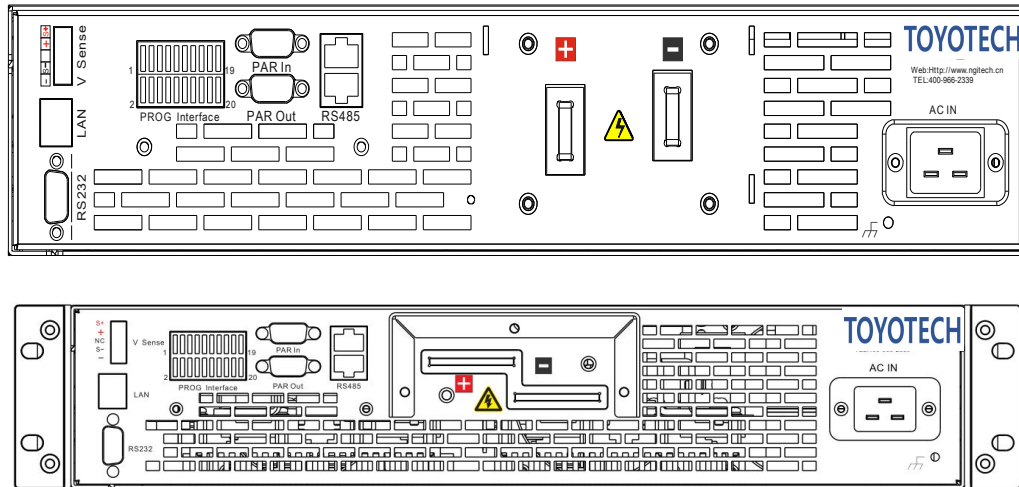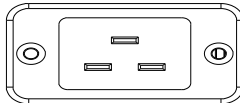
Figure 19   Rear Panel

Table 14

Name	Icon	Definition
Output interface	+ —	DC power supply output
Sense interface	V Sense	Voltage sense
Programming interface	PROG Interface	Analog programming, monitoring output, external control, etc.
Par-in	PAR In	Parallel current-sharing signal input
Par-out	PAR Out	Parallel current-sharing signal output
RS485 interface	RS485	For parallel communication
RS232 interface	RS232	For remote control

LAN port		For remote control
AC power socket		For AC power connection

6.3 Programming Interface
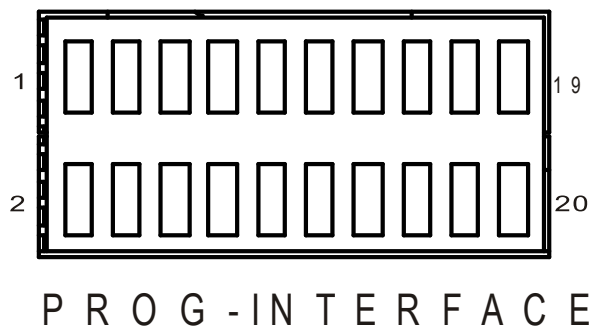
Figure 20   Programming Interface

◆ PIN 1 to PIN 8 can be directly connected to the corresponding positive and negative electrodes. Measurements on other pins should be grounded, that is, the positive electrode of multimeter is connected to the required pin, and the negative electrode of multimeter is connected to the digital ground PIN 9 or PIN 20.

◆ PIN 1 and PIN 3 are voltage monitoring output terminals. When using this function, please connect the positive electrode of multimeter to PIN 1 and the negative electrode to PIN 3. 0V to full scale of N3600 corresponds to the voltage monitoring signal of 0V ~ 10V. Let's take model N3608-080-060 for example. The output voltage of 0V ~ 80V corresponds to the voltage monitoring signal of 0V ~ 10V. When outputting 40V, the voltage between PIN 1 and PIN 3 is 5V.

◆ PIN 2 and PIN 4 are current monitoring output terminals. When using this function, please connect the positive electrode of multimeter to PIN 2 and the negative electrode to PIN 4. 0A to full scale corresponds to the current monitoring signal of 0V ~ 10V. Let's take model N3608-080-060 for example. The output current of 0A ~ 60A corresponds to the current monitoring signal of 0V ~ 10V. When outputting 30A, the voltage between PIN 2 and PIN 4 is 5V.

◆ PIN 5 to PIN 8 are programming input terminals. Please refer to chapter 7.6.2.

◆ PIN 10, PIN 12, PIN 14 and PIN 16 are TTL signal terminals. Please refer to chapter 7.4.4.

◆ PIN 11 is operation mode monitoring terminal. Please refer to chapter 7.5.6.

◆ PIN 13 is for indicating over voltage. When N3600 works properly, PIN 13 outputs a high level. When over voltage protection occurs on N3600, PIN 13 outputs a low level.

◆ PIN 15 is for indicating fault. When N3600 works properly, PIN 15 outputs a high level. When fault occurs on N3600, PIN 15 outputs a low level.

◆ PIN 17 is control input signal terminal. It can control N3600 on/off externally. Please refer to chapter 7.6.1.

◆ PIN 18 is output indication signal terminal. Please refer to chapter 7.4.3.

Table 15

Number	Pin	Definition
1	VMON+	Voltage monitoring output +
3	VMON-	Voltage monitoring output -
2	IMON+	Current monitoring output +
4	IMON-	Current monitoring output -
5	VSET+	Voltage programming input +
7	VSET-	Voltage programming input -
6	ISET+	Current programming input +
8	ISET-	Current programming input -
9	GND	Digital ground
11	MODE	N3600 operation mode
13	OV	Over voltage protection output
15	FAULT	Fault output
10	TTL0	TTL digital output
12	TTL1	TTL digital output
14	TTL2	TTL digital output
16	TTL3	TTL digital output
17	On/Off	Control input signal
18	DC_ON	Output indication signal
19	-	Reserved
20	GND	Digital ground

6.4 AC Input Connection

> **Warning: Please confirm the AC input power and connect to correct AC power. Wrong AC power may cause serious damage to the instrument.**

Notes for AC power input connection:

◆ Single phase input, 47Hz ~ 63Hz (Please refer to the voltage mark at the rear panel.)

◆ Reliable ground

6.5 Output Connection

Please select the proper output connection wire according to different power supply models. Do not use wires with smaller diameter to avoid overheating and danger. Please refer to the Recommended Wire Gauge Selection Table in Appendix.

6.6 Ethernet Cable Connection

The default connection to PC is via Ethernet. An Ethernet cable is provided as standard accessory in N3600 package.

Steps for connection to PC:

1. Check if N3600 is switched on properly.

2. Make sure the PC is switched on and its LAN port is working properly.

3. Connect one end of Ethernet cable to PC LAN port.

4. Connect another end of Ethernet cable to N3600 LAN port.

5. Check if the indicator light at LAN port on N3600 is flashing.

> Note 1: If the indicator light at LAN port on N3600 does not flash after the Ethernet cable was plugged, please check whether the LAN port on computer is working properly and make sure the computer is switched on correctly.
>
> Note 2: After completing the above operations, the indicator light at LAN port on N3600 will stop after a short flash. At this time, the hardware network connection has been established.

6.7 RS232 Serial Connection

N3600 can be connected with a controller by RS232 interface. A RS232 cable is provided as standard accessory in N3600 package.
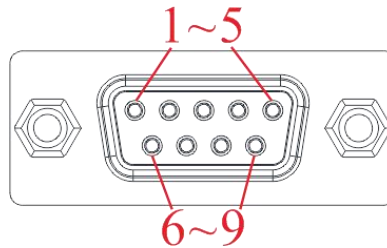

Figure 21   RS232 Interface

Table 16

Pin	Definition
1	NC
2	RXD, receive data
3	TXD, transmit data
4	NC
5	GND, ground
6	NC
7	NC
8	NC
9	NC

6.8 Remote Sense

When N3600 is working, due to the parasitic resistance of the wire, the voltage at the load input terminal will be lower than the voltage at N3600 output terminal after the current flows through the wire, which will affect the output accuracy of N3600. N3600 series supports remote sense to compensate the voltage drop.

When using remote sense, please connect S+ to load input+ and connect S- to load input-.

Note: Green connector is provided as standard accessory in N3600 package. When it is not necessary to use remote sense, the green connector must be installed on SENSE interface. S+ has been connected to + on green connector, and S- to -. Unplugging the green connector may cause instability or even danger.

6.9 Default Communication Parameter

Table 17

Parameter	N3600 Series Default Value
Default IP Address	192.168.0.123
Baud Rate	9600

7 Operation

N3600 series provides V/I mode, SEQ mode and CP mode. Users can enter the required mode by pressing the corresponding button on the front panel.

Parameter settings can be operated by pressing ◀ ▶ or ◯ . Users can press ⏎ to the editing interface. Value input can be completed by pressing the numeric buttons or rotating ◯ . Cursor scrolling can be realized by ◀ ▶ .

This chapter mainly describes N3600 functions and features.

- **V/I**
- **SEQ**
- **CP**
- **Output Configuration**
- **Protection**
- **External Programming**
- **Cascade**
- **Peripheral**
- **Save/Recall**
- **Factory Reset**

7.1 V/I

Methods to enter **V/I** mode:

Method 1: Press ⬭V-Set or ⬭I-Set on the front panel directly.

Method 2: Press ⬭Menu → Select **V/I** by ◀ ▶ or ◯ → Press ◯ or ⬭Enter .

80V/60A/800W   **V/I**

0.000 V
0.00 A
0.000 W

OFF

V-Set   0.000   V
I-Set   0.00   A
OVP   80.800   V

Figure 22   V/I Mode

Table 18

Parameter	Function
V-Set	To set output voltage
I-Set	To set output current
OVP	To set over voltage protection value

Under V/I mode, users can set output voltage, output current and OVP value. N3600 will begin to output after setting is completed and ⬭On/Off is pressed.

Note: The current setting value should be higher than load current to maintain CV mode for output. Otherwise the output voltage will not be same as **V-Set**.

7.2 SEQ

The SEQ mode includes SEQ test function and SEQ edit interface.

7.2.1 SEQ Test

SEQ test (sequence test function) supports simulation of complex voltage & current waveform, which is frequently used for automotive electronics test, engine start-up test, etc.

Methods to enter **SEQ Test**:

Method 1: Press ⬭(SEQ) on the front panel directly.

Method 2: Press ⬭(Menu) → Select **SEQ Test** by ⬭(◄) ⬭(►) or ◯ → Press ◯ or ⬭(Enter).
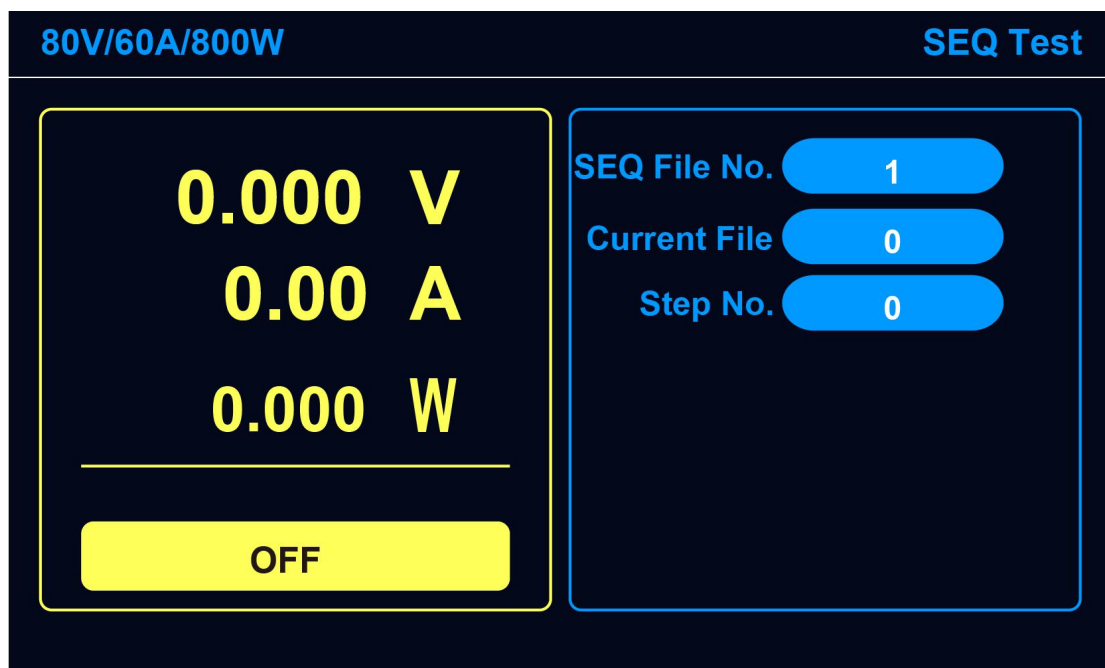
Figure 23   SEQ Test Interface

Table 19

Parameter	Function
SEQ File No.	To select SEQ file No.
Current File	Displaying the SEQ file under operation
Step No.	Displaying the step No. under operation

Under SEQ test mode, users choose the required file number and press ⬭. It will start sequence test. After all steps of sequence file are operated, it will stop sequence test and the system automatically shuts output.

7.2.2 SEQ Edit

N3600 series supports complex waveform output, with up to 100 sequence files and Max. 100 steps per file.
The principle of sequence test is to output the voltage and current according to the test steps edited by the user. When dwell time reaches, it will switch to the next step.
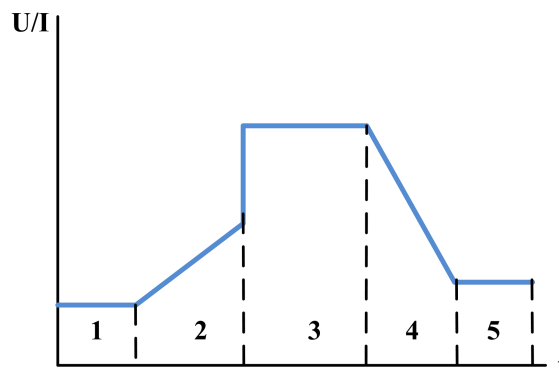

Figure 24   Output Voltage & Current Waveform by SEQ

Methods to enter SEQ Edit:

Method 1: Press ⬭ first on the front panel and then press ⬭ .

Method 2: Press ⬭ → Select **SEQ Edit** by ◀ ▶ or ◯ → Press ◯ or ⬭ .

Figure 25   SEQ Edit

Table 20

Parameter	Function
SEQ File No.	To set the sequence file number
Total Steps	To set the total test steps for the SEQ file, Max. 100 steps
Cycle Times	To set the number of cycles for the file under edit
Link to File	Link to the required file after the present file is completed. Zero means no link.
Step No.	To set the test step number
V-Out	To set the output voltage
I-Out	To set the output current
Dwell	To set single step delay time
V-Slew	To set the voltage slew rate
I-Slew	To set the current slew rate

7.3 CP

Under CP (constant power) mode, N3600 will adjust the output voltage or current continuously to maintain the output power at the set value as much as possible.

Methods to enter **CP**:

Method 1: Press ⬭(CP) on the front panel directly.

Method 2: Press ⬭(Menu) →choose **CP** by ⬭◀ ▶⬭ or ◯ →press ⬭(Enter) or ◯ .

80V/60A/800W   **CP**

0.000 V	Vmax 80.000 V
0.00 A	Imax 60.00 A
0.000 W	P-Set 0.000 W
	Ratio 50 %
OFF	
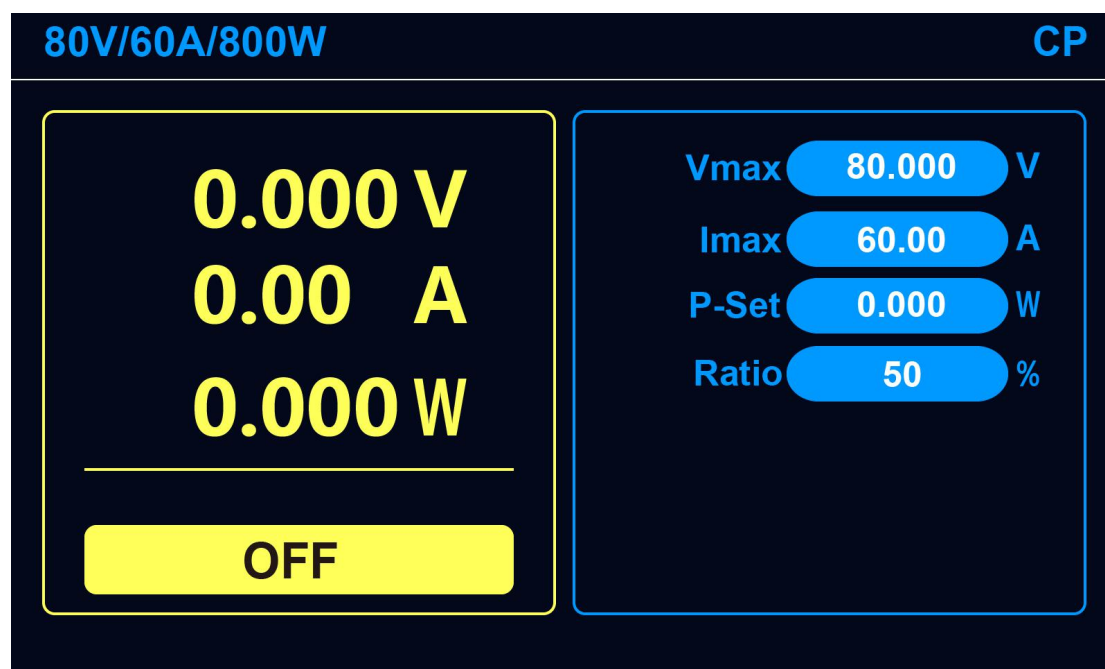
Figure 26   CP Mode

Table 21

Parameter	Function
Vmax	To set the maximum output voltage
Imax	To set the maximum output current
P-Set	To set the constant power output value
Ratio	To set the percentage of voltage slew (and current slew) to maximum slew rate during output

N3600 will adjust the output voltage and output current according to the load condition. Once the external load exceeds the set range of N3600, N3600 output will maintain at the maximum set value (see below figure).
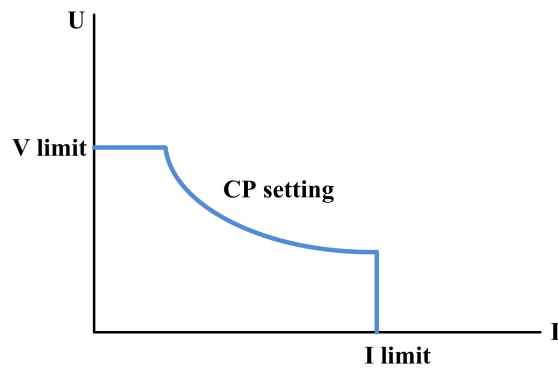
Figure 27   CP Mode

7.4 Output Configuration

Methods to enter **Output Config**:

Method 1: Press ⬭Shift first on the front panel and then press ⬭Menu.

Method 2: Press ⬭Menu → choose **Output Config** by ◀ ▶ or ◯ → press ⬭Enter or ◯.

80V/60A/800W		Output Config
Vmax	0.000 V	V-Fall 0.000 V
Vmin	0.000 V	TTL Value 0
Imax	0.00 A	V-Slew 5000.000 V/s
Imin	0.00 A	I-Slew 2000.000 A/s
V-Rise	0.000 V	

Figure 28   Output Configuration Interface

Table 22

Parameter	Function
V-Max	To set the maximum voltage
V-Min	To set the minimum voltage
I-Max	To set the maximum current
I-Min	To set the minimum current
V-Rise	This parameter is for controlling high level output of programming interface.
V-Fall	This parameter is for controlling low level output of programming interface.
TTL Value	To set TTL signal output of programming interface
V-Slew	To set voltage slew rate, maximum 5000
I-Slew	To set current slew rate, maximum 2000

7.4.1 V-Max and V-Min

V-Max and V-Min are used to limit the output voltage settable range under V/I mode. Normally, the settable range of output voltage is 0 ~ full scale. If V-Max and V-Min are set, the settable range of output voltage is reduced. This feature can prevent misoperation and protect the DUT. The limit will be invalid if V-Max and V-Min are set to 0.

When setting the output voltage under V/I mode, the settable value is between V-Max and V-Min. If setting is out of range, it will automatically switch to the limit value.

7.4.2 I-Max and I-Min

I-Max and I-Min are used to limit the output current settable range under V/I mode. Normally, the settable range of output current is 0 ~ full scale. If I-Max and I-Min are set, the settable range of output current is reduced. This feature can prevent misoperation and protect the DUT. The limit will be invalid if I-Max and I-Min are set to 0.

When setting the output current under V/I mode, the settable value is between I-Max and I-Min. If setting is out of range, it will automatically switch to the limit value.

7.4.3 V-Rise and V-Fall

After output is activated, the programming interface PIN 18 will output a high level when output voltage is equal to or greater than V-Rise. After output is shut, PIN 18 will output a low level and offer an access to other purposes when output voltage is equal to or lower than V-Fall.
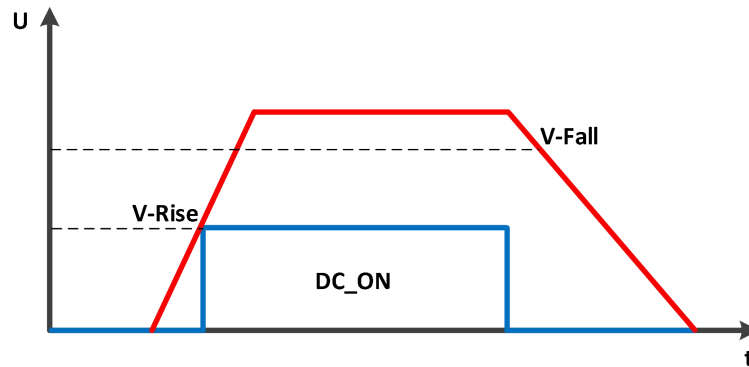

Figure 29   V-Rise and V-Fall

7.4.4 TTL Signal

After output is activated, programming interface PIN 10, PIN 12, PIN 14, and PIN 16 (corresponding to TTL0, TTL1, TTL2, and TTL3 respectively) will output 4-bit programmable TTL levels. **TTL Value** settable range is 0~15. The above four pins output high level or low level respectively to represent a binary number equal to the **TTL Value**. High level stands for 1 while low level for 0.

The following table shows the situation of TTL pins when setting different **TTL Value**.

Table 23

TTL Value	TTL3	TTL2	TTL1	TTL0
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0

9	1	0	0	1
10	1	0	1	0
11	1	0	1	1
12	1	1	0	0
13	1	1	0	1
14	1	1	1	0
15	1	1	1	1

7.5 Protection

On protection interface, users can set various protection parameters. When protection occurs, alarm information will be shown on the screen.

Methods to enter **Protection**:

Method 1: Press ⬮Shift first and then ⬮PROT CLR on the front panel directly.

Method 2: Press ⬮Menu →choose **Protection** by ⬮◀ ⬮▶ or ◯ →press ⬮Enter or ◯ .

Note: Please press ⬮PROT CLR to clear the alarm manually.

Figure 30   Protection Setting Interface

7.5.1 OVP (Over Voltage Protection)

This parameter is used to set over voltage protection value. Once the output voltage exceeds the OVP set value, N3600 will immediately shut off the output and protect the DUT. Meanwhile, alarm OVP will be displayed on the screen.

7.5.2 OCP (Over Current Protection)

This parameter is used to set over current protection value. Once the output current exceeds the OCP set value, N3600 will immediately shut off the output and protect the DUT. Meanwhile, alarm OCP will be displayed on the screen.

7.5.3 OPP (Over Power Protection)

This parameter is used to set over power protection value. Once the output power exceeds the OPP set value, N3600 will immediately shut off the output and protect the DUT. Meanwhile, alarm OPP will be displayed on the screen.

7.5.4 UVP (Under Voltage Protection)

This parameter is used to set under voltage protection value. Once the output voltage is lower than the UVP set value, N3600 will immediately shut off the output and protect the DUT. Meanwhile, alarm UVP will be displayed on the screen.

7.5.5 Monitoring Mode

When using N3600 to supply power to the DUT, users can use this function to monitor N3600 operation mode, if the DUT has operation mode demand for N3600 .

Options for monitoring mode are OFF, CV TO CC or CC TO CV.
◆ OFF: The monitoring mode is disabled.
◆ CV TO CC: After N3600 switches from CV mode to CC mode, N3600 will still work normally if N3600's operating time in CC mode does not exceed **Monitor T**. If N3600's operating time in CC mode exceeds **Monitor T**, N3600 will shut the

output. Meanwhile alarm ALTER will be displayed on the screen.

For example, Monitor mode is set to CV to CC. Monitor Time is set to 10s.
When N3600 switches from CV to CC, alarm ALTER will not be displayed on screen if within 10s N3600 switches back to CV. If N3600 does not switch back to CV after 10s, alarm ALTER will be displayed on screen.

◆ CC TO CV: After N3600 switches from CC mode to CV mode, N3600 will still work normally if N3600's operating time in CC mode does not exceed **Monitor T**.If N3600's operating time in CV mode exceeds **Monitor T**, N3600 will shut the output. Meanwhile alarm ALTER will be displayed on the screen.

For example, Monitor mode is set to CC to CV. Monitor Time is set to 10s.
When N3600 switches from CC to CV, alarm ALTER will not be displayed on screen if within 10s N3600 switches back to CC. If N3600 does not switch back to CC after 10s, alarm ALTER will be displayed on screen.

7.5.6 OTP (Over Temperature Protection)

When N3600 internal temperature exceeds the warning level, OTP will be activated and the output will be shut off to protect N3600. Meanwhile, alarm OTP will be displayed on the screen. OTP parameters have been solidified in N3600. It is not necessary to set OTP manually.

7.6 External Prog

Methods to enter **External Prog**:

Method 1: Press (Shift) first and then (CP) on the front panel directly.

Method 2: Press (Menu) → choose **External Prog** by (◀) (▶) or (○) → press (Enter) or (○).

Figure 31　External Prog Interface

7.6.1 External Control

This function allows users to control N3600 output on or off via PIN 17 at the programming interface. Users can use a switch and a wire to connect PIN 17 and GND, and use this function by turning on/off the switch. When External Control is set to ON, [On/Off] on the front panel is disabled.

Three options for External Control:

Table 24

Option	Function
OFF	Shut off the external control function
TOGGLE	PIN 17 defaults to a high level. When there is a low level, it is equivalent to pressing [On/Off] on the front panel to switch N3600 output.
HOLD	PIN 17 defaults to a high level. When there is a low level, it will start output. When there is a high level, it will shut off the output.

7.6.2 Analog Programming (APG)

Analog programming (APG) can control the output voltage and output current by using voltage analog signal. The external analog programming signal is introduced by PIN 5 to PIN 8 at the programming interface. Please refer to pin definition for programming interface.
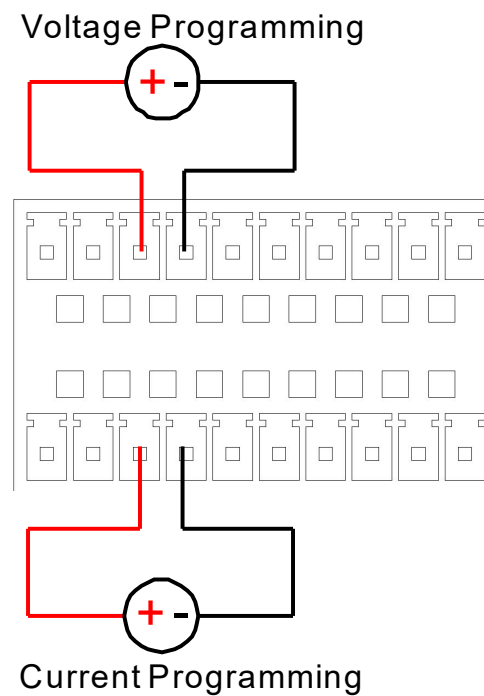
Figure 32   APG Wiring

Four options for analog programming:

Table 25

Option	Function
OFF	APG disabled
V	Voltage programming enabled, current programming disabled
I	Current programming enabled, voltage programming disabled
V&I	Both voltage and current programming enabled

After APG function is activated, the output voltage & current are controlled by externally input voltage signal. There are two options for external programming reference voltage.

1. 5V: 0~5V programming signal corresponds to 0 ~ full scale output voltage/current.

2. 10V: 0~10V programming signal corresponds to 0 ~ full scale output voltage/current.

Let's take model N3608-080-060 for example. When selecting 5V reference voltage, the input analog value is 0 ~ 5V, and the output voltage is between 0 ~ 80V. When the input analog voltage increases by 1V, N3600 output voltage increases by 16V. When the input analog voltage is 3V, N3600 output voltage will be 48V.
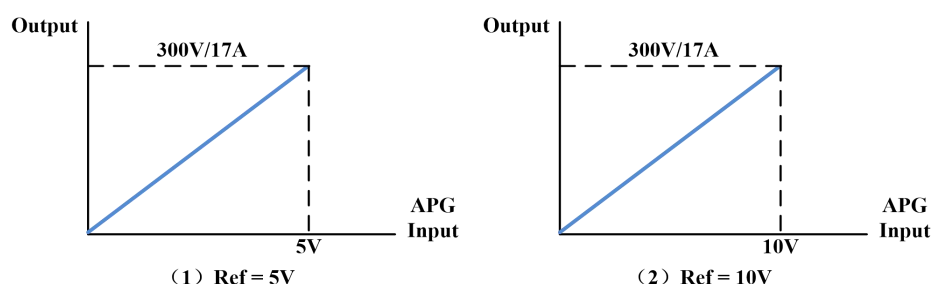

Figure 33   Output and APG Input

7.7 Cascade

N3600 series offers parallel/series operation, supporting Max. 5 units with same specification. Parallel and series connection cannot be used at same time. When used in series, the Max. total output voltage should not exceed 600V. It can be controlled and read back simultaneously via the shared bus.

7.7.1 Parallel/Series Output Wiring
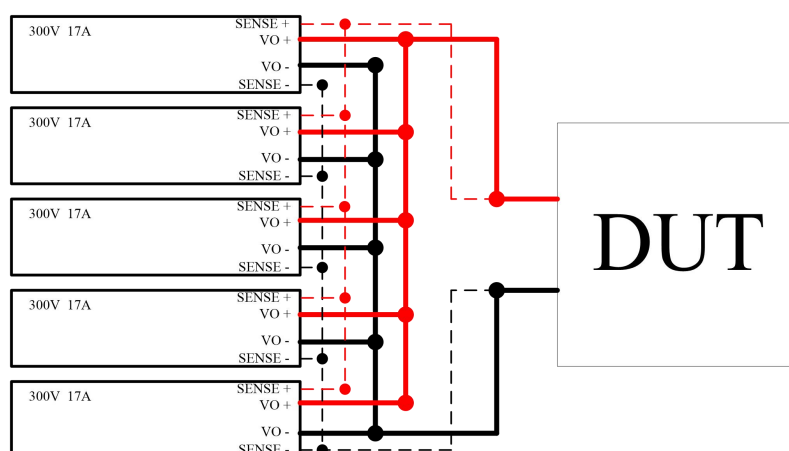
Figure 34   Parallel Wiring
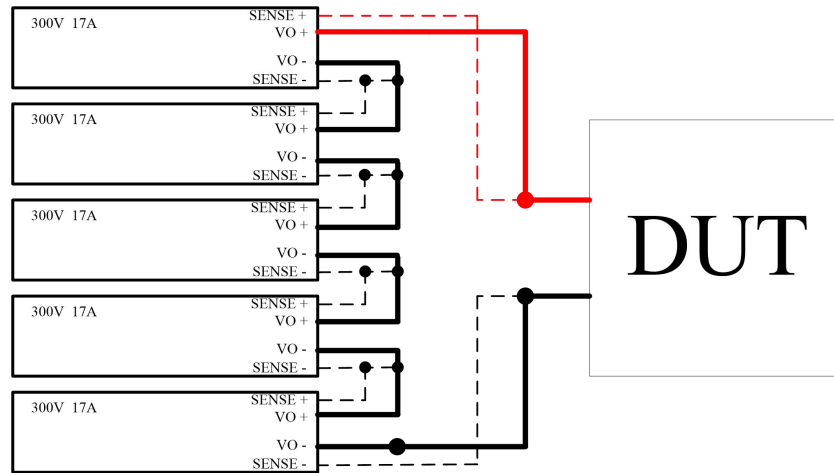
Figure 35   Series Wiring

7.7.2 Wiring for Communication Cable and Current Sharing Cable

It is necessary to set master and slave in cascade application. For example, if 5 units are connected in parallel, one of them should be set as master and the other four as slaves. The master and slave communicate with each other through RS485 cable. The master distributes configuration parameters to the slaves via RS485, and also obtains the sensing and status information of the slaves via RS485.

Current sharing cable is used to balance the output current of each unit in parallel. Therefore, in parallel applications, current sharing cables should be connected.

Note: Please take out the current sharing cable in series application. Otherwise, N3600 will be damaged.
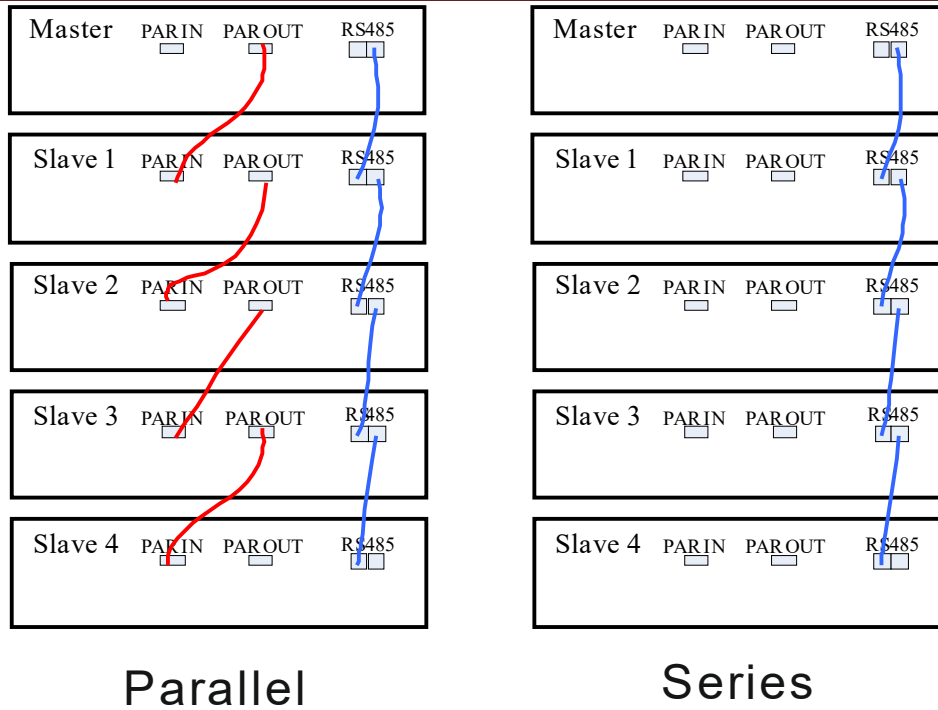
Figure 36   Cascade Communication Wiring

7.7.3 Parallel/Series Setting

Methods to enter **Cascade**:

Method 1: Press [Shift] first and then [Lock] on the front panel directly.

Method 2: Press [Menu] →choose **Cascade** by [◄] [►] or ◯ →press [Enter] or ◯ .

Figure 37   Parallel/Series Setting

The slave should be configured first in cascade application. Slave number should be set separately according to the quantity of cascaded units. Please note that the repeated number will cause communication failure.

After the device is set as a slave, it is invalid to set **Parallel/Series**, **Slave Number** and **M/S Control**.

Please press ⬭(V-Set) or ⬭(I-Set) to return to V/I interface. By now, it is not necessary to configure the slave. The left area will display readback data. The right area will just show slave number, hiding voltage, current, etc.

After slave setting completed, master setting is followed. There are three steps for master setting.
1. Set **Parallel/Series**: select according to actual demand.
2. Set **Slave Number**: set slave quantity based the connected slave units.
3. Start cascade: set **M/S Control** to ON.

When **M/S Control** is turned on, cascade application is activated immediately. The master will automatically search for slaves and establish communication connection. It is only necessary to operate on the master. Please note that after **M/S Control** is

turned on, **Parallel/Series** and **Slave Number** cannot be changed.

After cascade setting completed, press ⬭(V-Set) or ⬭(I-Set) to return to V/I interface. V/I interface will display data of the entire cascade group and indicate the present cascade type (parallel or series)at the bottom left corner.

7.7.4 Parallel/Series Voltage/Current Setting

Cascade function allows users to control the entire cascade group by only operating on the master. Users can set parameters such as voltage and current on the master and view the readback voltage/current/power and various status information of the entire cascade group. The settable range will be automatically adjusted after cascading. For example, if there are four slaves in parallel, the current settable range will be increased to 4 times. To turn on/off the output, please press ⬭(On/Off) on the master front panel.

After cascade is activated, all protection functions still take effect. If the master or any slave is protected and the output is cut off, the system will automatically shut off the output of the entire cascade group and display the protection information on the screen.

When slave is protected, protection information will be displayed on the slave screen.

Please press ⬭(PROT-CLR) to clear the alarm manually.

The below table indicates the possible protection or faults in cascade application.

Table 26

Number	Symbol	Definition
1	Parallel line Connected	Current sharing cable is connected in series. It may cause damage.
2	Parallel line Break	Current sharing cable is not connected in parallel. The slaves cannot output.

3	M-MIS	Master communication is missing.
4	S-MIS	Slave communication is missing.
5	S-OFF	Slave is protected and output is cut off.
6	Parallel flashing	Communication in parallel is unstable.
7	Series flashing	Communication in series is unstable.

7.8 Save/Recall

N3600 provides 20 groups of storage locations for users to save parameters, such as voltage, current, etc.

Figure 38   Save and Recall

7.8.1 Save

After voltage & current setting completed, please press ⬭, select the storage location and press ⬭. The parameter will be stored in the required location.

7.8.2 Recall

Press ⬭(Shift) first and then ⬭(Save) to enter recall interface.

Select the storage location and press ⬭(Enter).

If there is no parameters saved in the recalled location, recall operation will be invalid.

7.9 Factory Reset

Method to enter **Factory Reset**:

Press ⬭(Menu)→choose **Factory Reset** by ⬭◀ ⬭▶ or ◯→press ⬭(Enter) or ◯.

After selecting Confirm, please press ⬭(Enter) to complete the setting.

Note: After setting completed, it will take effect only after N3600 is restarted.

Factory Reset

Restore Factory Setting ?

Confirm   Cancel

Figure 39   Factory Reset

8 Remote Operation

N3600 is equipped with two communication interfaces: RS232 and LAN.

8.1 Remote Wiring

Please use RS232 cable or Ethernet cable to connect N3600 with PC. Users can download and install Application Software in the USB flash drive to control N3600 remotely.

8.1.1 RS232 Interface

On the rear panel, there is a male DB-9 interface with 9 pins.

Please use the supplied RS232 cable with both female ends for communication.

N3600 series applies UDP network communication mode. The default port number is 7000. IP address and subnet mask can be set.

It is necessary to set baud rate and parity mode in RS232 communication. The baud rate can be set to 4800/9600/19200/38400/115200. The parity mode can be set to None/Odd/Even.

> Note: The RS232 interface of N3600 does not support flow control.

Steps for remote control via RS232 interface:
1. Enter the N3600 Application Software on PC.

2. Find **Hardware Config**.

3. Select COM for **Communication Mode**.

4. Set Port, Baud rate and parity on N3600 screen.

5. Press **Test** to connect with N3600.

◆ On **System** interface, users can set **Baud Rate**. The rate of computer must be consistent with rate of N3600.

Figure 40　System Configuration Interface

8.1.2 LAN Port

The LAN port is at the rear panel, which can be used to communicate between N3600 and PC.

Figure 41　LAN Port

Steps for remote control via LAN port:
1. Enter the N3600 Application Software on PC.

2. Find **Hardware Config**.

3. Select LAN for **Communication Mode**.

4. Set **IP** address on N3600 screen. The IP should be consistent with IP of N3600.

5. Press **Test** to connect with N3600.

8.2 Remote Control

After N3600 receives the correct communication instruction, it will start remote control. Under remote control mode, local operation is disabled and N3600 can only be controlled by programming instructions. Please press ⬭ᴸᵒᶜᵏ to return to local operation.

Remote control and operation can be realized via the application software on PC. The software installation program can be obtained from the USB flash drive.

In addition, remote control can also be achieved by external programming software.

Figure 42   Remote Mode

9 Maintenance and Self-inspection

9.1 Regular Maintenance

Clean the Device

Please wipe lightly the device with a dry or slightly wet cloth, and do not wipe the inside of it. Make sure the power is disconnected before cleaning.

⚠ **Warning: Disconnect power before cleaning.**

9.2 Fault Self-inspection

Device Fault Self-inspection

Due to system upgrade or hardware problem, the device may break down. Please do the following necessary inspection to eliminate the troubles, which can save your maintenance and time cost. If the troubles cannot be recovered, please contact NGI.

The inspection steps are as below.
◆ Check whether the device is powered.
◆ Check whether the device can be turned on normally.
◆ Check whether the fuse has no damage.
◆ Check whether other connectors are correct, including wire cables, plug, etc.
◆ Check whether the system configuration is correct.
◆ Check whether all the specifications and performances are within the device working range.
◆ Check whether the device displays error information.
◆ Operate on a replacement device.

Calibration Intervals

It is suggested that N3600 series should be calibrated once a year.

10 Main Technical Data

Attention:

◆ The load is purely resistive.

◆ Please warm up for half hour and make sure there is current flowing.

◆ After warm-up, N3600 must be correctly calibrated in suitable operating environment.

◆ N3600 series has a wide range of voltage and current within the rated power.

◆ Maximum output current under rated output voltage is equal to rated output power divided by rated output voltage.

◆ Maximum output voltage under rated output voltage is equal to rated output power divided by rated output current.

10.1.1 Technical Data Sheet

Table 27

Model	N3608-080-060	N3612-080-060	N3612-240-030	N3618-016-250	N3618-080-120
Voltage	0-80V	0-80V	0-240V	0-16V	0-80V
Current	0-60A	0-60A	0-30A	0-250A	0-120A
Power	800W	1200W	1200W	1800W	1800W
CV Mode					
Range	0-80V	0-80V	0-240V	0-16V	0-80V
Setting Resolution	1mV	1mV	10mV	1mV	1mV
Setting Accuracy （23±5℃）	0.05%+0.05%F.S.				
CC Mode					
Range	0-60A	0-60A	0-30A	0-250A	0-120A
Setting Resolution	1mA	1mA	1mA	10mA	10mA
Setting Accuracy （23±5℃）	0.1%+0.1%F.S.				
Voltage Measurement					
Range	0-80V	0-80V	0-240V	0-16V	0-80V
Readback Resolution	1mV	1mV	10mV	1mV	1mV
Readback Accuracy （23±5℃）	0.05%+0.05%F.S.				

Temperature Coefficient	50ppm/℃				
Current Measurement					
Range	0-60A	0-60A	0-30A	0-250A	0-120A
Readback Resolution	1mA	1mA	1mA	10mA	10mA
Readback Accuracy （23±5℃）	0.1%+0.1%F.S.				
Temperature Coefficient	50ppm/℃				
Line Regulation					
Voltage	≤0.01%				
Current	≤0.05%				
Load Regulation					
Voltage	≤0.05%				
Current	≤0.05%				
Dynamic Characteristics					
Voltage Rise Time (no load)	≤20ms	≤20ms	≤60ms	≤10ms	≤20ms
Voltage Rise Time (full load)	≤500ms			≤300ms	≤500ms
Voltage Fall Time (no load)	≤1.2s	≤1.2s	≤0.8s	≤0.6s	≤1.2s
Voltage Fall Time (full load)	≤20ms	≤20ms	≤50ms	≤5ms	≤20ms
Transient Recovery Time	The recovery time of load varying from 10% to 90% and output voltage recovering within 0.5% of rated voltage is less than 20ms.			≤80ms	≤20ms
Output Ripple(20Hz-20MHz)					
Voltage Ripple (P-P)	≤300mVp-p	≤300mVp-p	≤400mVp-p	≤400mVp-p	≤400mVp-p
Others					
Efficiency	90%（Typical）				
Interface	RS232/LAN				
Communication Response Time	≤5ms				
AC Input	Single phase, please refer to the voltage mark at the rear panel.				
Temperature	Operating temperature: 0℃~40℃, storage temperature: -20℃~60℃				

Operating Environment	Altitude <2000m, relative humidity: 5%~90%RH(non-condensing), atmospheric pressure: 80~110kPa		
Net Weight	Approx. 15.5kg	16.5kg	18kg
Dimension	2U, 88.0(H)*482.0(W)*550.0(D)mm		

Table 28

Model	N3618-240-060	N3618-600-005	N3618-600-020	N3618-800-015
Voltage	0-240V	0-600V	0-600V	0-800V
Current	0-60A	0-5A	0-20A	0-15A
Power	1800W			
CV Mode				
Range	0-240V	0-600V	0-600V	0-800V
Setting Resolution	10mV			
Setting Accuracy (23±5℃)	0.05%+0.05%F.S.			
CC Mode				
Range	0-60A	0-5A	0-20A	0-15A
Setting Resolution	1mA			
Setting Accuracy (23±5℃)	0.1%+0.1%F.S.			
Voltage Measurement				
Range	0-240V	0-600V	0-600V	0-800V
Readback Resolution	10mV			
Readback Accuracy (23±5℃)	0.05%+0.05%F.S.			
Temperature Coefficient	50ppm/℃			
Current Measurement				
Range	0-60A	0-5A	0-20A	0-15A
Readback Resolution	1mA			
Readback Accuracy (23±5℃)	0.1%+0.1%F.S.			
Temperature Coefficient	50ppm/℃			
Line Regulation				

Voltage	≤0.01%			
Current	≤0.05%			
Load Regulation				
Voltage	≤0.05%			
Current	≤0.05%			
Dynamic Characteristics				
Voltage Rise Time (no load)	≤60ms	≤100ms	≤100ms	≤150ms
Voltage Rise Time (full load)	≤500ms	≤400ms	≤400ms	≤500ms
Voltage Fall Time (no load)	≤0.8s	≤1.2s	≤1.2s	≤0.9s
Voltage Fall Time (full load)	≤50ms	≤80ms	≤80ms	≤80ms
Transient Recovery Time	The recovery time of load varying from 10% to 90% and output voltage recovering within 0.5% of rated voltage is less than 20ms.			
Output Ripple(20Hz-20MHz)				
Voltage Ripple (P-P)	≤400mVp-p	≤600mVp-p	≤600mVp-p	≤750mVp-p
Others				
Efficiency	90%（Typical）			
Interface	RS232/LAN			
Communication Response Time	≤5ms			
AC Input	Single phase, please refer to the voltage mark at the rear panel.			
Temperature	Operating temperature: 0℃~40℃, storage temperature: -20℃~60℃			
Operating Environment	Altitude <2000m, relative humidity: 5%~90%RH(non-condensing), atmospheric pressure: 80~110kPa			
Net Weight	Approx. 18kg			
Dimension	2U, 88.0(H)*482.0(W)*550.0(D)mm			

Table 29

Model	N3618-1000-010	N3630-016-500	N3630-080-120	N3630-240-060
Voltage	0-1000V	0-16V	0-80V	0-240V
Current	0-10A	0-500A	0-120A	0-60A
Power	1800W	3000W	3000W	3000W
CV Mode				
Range	0-1000V	0-16V	0-80V	0-240V
Setting Resolution	100mV	1mV	1mV	10mV
Setting Accuracy（23±5℃）	0.05%+0.05%F.S.			
CC Mode				
Range	0-10A	0-500A	0-120A	0-60A
Setting Resolution	1mA	10mA	10mA	1mA
Setting Accuracy（23±5℃）	0.1%+0.1%F.S.			
Voltage Measurement				
Range	0-1000V	0-16V	0-80V	0-240V
Readback Resolution	100mV	1mV	1mV	10mV
Readback Accuracy（23±5℃）	0.05%+0.05%F.S.			
Temperature Coefficient	50ppm/℃			
Current Measurement				
Range	0-10A	0-500A	0-120A	0-60A
Readback Resolution	1mA	10mA	10mA	1mA
Readback Accuracy（23±5℃）	0.1%+0.1%F.S.			
Temperature Coefficient	50ppm/℃			
Line Regulation				
Voltage	≤0.01%			
Current	≤0.05%			
Load Regulation				
Voltage	≤0.05%			

Current	≤0.05%			
Dynamic Characteristics				
Voltage Rise Time (no load)	≤150ms	≤10ms	≤20ms	≤60ms
Voltage Rise Time (full load)	≤500ms	≤300ms	≤500ms	
Voltage Fall Time (no load)	≤0.9s	≤0.6s	≤1.2s	≤0.8s
Voltage Fall Time (full load)	≤100ms	≤5ms	≤20ms	≤50ms
Transient Recovery Time	≤20ms	≤80ms	The recovery time of load varying from 10% to 90% and output voltage recovering within 0.5% of rated voltage is less than 20ms.	
Output Ripple(20Hz-20MHz)				
Voltage Ripple (P-P)	≤750mVp-p	≤400mVp-p	≤400mVp-p	≤400mVp-p
Others				
Efficiency	90%（Typical）			
Interface	RS232/LAN			
Communication Response Time	≤5ms			
AC Input	Single phase, please refer to the voltage mark at the rear panel.			
Temperature	Operating temperature: 0℃~40℃, storage temperature: -20℃~60℃			
Operating Environment	Altitude <2000m, relative humidity: 5%~90%RH(non-condensing), atmospheric pressure: 80~110kPa			
Net Weight	Approx. 18kg	Approx. 20kg	Approx. 18kg	
Dimension	2U, 88.0(H)*482.0(W)*550.0(D)mm			

Table 30

Model	N3630-600-020	N3630-800-015	N3630-1000-010
Voltage	0-600V	0-800V	0-1000V
Current	0-20A	0-15A	0-10A
Power	3000W		
CV Mode			
Range	0-600V	0-800V	0-1000V
Setting Resolution	10mV	10mV	100mV
Setting Accuracy（23±5℃）	0.05%+0.05%F.S.		
CC Mode			
Range	0-20A	0-15A	0-10A
Setting Resolution	1mA		
Setting Accuracy（23±5℃）	0.1%+0.1%F.S.		
Voltage Measurement			
Range	0-600V	0-800V	0-1000V
Readback Resolution	10mV	10mV	100mV
Readback Accuracy（23±5℃）	0.05%+0.05%F.S.		
Temperature Coefficient	50ppm/℃		
Current Measurement			
Range	0-20A	0-15A	0-10A
Readback Resolution	1mA		
Readback Accuracy（23±5℃）	0.1%+0.1%F.S.		
Temperature Coefficient	50ppm/℃		
Line Regulation			
Voltage	≤0.01%		
Current	≤0.05%		
Load Regulation			

Voltage	≤0.05%		
Current	≤0.05%		
Dynamic Characteristics			
Voltage Rise Time (no load)	≤100ms	≤150ms	≤150ms
Voltage Rise Time (full load)	≤400ms	≤500ms	≤500ms
Voltage Fall Time (no load)	≤1.2s	≤0.9s	≤0.9s
Voltage Fall Time (full load)	≤80ms	≤80ms	≤100ms
Transient Recovery Time	The recovery time of load varying from 10% to 90% and output voltage recovering within 0.5% of rated voltage is less than 20ms.		
Output Ripple(20Hz-20MHz)			
Voltage Ripple (P-P)	≤600mVp-p	≤750mVp-p	≤750mVp-p
Others			
Efficiency	90%（Typical）		
Interface	RS232/LAN		
Communication Response Time	≤5ms		
AC Input	Single phase, please refer to the voltage mark at the rear panel.		
Temperature	Operating temperature: 0℃~40℃, storage temperature: -20℃ ~60℃		
Operating Environment	Altitude <2000m, relative humidity: 5%~90%RH(non-condensing), atmospheric pressure: 80~110kPa		
Net Weight	Approx. 18kg		
Dimension	2U, 88.0(H)*482.0(W)*550.0(D)mm		

Note 1: The above specifications are only for reference. For other specifications, please contact TOYOTECH.
Note 2: All specifications are subject to change without notice.

10.1.2 Protection Function

Table 31

Protection	N3600
Over Voltage Protection (OVP)	Yes
Over Current Protection (OCP)	Yes
Over Temperature Protection (OTP)	Yes
Power Limit	Yes

10.1.3 Communication Interface

Table 32

N3600		
RS232	Hardware	Standard RS232 interface Baud rate: 4800/9600/19200/38400/115200bps Data length: 8 bits Stop bit:1 bit Parity bit: None Flow control: None
LAN	Hardware	IEEE 802.3 100M Ethernet IPv4, RJ-45 interface

11 Appendix

11.1 Protection and Fault Definition Table

Table 33

Symbol	Definition	Symbol	Definition
Parallel line Break	Current sharing cable is not connected in parallel. The slaves cannot output.	OVP	Over voltage protection
Parallel line Connected	Current sharing cable is connected in series. It may cause damage.	OCP	Over current protection
M-MIS	Master communication is missing.	OPP	Over power protection
S-MIS	Slave communication is missing.	OTP	Over temperature protection
S-OFF	Slave is protected and output is cut off.	UVP	Under voltage protection
SHUT DOWM	Abnormal shutdown.	FAULT	Power failure
ALTER	Operation mode altered.		

11.2 100M/s Ethernet Cable(Standard Accessory)

The cable is used to connect N3600 with PC via LAN port.

Table 34

Product	100M network cable
Feature	8-core wire structure
Connector	Gold-plated copper contacts
Connector Material	HPVC resin
Upper Bandwidth	100Mbps
Channel Bandwidth	250MHz

11.3 Recommended Wire Gauge Selection Table

Table 35

Model	Sectional Area	Temperature Conditions			
AWG	mm²	60℃	75℃	85℃	90℃
		Wire model: RUW, T , UF	Wire model: RHW, RH	Wire model: V, MI	Wire model: TA, TBS, SA, AV
		Rated Current (A)			
14	2.08	20	20	20	20
12	3.31	25	25	30	30
10	5.26	30	35	40	40
8	8.36	40	50	55	55
6	13.3	55	65	70	75
4	21.1	70	85	95	95
3	26.7	85	100	110	110
2	33.6	95	115	125	130
1	42.4	110	130	145	150
0	53.5	125	150	165	170
00	67.4	145	175	190	195
000	85	165	200	215	225
0000	107	195	230	250	260

11.4 Trouble Shooting

◆ Screen does not work after power-on.

Table 36

Fault	Possible Causes	Solutions
N3600 screen does not work after power-on.	The power cord is broken.	Change a new power cord.
	The power cord is not properly connected.	Ensure proper connection.

◆ No output.

Table 37

Fault	Possible Causes	Solutions
There is no output after switching on.	The voltage/current setting is zero.	Set the required voltage/current.
The voltage output stops after transient output.	There is over voltage protection (OVP).	Lower the setting.

◆ It is not allowed to set output voltage/current properly.

Table 38

Fault	Possible Causes	Solutions
The output voltage/current cannot be set properly.	The set voltage/current is higher than V-Limit Max/I-Limit Max.	Set the required voltage/current.
	The set voltage/current is lower than V-Limit Min/I-Limit Min.	

◆ Unstable output voltage.

Table 39

Fault	Possible Causes	Solutions
The output voltage are not stable.	N3600 is switching between CV and CC.	Change the setting.
The output voltage is wobbly.	The sense terminal is not connected.	Connect to sense terminal, using the green terminal supplied.

◆ High output voltage ripple.

Table 40

Fault	Possible Causes	Solutions
The ripple is high sometimes.	The output voltage is out of range.	Adjust the output voltage.

The ripple is high in another operation environment.	There is strong electromagnetic interference nearby.	Stay away from the interference.