User Manual

N36600 Series Portable Wide Range Programmable DC Power Supply

Version: V20231130

Copyright Statement

Contents

1 Preface

Dear Customers

First of all, we greatly appreciate your choice of N36600 series DC Power Supply (N36600 for short). We are also honored to introduce our company, Hunan Next Generation Instrumental TOYOTECH.

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 N36600 series programmable DC power supply, including installation, operation, specifications and other detailed information. 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 N36600, 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 Symbols

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

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

2.2 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 N36600's rated range.

3 Inspection and Installation

3.1 Inspection

After receiving N36600, please check the instrument according to the following steps:

1. Check whether the instrument is damaged during transportation.
2. Check accessories.
3. Make sure the following accessories are attached.

Note

1: If any severe damage to the package, please contact our authorized distributor or TOYOTECH. Send it back after getting a positive response.

2: If no problem, please keep it carefully. Compliance with packing requirements when returning for service.

3.2 Connection to Power Cord

Before connecting the power cord, observe the following precautions to prevent electric shock and damage to the instrument:

Warnings

- Make sure that the voltage matches the rated voltage of the instrument;
- Make sure the power switch is off;
- Please use the power cord supplied by our company, and connect the power cord to a three-pronged socket with a protective grounding terminal;

Connect one end of the power cord to the input socket on the back panel of the instrument and the other end to the three-pronged socket with a protective grounding terminal.

3.3 Power-on Inspection

After receiving N36600 device, please check the device by following these steps:

- Switch-On

Press the POWER button on the front panel to turn on the device. If you find that the power supply cannot start normally, first check whether the power cable is connected, whether the power supply has been powered, and whether the power switch has been turned on.

Warnings

When the power switch is off, some components inside the power supply may still have a high voltage. In order to avoid the risk of electric shock, do not open the cover.

- Output voltage check

Verify the basic voltage function of the power supply without load with the following steps:

1. Turn on the power switch.
2. Set the supply voltage value to 1V.
3. Turn the output ON.
4. Check that the voltage value displayed on the screen is close to the set voltage value.
5. Ensure that the voltage can be regulated from 0V to the maximum voltage in the range.

- Check output current

Use the following steps to verify the basic function of the power supply when the output is short-circuited:

1. Turn on the power switch.
2. Make sure the power output state is OFF.

3. Connect an insulated wire to the output of the power supply to short-circuit the positive and negative terminals. The wire should be able to withstand the maximum output current of the power supply.
4. Set the current value 1A.
5. Turn the output ON.
6. Check whether the current displayed on the screen is close to the set current value.
7. Ensure that the current can be adjusted from 0A to the maximum current value in the range.

3.4 Load Connection

3.4.1 Load Wires

N36600 series power supply does not provide load wires, users need to choose their own wires. The following points should be noted when selecting the wires between the load and the power supply:

- The maximum allowable current of a wire.
- The insulation level of the wire shall not be lower than the maximum output voltage of the power supply.
- Maximum wire length and wire voltage drop.
- Noise and impedance effects on the load wire.

3.4.1.1 Maximum Allowable Current

The following two factors should be considered when choosing the wire diameter:

1. The wire should be thick enough to avoid overheating when carrying the rated load current or load short circuit current (whichever is larger).
2. The wire diameter should be selected reasonably to minimize the voltage drop on each wire to prevent excessive power consumption of the power supply output and affect the load adjustment rate (although the N36600 series power

supply can use the remote sampling function to compensate the voltage, but it is recommended to minimize the voltage drop).

3.4.1.2 Effects of Noise and Impedance

In order to reduce noise or radiation, the load wires and the remote sense wires should be twisted pair and the length should be as short as possible. Shielded wires must be used in high noise environments. The shielded part is connected to chassis through the grounding screw hole on rear panel.

Even if the noise is not loud, the load wire and remote sense wires should also be twisted pair to reduce coupling and increase the stability of power supply. The remote sense wires must be separated from AC input power cord.

Twisted-pair load wires can reduce the parasitic inductance of the wires and prevent high-frequency voltage peak on the load and the power supply output, caused by fluctuation of the load current.

The impedance between the power supply output and the load makes the ripple & noise on the load higher than that at the rear panel terminal of power supply. If necessary, an additional filter circuit with a bypass capacitor can be connected to the load to limit the high-frequency load current.

3.4.1.3 Inductive Load

When supplying power to inductive loads such as motors, users can connect a diode across the power output since the inductive load will produce a voltage spike which is harmful to power supply. The rated voltage and current of the diode should be higher than the rated output voltage and current of power supply. The negative polarity of diode is connected to the positive output of power supply. The positive polarity is connected to the negative output of power supply.

When supplying power to inductive loads such as motors, load transients, such as counter electromotive force from motors, may occur. Please connect a surge current suppressor across the output to protect the power supply. The rated breakdown voltage of surge current suppressor must be approximately 10% higher than the rated output voltage of the power supply.

4 Product

4.1 Brief Introduction

N36600 series programmable DC power supply has the widest voltage and current utilization rate of similar products, greatly improving the application range. For example, 100W power, the output value is adjustable in 80V/5A, and the rate of change of voltage and current is automatically controlled, and the power ratio reaches four times as much. One machine can replace four models, reducing repeated investment of customers.

Features

- Fully digital control
- Full scale high resolution
- Low ripple, low noise
- Minimum external dimensions
- Ultra high brightness VA screen display
- Constant voltage, current and power output (only remote control)
- Standard RS232 and RS485, USB or LAN optional
- Support SCPI command set, MODBUS-RTU protocol
- High reliability: OVP/OCP &OTP
- Output controlled by On/Off button
- Remote compensation, external trigger, with output terminals on the front and rear panels.
- High quality and high cost performance
- Multiple sets of output voltage and current can be preset: 4×100 sets

4.2 Appearance & Dimension

N36600 series product dimension：

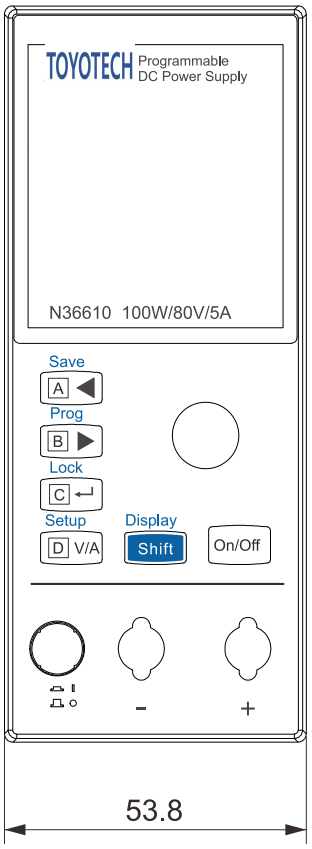


Figure1 Front Panel Dimension (mm)

Figure2 Side View Size (mm)

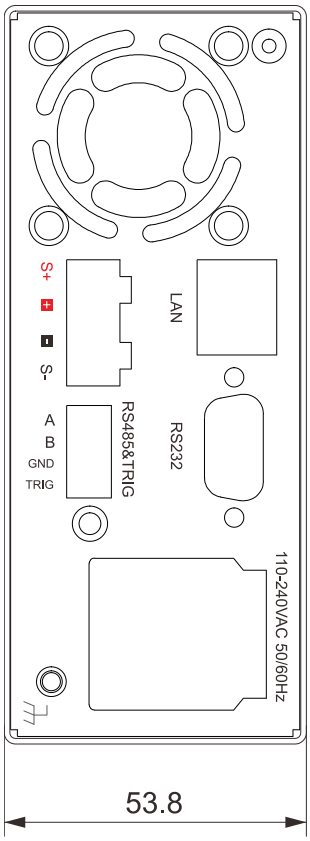


Figure3 Rear Panel Dimension(mm)

4.3 Front Panel Introduction

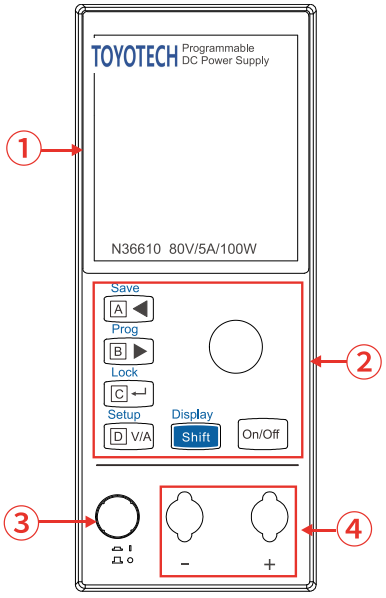


Figure4 Front Panel Introduction

Table2

Serial No.	Name	Description
①	Screen	Displaying information
②	Function buttons&knobs	Device operation
③	switch	turn on/off
④	Output terminal	Dc power output terminal

4.3.1 Button & Knob

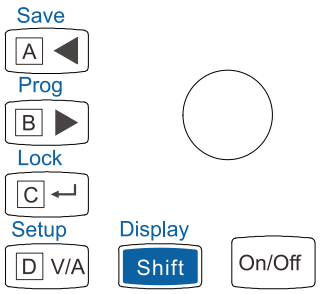


Figure5 button&knob

Table3

Button/Knob	Name and Function
Save A ◀	Navigate key (Left)+Shortcut A, Shortcut Save (Shift)
Prog B ▶	Navigate key (Right)+Shortcut B, Shortcut Prog (Shift)
Lock C ↵	Enter+Shortcut C, Shortcut Lock (Shift)
Setup D V/A	Voltage/Current Setting +Shortcut D, Power setup (Shift)
Display Shift	Second function switch, Check set value (Shift)
On/Off	Output On/Off
○	Adjust numeric values

4.4 Rear Panel Introduction

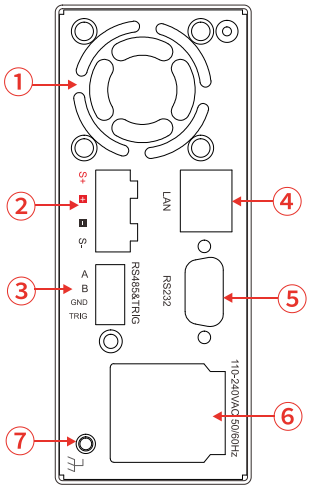


Figure6 Rear Panel

Table4

Serial No.	Name	Description
①	Fan	Fan ventilation hole
②	4-wire sense	Remote sensing & output terminal

③	TRIG/RS485	Used to connect external control inputs and also to communicate with the device via RS485
④	LAN port	Communication with the device through LAN
⑤	RS232 port	The equipment can be controlled by RS232 communication
⑥	Power input socket	100-240V AC power input, built-in fuse
⑦	Ground terminal	Chassis ground terminal

4.4.1 Ac Input Port

Please pay attention to the following for N36600 series power input connection:

- AC input：Single phase, please refer to the voltage mark at the rear panel.
- Ensure reliable grounding;

4.4.2 LAN Port

LAN port is a default communication port for N36600. The Ethernet cable is a standard accessory.

Steps for remote control via LAN port:

1. Check if N36600 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 N36600 LAN port.
5. Check if the indicator light at LAN port on N36600: green light always on, orange light flashing.

Note

If the green light is always on and the orange light is flashing, it means the hardware network connection has been established. Otherwise, please check whether the computer LAN port works properly, and make sure the computer is turned on properly.

4.4.3 RS232 Interface

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

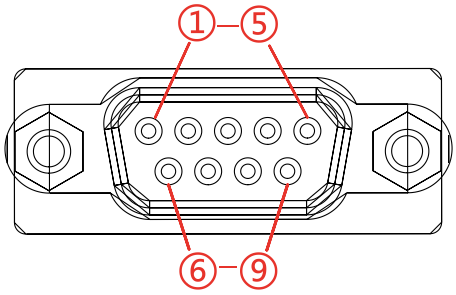


Figure7 RS232 Interface

Table5

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

4.4.4 RS485/TRIG

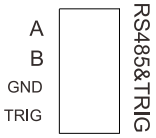


Figure8 RS485/TRIG

This terminal is used for RS485 communication and external control.

Table6

Pin	Label	Definition
①	A	RS485 Communication A。
②	B	RS485 Communication B。
③	G	RS485 Communication Ground
④	TRIG	External control signal input

4.4.5 Four-wire Interface

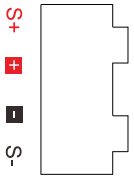


Figure9 4-wire interface

Four-wire interface providing local and remote sense.

Table7

Pin	Definition
S+	Remote sense positive polarity
+	Local sense positive polarity,internally connected to positive output terminal
-	Local sense negative polarity,internally connected to negative output terminal
S-	Remote sense negative polarity

4.4.6 Grounding Screw

The chassis of N36600 is insulated from the inner live conductor. Normally, the chassis is uncharged. If there is an accident which causes the chassis to be charged, there is a potential difference between the chassis and the ground at this time. If it is not well grounded and the operator accidentally touches the chassis, it will form a closed-circuit through the human body and cause danger. Therefore, a reliable grounding must be made between the chassis and ground to have the same potential. In addition, a reliable grounding can also prevent the accumulation of static electricity.

5. Start

5.1 Interface Introduction

Display screen is used in N36600 series.

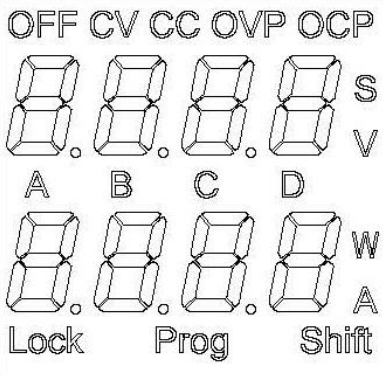


Figure10 Display screen

Table8

Characters	Function Description
OFF	Power output off
CV	The power supply is in constant voltage output state
CC	The power supply is in constant current output state
OVP	Over voltage state, output is shut down automatically in this state
OCP	Over current state, output is shut down automatically in this state
8.8.8.8 S V	Voltage setting/measurement display, time display
8.8.8.8 W A	Current setting/measurement display, output power display
A B C D	Step value A、B、C、D
Lock	lock mode
Prog	Shortcut mode
Shift	Modifier key for secondary function

5.2 Set Voltage

Press D V/A to move the cursor to V, and V blinks. At this time, the power supply is in voltage setting mode. Press A ◀ B ▶ to adjust the step to position B. At this time, the voltage will rise or fall by 1V for each rotation of the knob. At this time, the voltage will be adjusted to 12.00V.

Figure11 Set voltage

5.3 Set Current

Press D V/A to move cursor to A, and A blinks. At this time, the power supply is in current setting mode. Press A ◀ B ▶ to adjust the step to position A, at this time, the current will rise or fall by 1A for each rotation of the knob, and the current will be adjusted to 4.000A.

Figure12 Set current

5.4 Turn on Power Output

After the power output is turned on by pressing On/Off , the display on the screen will change from the set value to the actual measured voltage and current value of the power output. At this time, the power output OFF is turned off, and it indicates that the power supply is in the output state.

Pressing On/Off again will turn off the output of the power supply. At this time, the power output OFF indicator is on, indicating that the power supply is not in output state.

Figure13 Turn on power output

Table9

Step indication display	Voltage step value	Current step value
A	------	1A
B	1V	0.1A
C	0.1V	0.01A
D	0.01V	0.001A

5.5 Display Time and Power

After pressing the Shift , the Shift indicator is on, and then pressing the knob, the voltage/current display will switch to the time/power display. The S position shows the time the output is turned on in seconds, and the W position shows the output power in watts.

Repeat the above steps to switch to voltage/current display.

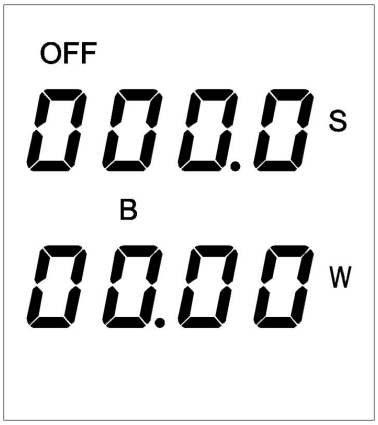


Figure14 Display time and power

5.6 Check Set Voltage and Current Values

Voltmeters and ammeters generally display the actual output measurement value of voltage and current. When the voltage and current are set, they will automatically switch to display the set value; To check the set value, press Shift button twice in succession and the voltage/current set value will flash for three seconds.

5.7 Lock

The keypad lock function can prevent unauthorized personnel or operators from misoperation, so as not to cause damage to the DUT. After pressing the Shift , the Shift indication is on, and then pressing the C↵ (Lock) , the Lock indication is on.

At this time, all the keys and knobs on the keyboard are locked except the Shift and On/Off . Repeat the above steps to unlock the keypad.

5.8 Protection

5.8.1 Overvoltage Protection (OVP)

Press the Shift, then press the D V/A (Setup) for about 5 seconds, and INIT will be displayed on the screen. Press the C ↵ to enter OVP setup page, and OVP will be displayed on the screen. The A ◀ B ▶ can be used to adjust the OVP voltage.

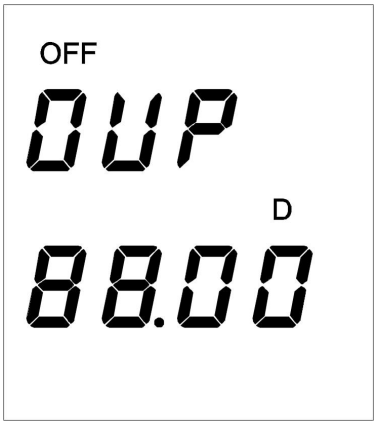


Figure15 Overvoltage protection settings

5.8.2 Overcurrent Protection (OCP)

After setting OVP, press  button to enter the OCP setting interface. You can use  to adjust the OCP current.

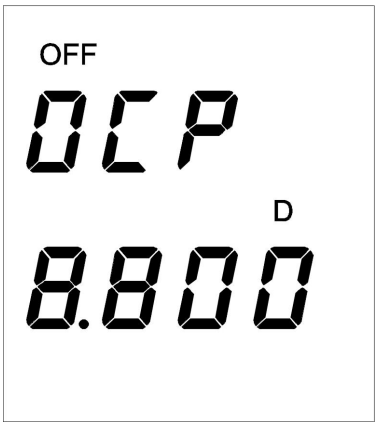


Figure16 Overcurrent protection settings

Note

OVP and OCP values set below the actual use of voltage/current value will cause power protection, output shut off, the factory preset value is the nominal maximum value.

5.8.3 P_ON

After setting OVP/OCP, press  to enter the P_ON setting interface. You can use the knob to select ON/OFF. ON means to turn on the OVP/OCP protection function, and OFF means to turn it off. Press  to confirm.

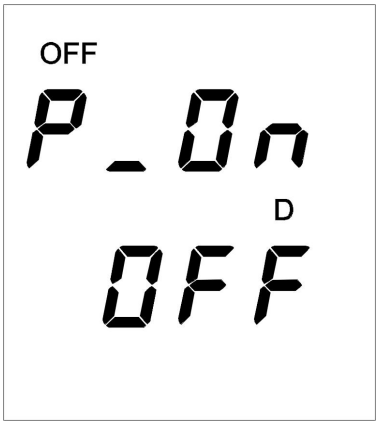


Figure17 Protection Setting

5.9 BEEP

After setting P_ON, press  button to enter the BEEP setting interface. You can use the knob to select ON/OFF. ON enables the sound heard when a key is pressed, and OFF disables the sound heard when a key is pressed. Press  to confirm.

Figure 18

5.10 ADD

After setting the BEEP, press C button to enter the ADD address setting interface. You can use A B to set the power address. Address range: 1~511, press C to confirm.

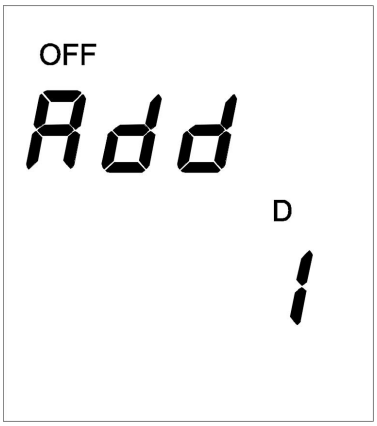


Figure 19

5.11 GRP

After setting ADD, press C to enter the GRP setting interface. You can use A B to make shortcut group selection. Press C to confirm.

N36600 series allows customers to set up 100 sets of shortcuts.

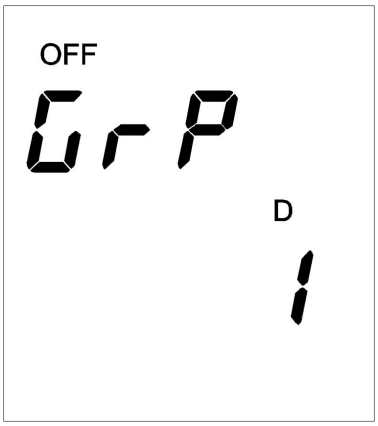


Figure 20

5.12 BAUD

After setting GRP, press  button to enter the BAUD setting interface. You can use the knob to select the baud rate, which respectively is 9600→19200→38400→57600→115200, and press  button to confirm. The baud rate require a restart to become effective.

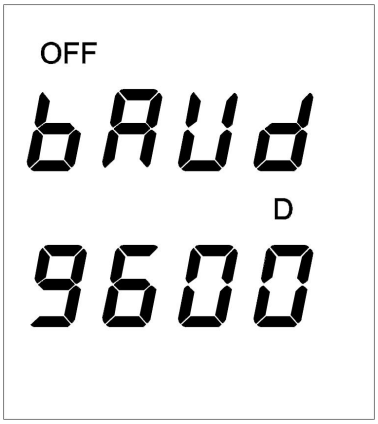


Figure 21

5.13 PROT

After setting BAUD, press  to enter the PROT setting interface. You can use the knob to select, in turn, SCPI→MODBUS, and press  to confirm.

Figure 22

5.14 VPLC

After setting PROT, press  to enter the VPLC setting interface, you can use the knob to select ON/OFF. ON enables the voltage sampling filter function, and OFF disables this function. Press  to confirm.

Figure 23

5.15 APLC

After setting the VPLC, press  button to enter the APLC setting interface. You can use the knob to select ON/OFF. ON enables the current sampling filter function, and OFF disables this function. Press  to confirm.

Figure 24

5.16 TRIG

After setting APLC, press  button to enter the TRIG setting interface. You can use the knob to select the code, and press  to confirm.

Code description:

0 Triggered by an external key

1 Rear panel TTL trigger

2 Communication interface is triggered

3 "TRIGger:IMMediate" command is triggered, and all other triggers are invalid

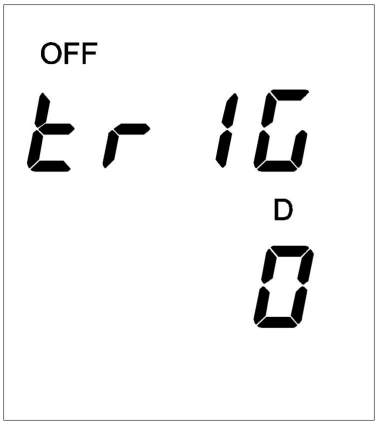
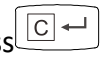


Figure 25

5.17 TYPE

After setting TRIG, press  button to enter the TYPE setting interface. You can use the knob to carry out the EP or Lin, default Lin. Press  to confirm.

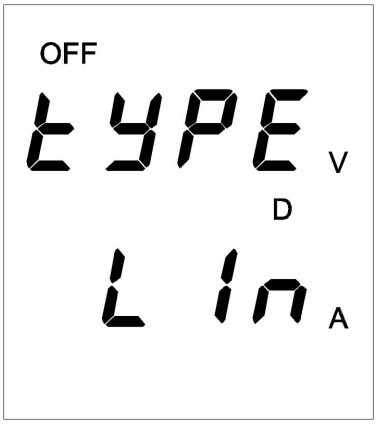


Figure 26

5.18 COUN

After setting TYPE, press  button to enter the COUN setting interface. You can use the knob to select the attenuation constant or the average number. The default is 10. Press  button to confirm and end Setup mode.

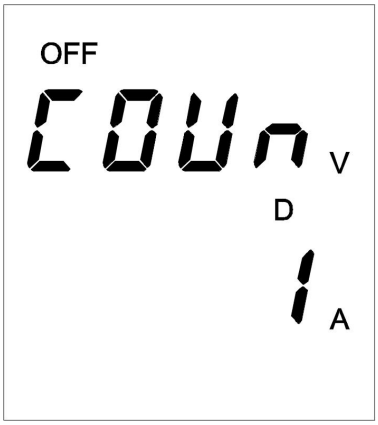


Figure 27

Description of TYPE and COUN

Power supplies can perform exponential and moving averages on numerical data. Through this function, it is effective for the situation that the value display is unstable and the reading is difficult when the power supply or load changes greatly.

Exponential average (EP)

With the specified attenuation constant, the numerical data were averaged exponentially according to the following formula.

Dn: Value displayed after the NTH exponential averaging (D1=M1)

Dn1: The value displayed after the (N-1)TH exponential averaging

Mn: The numerical data for the NTH time

K: attenuation constant

Moving Average (Lin)

Calculate the moving average by the specified number of averages according to the following formula.

Dn: The value displayed after linear average of m numerical data from n - (m - 1) to n times

Mn(m1): Numerical data of the n - (m - 1) th times

.....

Mn1: Numerical data for the NTH - 1th times

Mn: Numerical data of the NTH times

m: The average number

Average coefficient (attenuation constant or average number)

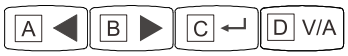
The attenuation constant (exponential average) or the number of averages (moving average) can be selected from the following options. The default Settings are all 10, ranging from 1 to 64.

5.19 Set Shortcuts

In normal mode, after setting the voltage and current value to be stored in the shortcut key, press 

and then press 

(Save) . At this time, the A, B, C and D indicators of the display screen will flash simultaneously. You can press



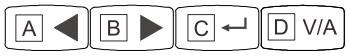
any shortcut key to save the set value in this shortcut key for direct call in the future.

5.20 Use shortcut feature

After pressing 

, press 

(Prog), then the Prog indicator displays, indicating that the current work is in the shortcut key mode. You can press 

any key to call the prestored voltage and current value in the key. When working in shortcut mode, the normal function of the four keys 

will be disabled and can only be used as shortcut keys. To stop the shortcut mode, press 

and then press "►" (Prog) to leave the shortcut mode.

5.21 CV&CC Mode

The power supply can convert automatically between the CC mode and CV mode.

For the current load, The power supply will provide a controlled output voltage under CV mode, as the load resistance decreases, the output voltage drop remains constant until the current increases to the preset value, and then the transition occurs. At this point, the power supply becomes a constant current output, and the output voltage will be reduced proportionally with the load resistance. When the current value falls below the set value, the power supply returns to the constant voltage mode.

6 Maintenance and Self-inspection

6.1 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.**

6.2 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 TOYOTECH.

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 N36600 series should be calibrated once a year.

7 Main Technical Data

Table10

Model	N36610-80-06	N36620-80-08
Voltage	0.5~81V	0.5~81V
Current	0~6.0A	0~8.2A
Power	100W	200W
CV Mode		
Range	0.5~81V	
Setting resolution	10mV	
Setting accuracy (23±5℃)	0.05%+10mV	
CC Mode		
Range	0~6.0A	0~8.2A
Setting resolution	1mA	1mA
Setting accuracy (23±5℃)	0.2%+2mA	0.2%+5mA
Voltage measurement		
Range	0.5~81V	
Readback resolution	10mV	
Readback accuracy (23±5℃)	0.05%+10mV	
Temperature coefficient	50ppm/℃	
Current measurement		
Range	0~6.0A	0~8.2A
Readback resolution	1mA	1mA
Readback accuracy (23±5℃)	0.2%+2mA	0.2%+5mA
Temperature coefficient	50ppm/℃	
Line regulation		
Voltage	<0.01%+3mV	
Current	<0.1%+5mA	
Load regulation		
Voltage	≤20mV	≤30mV
Current	≤10mA	
Dynamic characteristics		
Voltage rise time (no load)	≤300ms	

Voltage rise time (full load）	≤300ms	
Voltage fall time (no load)	≤500ms	
Voltage fall time (full load)	≤200ms	≤300ms
Transient recovery time	≤5ms	
Output ripple & noise（20Hz~20MHz）		
Voltage	≤10mVrms	
Current	≤8mArms	
Others		
AC input	Single phase, please refer to the voltage mark at the rear panel.	
Operating environment	0℃~40℃，≤80% (non-condensing)	
Storage temperature	-10℃~70℃，≤70% (non-condensing)	
Interface	RS232、RS485、LAN	
Dimension	55 mm（W）*315 mm（D）*140 mm（H）	
Net weight	1.8kg	