Programmable DC Power Supply

GPP-1000 Series

USER MANUAL

GW INSTEK PART NO.



ISO-9001 CERTIFIED MANUFACTURER

GW INSTEK

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SAFETY INSTRUCTIONS

This chapter contains important safety instructions that you must follow during operation and storage. Read the following before any operation to insure your safety and to keep the instrument in the best possible condition.

Safety Symbols

These safety symbols may appear in this manual or on the instrument.

 WARNING	Warning: Identifies conditions or practices that could result in injury or loss of life.
 CAUTION	Caution: Identifies conditions or practices that could result in damage to the GPP-1000 series or to other properties.
	DANGER High Voltage
	Attention Refer to the Manual
	Protective Conductor Terminal
	Earth (ground) Terminal
	Do not dispose electronic equipment as unsorted municipal waste. Please use a separate collection facility or contact the supplier from which this instrument was purchased.

Safety Guidelines

General Guidelines ⚠ CAUTION	• Do not place any heavy object on the device. • Avoid severe impacts or rough handling that leads to damaging the device. • Do not discharge static electricity to the device. • Do not block or obstruct the cooling fan vent opening. • Do not disassemble the device unless you are qualified as service personnel.
Power Supply ⚠ CAUTION	• AC Input voltage: 100 V / 120 V / 220 V / 240 VAC ±10 %, 50 / 60 Hz • Frequency: 47 Hz to 63 Hz • Before connecting the power plug to an AC line outlet, make sure the voltage selector switches of the bottom panel in the correct position.
⚠ WARNING	• The fuse specification is as following: 100 V / 120 V: T3.15 A / 250 V 220 V / 240 V: T1.6 A / 250 V • Disconnect power cord and test leads before replacing fuse. • To avoid electrical shock connect the protective grounding conductor of the AC power cord to an earth ground.
Cleaning the device	• Disconnect the power cord before cleaning. • Use a soft cloth dampened in a solution of mild detergent and water. Do not spray any liquid. • Do not use chemicals or cleaners containing harsh products such as benzene, toluene, xylene, and acetone.

Operation Environment	• Location: Indoor, no direct sunlight, dust free, almost non-conductive pollution (note below) • Relative Humidity: < 80 % • Altitude: < 2000 m • Temperature: 0 °C to 40 °C
	(Pollution Degree) EN 61010-1:2010 specifies the pollution degrees and their requirements as follows. The GPP-1000 series falls under degree 2. Pollution refers to "addition of foreign matter, solid, liquid, or gaseous (ionized gases), that may produce a reduction of dielectric strength or surface resistivity". • Pollution degree 1: No pollution or only dry, non-conductive pollution occurs. The pollution has no influence. • Pollution degree 2: Normally only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation must be expected. • Pollution degree 3: Conductive pollution occurs, or dry, non-conductive pollution occurs which becomes conductive due to condensation which is expected. In such conditions, equipment is normally protected against exposure to direct sunlight, precipitation, and full wind pressure, but neither temperature nor humidity is controlled.
Storage environment	• Location: Indoor • Relative Humidity: < 70 % • Temperature: −10 °C to 70 °C

GETTING STARTED

This chapter describes the power supply in a nutshell, including its main features and front / rear panel introduction. After going through the overview, please read the theory of operation to become familiar with the operating modes, protection modes and other safety considerations.

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GPP-1000 Series Overview

Series lineup

The GPP-1000 Series consists of 2 models: GPP-1323 and GPP-1205. Note that throughout the user manual, the term "GPP-1000" refers to all the models in the GPP-1000 Series lineup, unless stated otherwise.

Model	Output Voltage	Output Current	Output Power
GPP-1323	32 V	3 A	96 W
GPP-1205	20 V	5 A	100 W

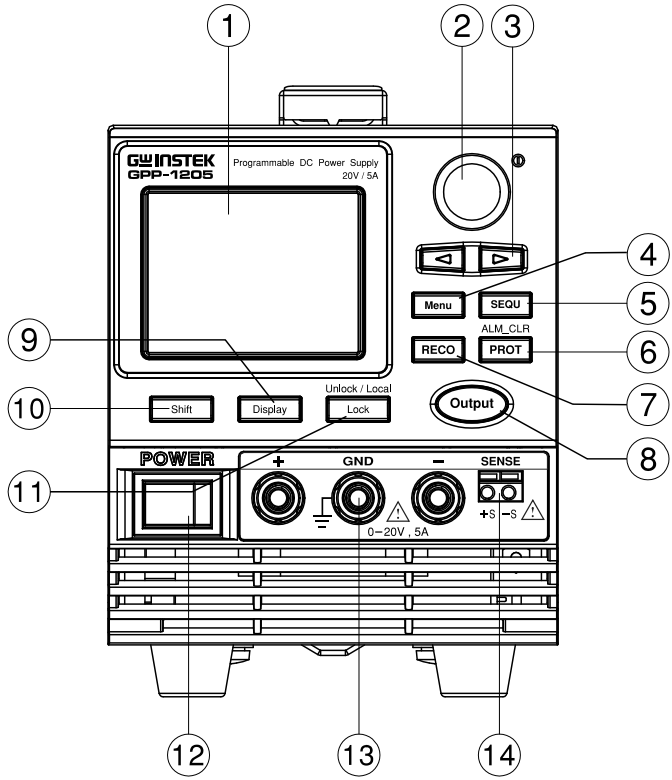
Main Features

• Features	• 2.4-inch TFT-LCD Panel. • Low noise: Temperature controlled cooling fan. • Remote sensing to compensate for voltage drop in load leads . • Output On/Off delay control. • CV, CC priority start function. (prevents overshoot with output ON) • Adjustable voltage and current slew rates. • Bleeder circuit ON/OFF setting. • OVP, OCP and OTP protection. • Supports test sequence. • With 3 measuring currents function.
Interface	• Built-in USB and LAN interface. • Optional GPIB interface. • External trigger control function.

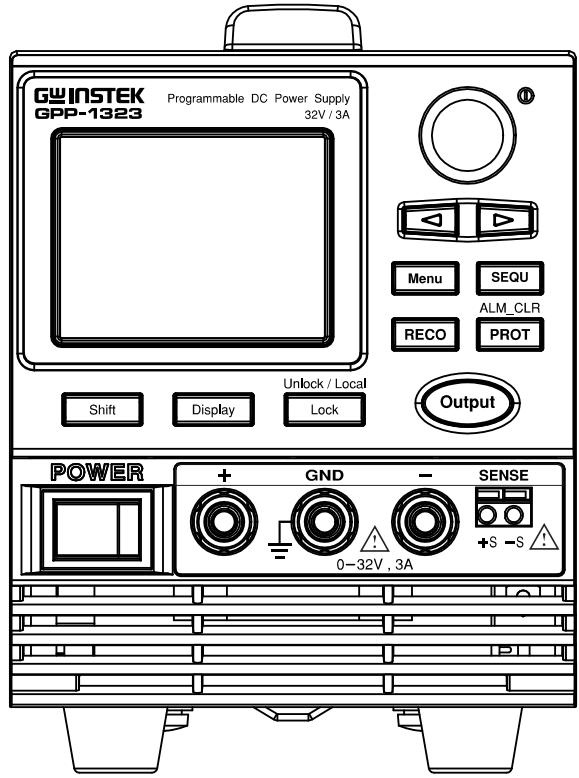
Appearance

Front Panel Overview

GPP-1205

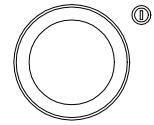


GPP-1323

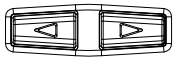
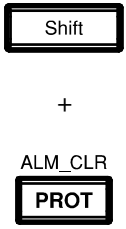
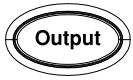


1. Display area — The display area shows set values, output values and parameter settings.

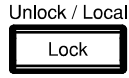
2. Knob Key



Used to navigate menu, and to configure or confirm voltage/current/time values, among others. Also, the indicator on the upper-right corner shows current state and power mode.

3.	Left/Right Arrow Keys		Used to select a parameter number in the Function settings .Also the left arrow key can be used as backspace.
4.	Menu Button		Used to enter the Menu page. Refer to page 87 for detail.
5.	SEQU Button		Used to run customized test sequence. Refer to page 61 for detail.
6.	PROT Button		Used to set OVP, OCP protecting functions. Refer to page 46 for details.
	ALM_CLR Button		(+Shift) Used to release protection functions that have been activated. The tripped protection alarms include the following: OVP Alarm, OCP Alarm, OTP Alarm, Sense Alarm.
7.	RECO Button		Used to run recorder function. Refer to page 60 for detail.
8.	Output Button		Used to turn the output on or off.
9.	Display Button		Used to switch among 3 different display modes.
10.	Shift Button		Used to enable the functions that are written in blue characters above certain buttons.

11. Lock Button



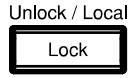
Used to lock all front panel buttons other than the Output Button. Refer to page 60for detail.

Unlock/Local Button

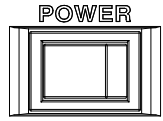


(+Shift) Used to unlock the front panel buttons or it switches to local mode.

+

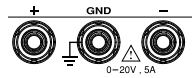


12. Power Switch

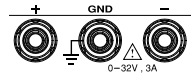


Used to turn the power on/off.

13. Output terminal

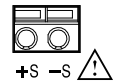


DC output terminal for GPP-1000 is European Type Jack Terminal.
GPP-1205 the max. output is 20 V / 5 A / 100 W



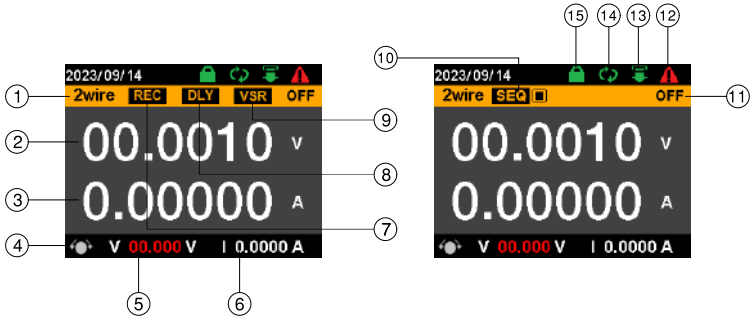
DC output terminal for GPP-1000 is European Type Jack Terminal.
GPP-1323 the max. output is 32 V / 3 A / 96 W

14. Sensing Terminal



Terminal to connect the sensing cables, which compensate voltage drop occurred in load leads.

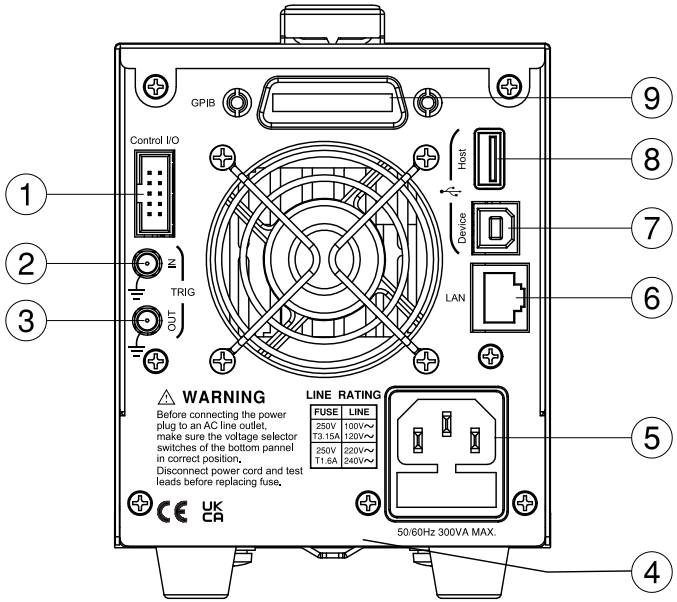
Display Area



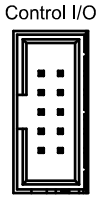
1.	2Wire/4Wire	2-wire or 4-wire indicator.
2.	Voltage Meter	Displays the voltage.
3.	Current Meter	Displays the current.
4.	V/A Set Guidance	The scrolling symbol indicates to select between V and A set via scrolling knob key.
5.	V Set	Manually sets voltage.
6.	I(A) Set	Manually sets current.
7.	REC Icon	When Recorder is enabled, the icon will be shown accordingly. Note that when SEQ appears, the icon will be faded out.
8.	DLY Icon	When Output On/Off delay is enabled, the icon will be shown accordingly. Note that when SEQ appears, the icon will be faded out.
9.	VSR/ISR Icon	When CV/CC Slew Rate Priority (CVLS/CCLS) is activated, the icon will be shown . Note that when SEQ appears, the icon will be faded out.
10.	SEQ Icon	When Sequence function is turned On, the icon will be shown accordingly.

11.	CC/CV indicator	It shows when constant voltage or constant current mode is ongoing. However, when output is unregulated, which means neither in CV mode nor CC mode. If it is not under power output, it simply shows Off.
12.	Error Indicator	When error occurs from command of remote control, the icon will be shown.
13.	Remote Control Indicator	When remote control (USB/LAN/GPIB) is underway, the icon will be shown
14.	Communication Monitor Indicator	When communication monitor is enabled, the icon will be shown.
15.	Lock Indicator	When the lock mode is activated, the icon will be shown.

Rear Panel Overview

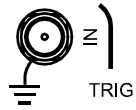


1. Control I/O



External Operation and Status Monitoring

2. Trigger-IN



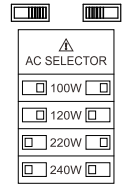
External Trigger Signal Input Terminal

3. Trigger-OUT



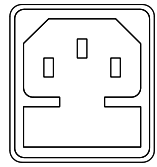
Trigger Signal Output Terminal

4. AC Select Switch



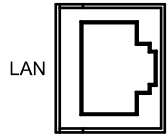
The AC selector is located at the bottom side of the unit.
Switch Voltage to 100 V, 120 V, 220 V or 240 V.

5. Power Cord / Fuse Socket



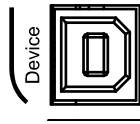
The power cord socket accepts the AC mains. For power up details, see page 29.
The fuse holder contains the AC mains fuse .For fuse replacement details, see page 144.

6. LAN



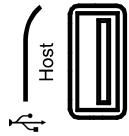
Ethernet port for controlling the GPP-1000 remotely

7. USB



USB port for controlling the GPP-1000 remotely.

8. USB A Port



USB A port for data transfer, loading test scripts and firmware update.

9. GPIB



GPIB connector for units equipped with IEEE programming option. (Factory Installed Options)

Theory of Operation

The theory of operation chapter describes the basic principles of operation, protection modes and important considerations that must be taken into account before use.

Operating Description

Background

The GPP-1000 power supplies are regulated DC power supplies with a stable voltage and current output. These operate within a switch automatically between constant voltage and constant current according to changes in the load.

Note

Suitable supply cord set for use with the equipment:

Mains plug: shall be national approval

Mains connector: C13 type

Cable:

1. Length of power supply cord: less than 3 m
2. Cross-section of conductors: at least 0.75 mm^2
3. Cord type: shall meet the requirements of IEC 60227 or IEC 60245 (e.g.: H05VV-F, H05RN-F)

Caution

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

CC and CV Mode

CC and CV mode Description

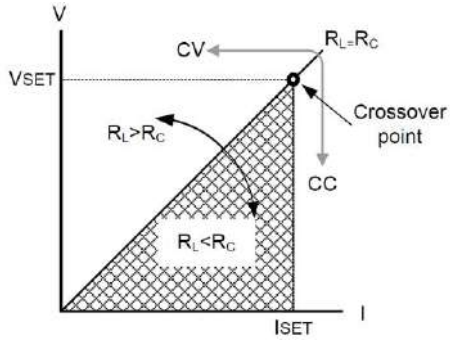
When the power supply is operating in constant current mode (CC) a constant current will be supplied to the load. When in constant current mode the voltage output can vary, whilst the current remains constant. When the load resistance increases to the point where the set current limit(ISET) can no longer be sustained the power supply switches to CV mode. The point where the power supply switches modes is the crossover point.

When the power supply is operating in CV mode, a constant voltage will be supplied to the load, whilst the current will vary as the load varies. At the point that the load resistance is too low to maintain a constant voltage, the power supply will switch to CC mode and maintain the set current limit.

The conditions that determine whether the power supply operates in CC or CV(VSET), the load resistance (RL) and the critical resistance (RC). The critical resistance is determined by VSET/ISET. The power supply will operate in CV mode when the load resistance is greater than the critical resistance. This means that the voltage output will be equal to the VSET voltage but the current will be less than ISET. If the load resistance is reduced to the point that the current output reaches the ISET level, the power supply switches to CC mode.

Conversely the power supply will operate in CC mode when the load resistance is less than the critical resistance. In CC mode the current output is equal to ISET and the voltage output is less than VSET.

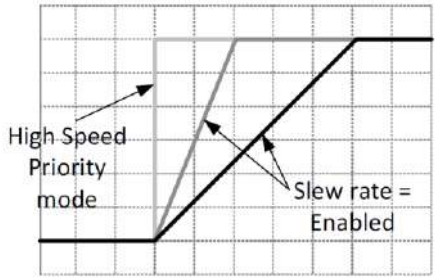
Diagram



Slew Rate

Theory

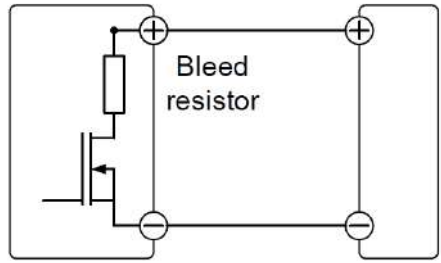
The GPP-1000 has selectable slew rates for CC and CV mode. This gives the GPP-1000 power supply the ability to limit the current/voltage draw of the power supply. Slew rate settings are divided into High Speed Priority and Slew Rate Priority. High speed priority mode will use the fastest slew rate for the instrument. Slew Rate Priority mode allows for user adjustable slew rates for CC or CV mode. The rising and falling slew rate can be set independently.



Bleeder Control

Background

The GPP-1000 DC power supplies employ a bleed resistor in parallel with the output terminals.



Bleed resistors are designed to dissipate the power from the power supply filter capacitors when power is turned off and the load is disconnected. Without a bleed resistor, power may remain charged on the filter capacitors for some time and be potentially hazardous.

In addition, bleed resistors also allow for smoother voltage regulation of the power supply as the bleed resistor acts as a minimum voltage load.

The bleed resistance can be turned on or off using the configuration settings.

Note

By default the bleed resistance is on. For battery charging applications, be sure to turn the bleed resistance off as the bleed resistor can discharge the connected battery when the unit is off.

Alarms

The GPP-1000 power supplies have a number of protection features. When one of the protection alarms is tripped, an alarm message will appear on the display, the corresponding alarm icon (OCP, OVP etc) will appear in the status bar. When an alarm has been tripped ,the output will be automatically turned off or the power supply will turn off, depending on the type of alarm and on the Breaker Control

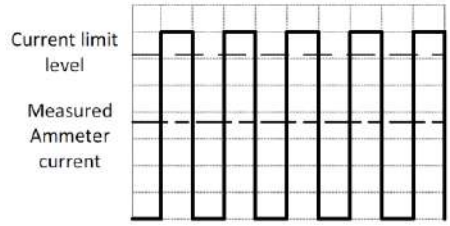
settings (page 46). For details on how to clear an alarm or to set the protection modes, please see pages 48.

OVP	Over voltage protection (OVP) prevents a high voltage from damaging the load. This alarm can be set by the user.
OCP	Over current protection prevents high current from damaging the load. This alarm can be set by the user.
OTP	Over temperature protection protect the instrument from overheating.

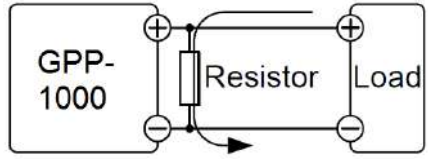
Considerations

The following situations should be taken into consideration when using the power supply.

Inrush current	When the power supply switch is first turned on, an inrush current is generated. Ensure there is enough power available for the power supply when first turned on, especially if a number of units are turned on at the same time.
Pulsed or Peaked loads	When the load has current peaks or is pulsed, it is possible for the maximum current to exceed the mean current value. The GPP-1000 power supply ammeter only indicates mean current values, which means for pulsed current loads, the actual current can exceed the indicated value. For pulsed loads, the current limit must be increased, or a power supply with a greater capacity must be chosen. As shown below, a pulsed load may exceed the current limit and the indicated current on the power supply ammeter.



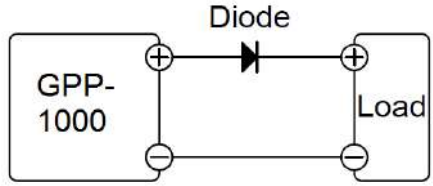
Reverse Current: Regenerative load	When the power supply is connected to a regenerative load such as a transformer or inverter, reverse current will feed back to the power supply. The GPP-1000 power supply cannot absorb reverse current. For loads that create reverse current, connect a resistor in parallel to the power supply to bypass the reverse current. This description only applies when the bleed resistance is off.



Reverse current

Note	The current output will decrease by the amount of current absorbed by the resistor. Ensure the resistor used can withstand the power capacity of the power supply/load.

Reverse Current: Accumulative energy.	When the power supply is connected to a load such as a battery, reverse current may flow back to the power supply if the bleed resistance is on. To prevent damage to the power supply under this condition, use a reverse-current-protection diode in series between the power supply and load. If the bleed resistor is turned off or set to auto, there is no need to add a diode.

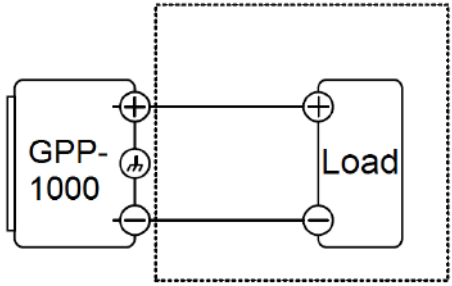


Caution	Ensure the reverse withstand voltage of the diode is able to withstand 2 times the rated output voltage of the power supply and the forward current capacity can withstand 3 to 10 times the rated output current of the power supply. Ensure the diode is able to withstand the heat generated in the following scenarios. When the diode is used to limit reverse voltage, remote sensing cannot be used.

Grounding

The output terminals of the GPP-1000 power supplies are isolated with respect to the protective grounding terminal. The insulation capacity of the load, the load cables and other connected devices must be taken into consideration when connected to the protective ground or when floating.

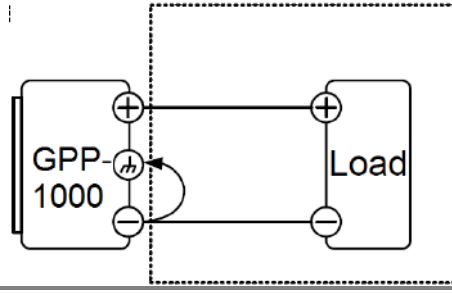
Floating	As the output terminals are floating, the load and all load cables must have an insulation capacity that is greater than the isolation voltage of the power supply.



Warning	If the insulation capacity of the load and load cables are not greater than the isolation voltage of the power supply, electric shock may occur.

Grounded output terminal

If the positive or negative terminal is connected to the protective ground terminal, the insulation capacity needed for the load and load cables is greatly reduced. The insulation capacity only needs to be greater than the maximum output voltage of the power supply with respect to ground.



Caution

If using external voltage control, do not ground the external voltage terminal as this will create a short circuit.

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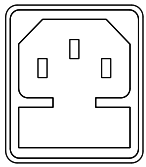
SETUP

This chapter describes how to properly power up and configure the GPP series before operation.

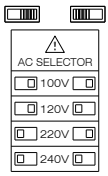
Power Up

Background
Make sure that the power source is shut off.
Use the AC power cable supplied with the product.

Steps
1.Connect the AC power cord to the rear panel socket.



Note
Before connecting the power plug to an AC line outlet, make sure the voltage selector switches of the bottom panel in the correct position. Disconnect power cord and test leads before replacing fuse. Refer to page 144 for more details.



2.Press the POWER switch on .If used for the first time, the default settings will appear on the display, otherwise the GPP-1000 recovers the state right before the power was last turned OFF.



Caution
Do not turn the power on and off quickly. Please wait for the display to fully turn off.

Wire Gauge Considerations

Background

Before connecting the output terminals to a load, the wire gauge of the cables should be considered.
It is essential that the current capacity of the load cables is adequate. The rating of the cables must equal or exceed the maximum current rated output of the instrument.

Recommended wire gauge

Wire Gauge	Nominal Cross Section	Maximum Current
28	0.1	3
26	0.15	4
24	0.25	5
22	0.35	7
20	0.55	9
18	1	12

The maximum temperature rise can only be 60 degrees above the ambient temperature. The ambient temperature must be less than 30 degrees.

Output Terminals

Background

Before connecting the output terminals to the load, first consider whether voltage sense will be used, the gauge of the cable wiring and the withstand voltage of the cables and load.

Warning

Dangerous voltages. Ensure that the power to the instrument is disabled before handling the power supply output terminals. Failing to do so may lead to electric shock.

Connection with the front panel output terminal

Steps

1. Turn the power switch off.



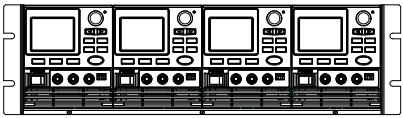
2.Connect the test lead includes in the accessory parts to front panel output terminal.
3.Fix the load cables firmly to eliminate loose connections from the front output terminals and load cables.

Using the Rack Mount Kit

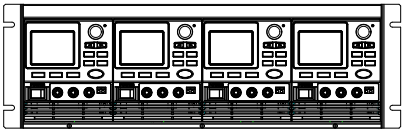
Background

The GPP-1000 series has an optional Rack Mount Kit (GW Instek part number: GRA-441-J [JIS], GRA-441-E [EIA])that can be used to hold up to 4 GPP-1000 units into rack.

GRA-441-E [EIA] Rack mount diagram



GRA-441-J [JIS] Rack mount diagram



How to Use the Instrument

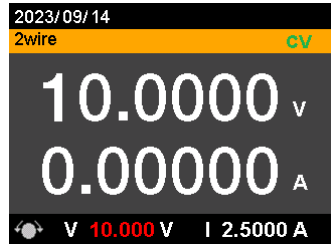
Background

The GPP-1000 power supplies generally use the knob key and arrow keys to enter each page and setting, to return to previous page, to edit numerical values or to confirm settings.
The following section will explain some of these concepts in detail.

Example1 Use the knob key and arrow keys to set a voltage of 10.100 volts.

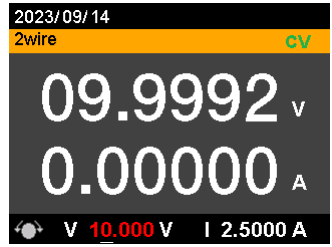
1. From the main display, scroll knob key to move cursor to V Set field.





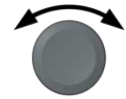
2. Click the knob key to enter the V Set field.

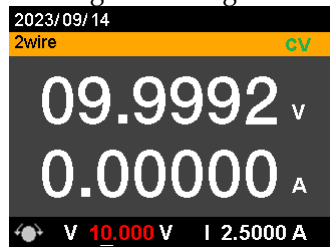




3. Use arrow keys to move the cursor to desired digits followed scrolling knob key to edit values. Repeat the step for each digit until target value.

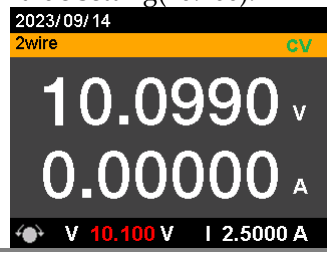






4. Click the knob key to confirm the input value setting(10.100).

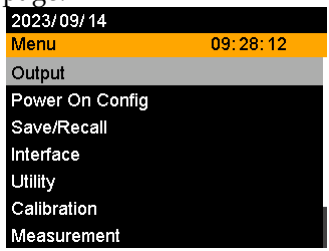




Example2 Use the knob key to enter Measurement Average field and setting Middle option. Also, use the left arrow key to return to the previous page.

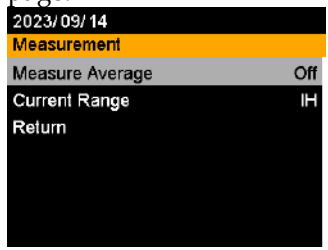
1. Press the Menu key to enter the Menu page.





2. Scroll the knob key to move to the Measurement field followed by clicking the knob key to enter the Measurement page.

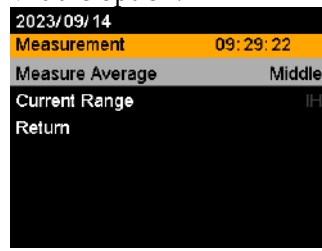


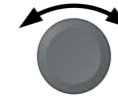




3. Click the knob key to enter the Measurement Average field followed by scrolling the knob key to select Middle option.

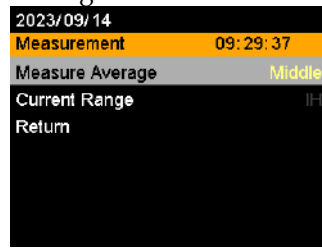






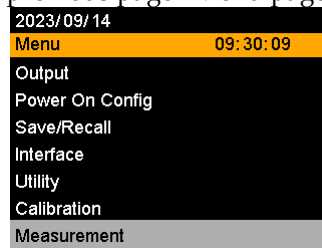
4. Click the knob key to confirm the Middle option for Measurement Average.





5. Click the left arrow key to return to the previous page –Menu page.





Reset to Factory Default Settings

Background	There's a group of Default value, the non-modifiable factory default setting. User is able to restore Default or proceed to Preset operation from Power On under System. See page 148 for the default factory settings.

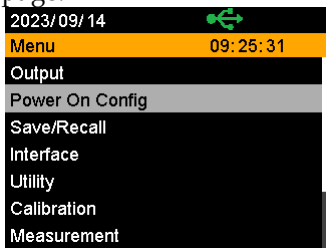
Steps

1. Press the Menu key to enter the Menu page.



2. Scroll the knob key to move to the Power On Config field followed by clicking the knob key to enter the Power On Config page.

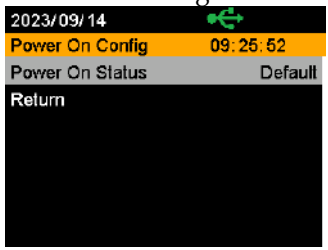






3. Scroll knob key to move to the Power On Status Set field. Click knob key to enter the field followed by scrolling knob key to select Default option. Click knob key again to confirm setting.







View System Version

Background The System Information allows you to view the GPP-1000 model name, serial number as well as firmware version.

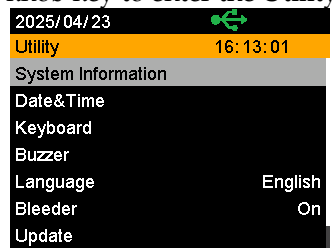
Steps

1. Press the Menu key to enter the Menu page.



2. Scroll the knob key to move to the Utility field followed by clicking the knob key to enter the Utility page.

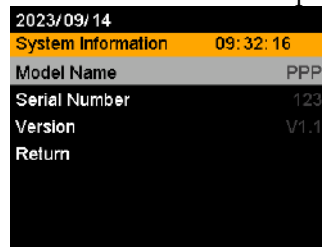






3. Click the knob key to enter the System Information page where GPP-1000 model name, serial number, as well as firmware version are displayed.







Menu Tree

Convention

Use the menu trees as a handy reference for the power supply functions and properties. The GPP-1323/GPP-1205 menu system is arranged in a hierarchical tree. Each hierarchical level, which is coated in varied colors, can be navigated through the orders within the diagrams below.

For example: To set the measurement average high:

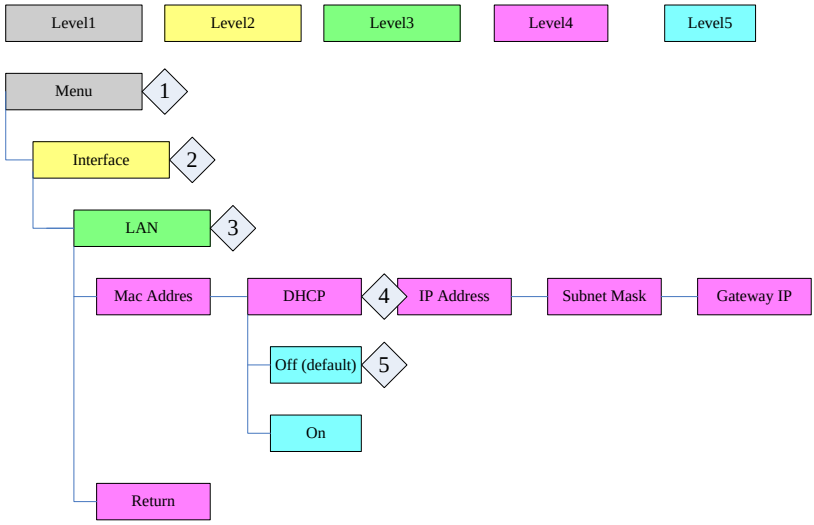
①Press the Menu key.

②Navigate to the Interface option.

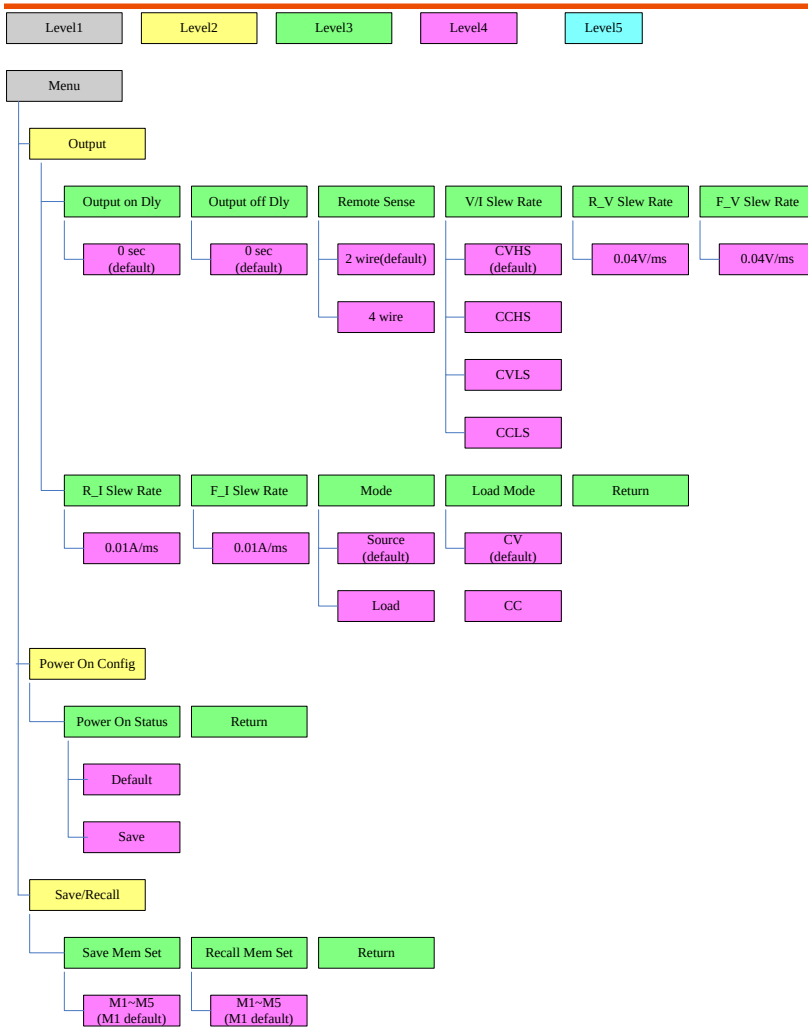
③Enter the LAN option.

④ Enter the DHCP option.

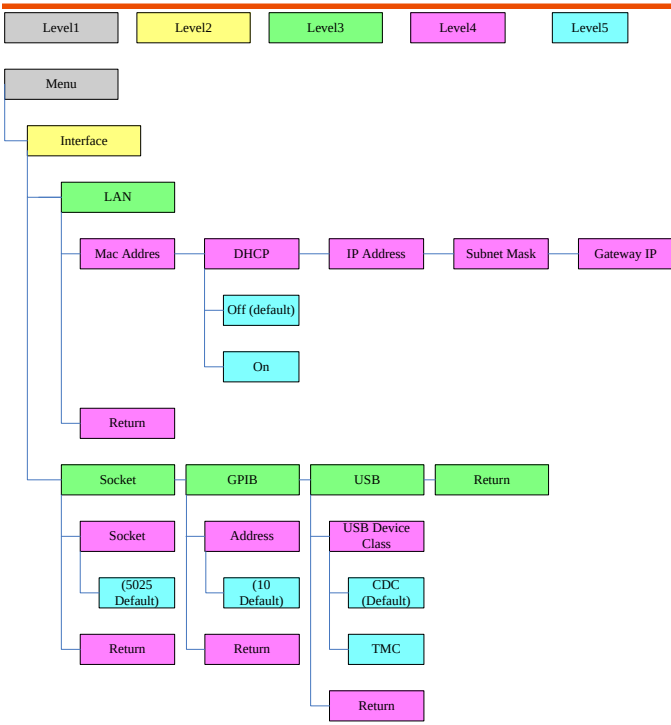
⑤Select Off



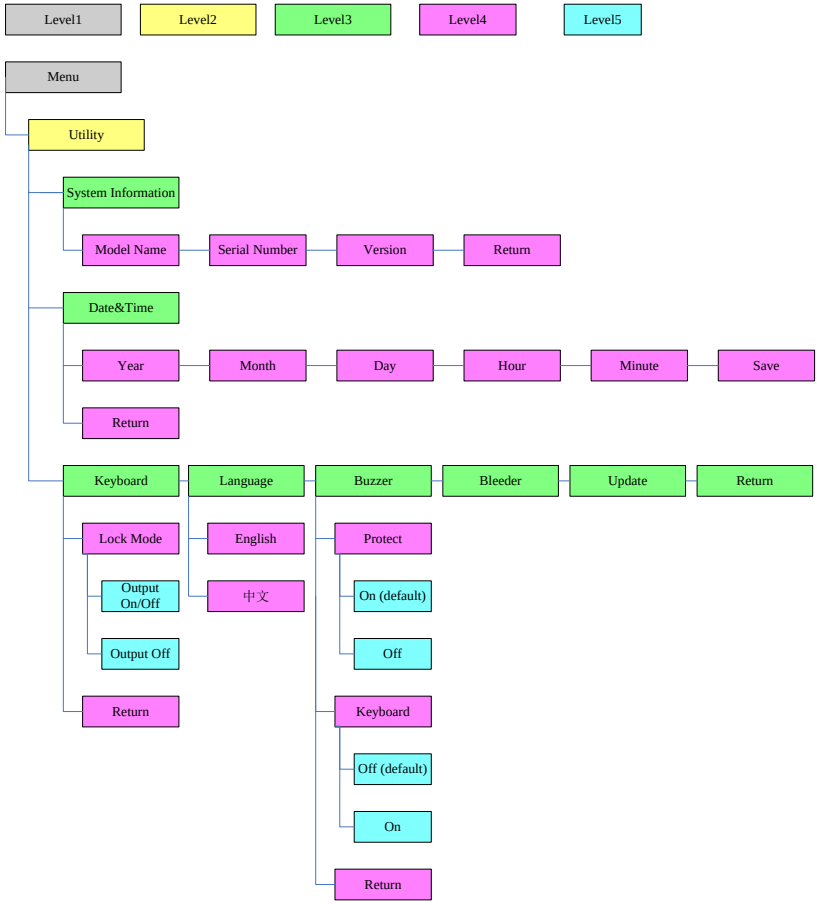
Menu Page - 1


Level1
Level2
Level3
Level4
Level5
Menu
Output
Output on Dly
0 sec (default)
Output off Dly
0 sec (default)
Remote Sense
2 wire(default)
4 wire
V/I Slew Rate
CVHS (default)
CCHS
CVLS
CCLS
R_V Slew Rate
0.04V/ms
F_V Slew Rate
0.04V/ms
R_I Slew Rate
0.01A/ms
F_I Slew Rate
0.01A/ms
Mode
Source (default)
Load
Load Mode
CV (default)
CC
Return
Power On Config
Power On Status
Default
Save
Return
Save/Recall
Save Mem Set
M1~M5 (M1 default)
Recall Mem Set
M1~M5 (M1 default)
Return

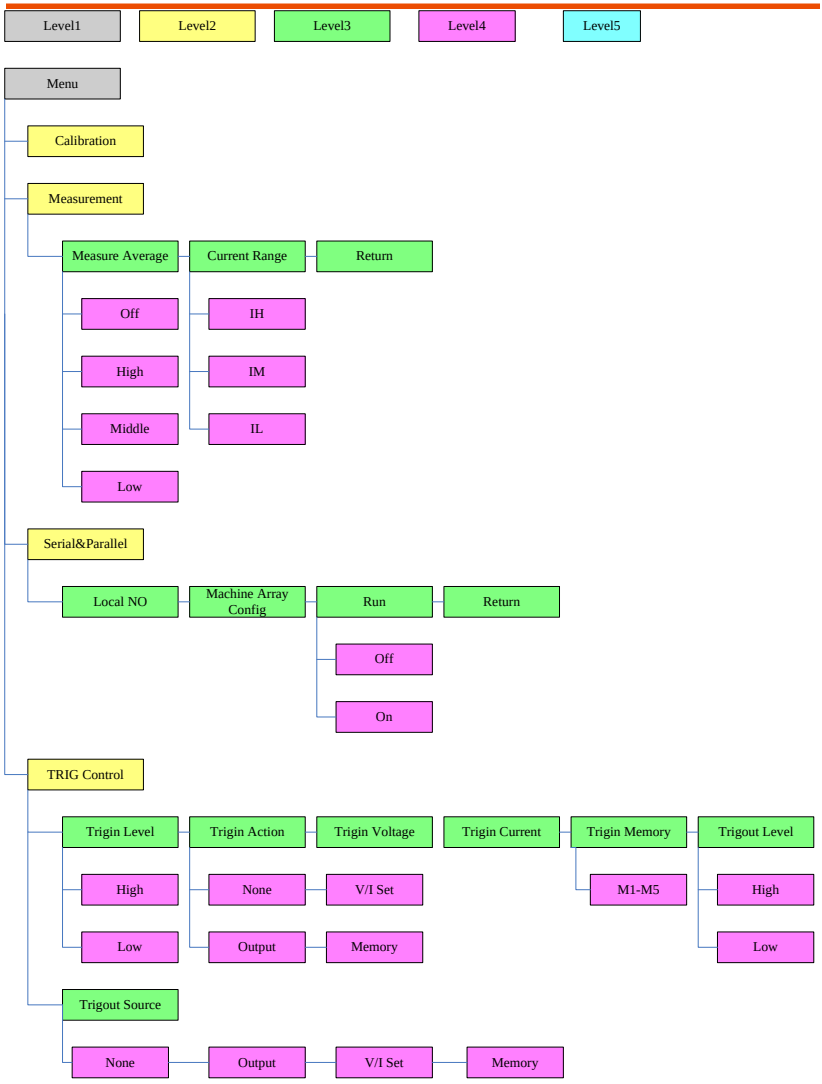
Menu Page - 2


Level1
Level2
Level3
Level4
Level5
Menu
Interface
LAN
Mac Addres
DHCP
IP Address
Subnet Mask
Gateway IP
Off (default)
On
Return
Socket
GPIB
USB
Return
Socket
Address
USB Device Class
(5025 Default)
(10 Default)
CDC (Default)
Return
Return
TMC
Return

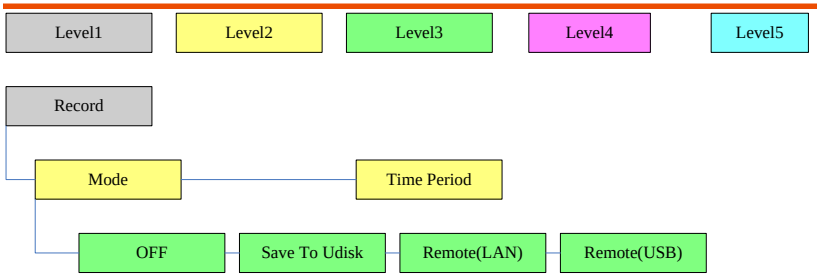
Menu Page - 3


Level1
Level2
Level3
Level4
Level5
Menu
Utility
System Information
Model Name
Serial Number
Version
Return
Date&Time
Year
Month
Day
Hour
Minute
Save
Return
Keyboard
Language
Buzzer
Bleeder
Update
Return
Lock Mode
English
Protect
Output On/Off
中文
On (default)
Output Off
Off
Return
Keyboard
Off (default)
On
Return

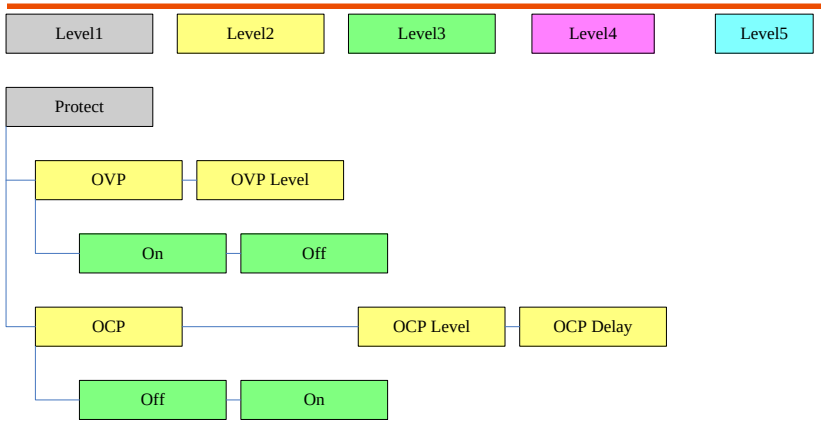
Menu Page - 4


Level1
Level2
Level3
Level4
Level5
Menu
Calibration
Measurement
Measure Average
Current Range
Return
Off
High
Middle
Low
IH
IM
IL
Serial&Parallel
Local NO
Machine Array Config
Run
Return
Off
On
TRIG Control
Trigin Level
Trigin Action
Trigin Voltage
Trigin Current
Trigin Memory
Trigout Level
High
Low
None
Output
V/I Set
Memory
M1-M5
High
Low
Trigout Source
None
Output
V/I Set
Memory

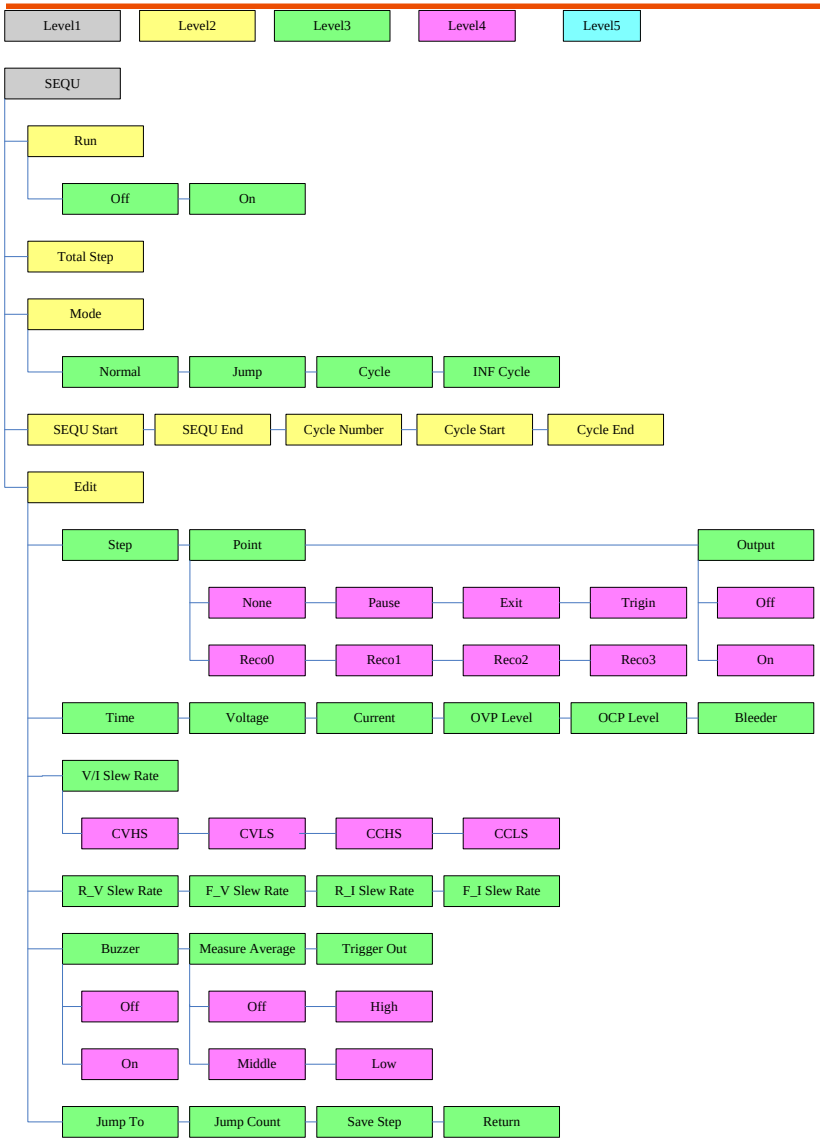
Record



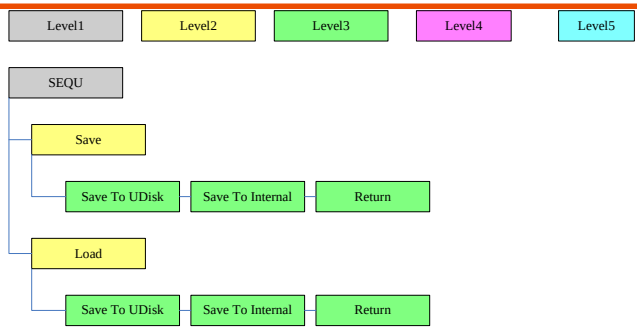
Protect



Sequence-1


Level1
Level2
Level3
Level4
Level5
SEQU
Run
Off
On
Total Step
Mode
Normal
Jump
Cycle
INF Cycle
SEQU Start
SEQU End
Cycle Number
Cycle Start
Cycle End
Edit
Step
Point
Output
None
Pause
Exit
Trigin
Off
Reco0
Reco1
Reco2
Reco3
On
Time
Voltage
Current
OVP Level
OCP Level
Bleeder
V/I Slew Rate
CVHS
CVLS
CCHS
CCLS
R_V Slew Rate
F_V Slew Rate
R_I Slew Rate
F_I Slew Rate
Buzzer
Measure Average
Trigger Out
Off
Off
High
On
Middle
Low
Jump To
Jump Count
Save Step
Return

Sequence-2


Level1
Level2
Level3
Level4
Level5
SEQU
Save
Save To UDisk
Save To Internal
Return
Load
Save To UDisk
Save To Internal
Return

Basic Operation

This section describes the basic operations required to operate the power supply.

Setting OVP/OCP Levels 45
Set to C.V. Priority Mode 47
Set to C.C. Priority Mode 50
Display Modes 54
Panel Lock 55
Save Setup 55
Recall Setup 56
Remote Sense 57
Record 59
Sequence Test 61
Sequence Script File Format 61
Sequence Script Settings 61
Sequence Step Edit Settings 63
Setting Sequence Script Configurations 66
Run Sequence Script 77
Load Sequence Script 80
Save Sequence Script 83

Setting OVP/OCP Levels

Background

The OVP level and OCP level has a selectable range that is based on the output voltage and output current, respectively. The OVP and OCP level is set to the highest level by default. The actual selectable OVP and OCP range depends on the GPP-1000 model.

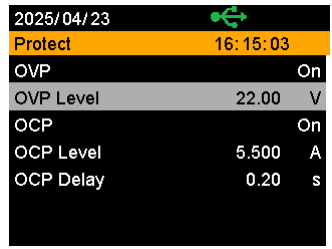
When one of the protection measures are on, the type of alarm message will be shown on display. Press Shift + PROT key to clear any protection alarm messages that have been tripped. By default, the output will turn off when the OVP or OCP protection levels are tripped.

Before setting the protection settings:
- Ensure the load is not connected.
- Ensure the output is turned off.

Steps

1. Press the PROT key to enter the Protect page.

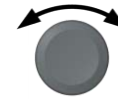




Enable/Disable OVP and OCP

2. Scroll the knob key to move between OVP/OCP fields. Click the knob key to enter each field, respectively. Scroll the knob key to turn ON/OFF the function. Further click the knob key again to confirm your setting.

Option On,Off

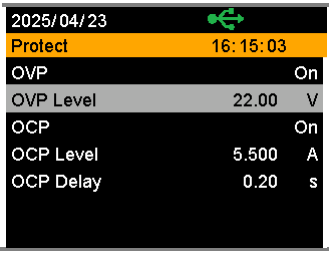




Setting the Protection Level

3. Scroll the knob key to move among OVP/OCP Level fields. Click the knob key to enter each field, respectively. Scroll the knob key to adjust value, along with the arrow keys to change among digits followed by clicking the knob key to confirm set value.

Model	OCP	OVP
GPP-1205	0.25 A to 5.5 A	1 V to 22 V
GPP-1323	0.15 A to 3.3 A	1.8 V to 35.2 V

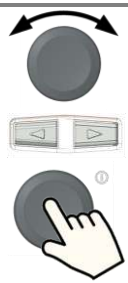


Note

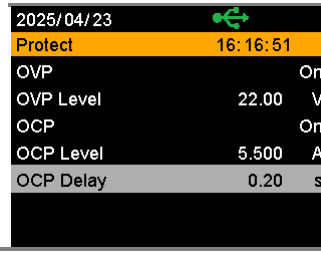
●The OVP setting range is from 5 % to 110 % of the rated output voltage.
●The OCP setting range is from 5 % to 110 % of the rated output current.

Setting the Delay Time

4. Scroll the knob key to move between OCP Delay fields. Click the knob key to enter each field, respectively. Scroll the knob key to adjust value, along with the arrow keys to change among digits followed by clicking the knob key to confirm set value.



Setting Range
OCP Delay
0.20 s to 2.50 s



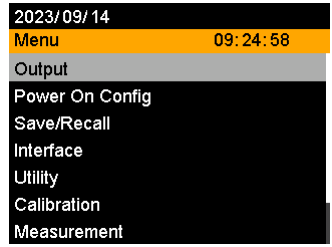
Clear OVP/OCP protection	The OVP and OCP protection can be cleared after it has been tripped by clicking Shift key + ALM CLR key.	

Set to C.V. Priority Mode

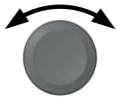
When setting the power supply to constant voltage mode, a current limit must also be set to determine the crossover point. When the current exceeds the crossover point, the mode switches to C.C. mode. For details about C.V. operation, see page20.

C.C. and C.V. mode have two selectable slew rates: High Speed Priority and Slew Rate Priority. High Speed Priority will use the fastest slew rate for the instrument while Slew Rate Priority will use a user-configured slew rate.

Background	Before setting the power supply to C.V. mode, ensure: The output is off. The load is connected.
Steps	1. Press the Menu key followed by clicking on Output to enter the Output page. 



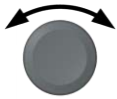
2. Scroll the knob key to move to the V/I Slew Rate field followed by clicking the knob key to enter the field.





2023/09/14	
Output	09:34:48
Remote Sense	2 Wire
V/I Slew Rate	CVHS
R_V Slew Rate	0.0400V/ms
F_V Slew Rate	0.0400V/ms
R_I Slew Rate	0.01000A/ms
F_I Slew Rate	0.01000A/ms
Mode	Source

3. Scroll the knob key to select between CVHS(CV High Speed Priority) and CVLS (CV Slew Rate Priority) options.



Options CVHS = CV High Speed Priority
CVLS = CV Slew Rate Priority

4. Press the knob key to save the selected option.



5. When CV Slew Rate Priority was chosen as the operating mode, scroll knob key to R_V Slew Rate and F_V Slew Rate fields followed by clicking knob key to enter the fields, respectively.





2023/09/14	
Output	09:35:32
Remote Sense	2 Wire
V/I Slew Rate	CVLS
R_V Slew Rate	0.0001V/ms
F_V Slew Rate	0.0400V/ms
R_I Slew Rate	0.01000A/ms
F_I Slew Rate	0.01000A/ms
Mode	Source

6. Scroll the knob key to adjust value, along with the arrow keys to change among digits followed by clicking the knob key to confirm set value, respectively.



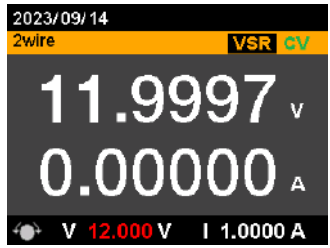
R_V Slew Rate / F_V Slew Rate Setting Range		
Model	Max. Value	Min. Value
GPP-1323	0.0001 V/ms	0.04 V/ms
GPP-1205	0.0001 V/ms	0.04 V/ms

7. Press the Menu key again to return to the main screen.

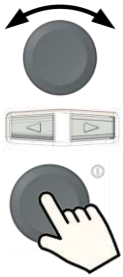


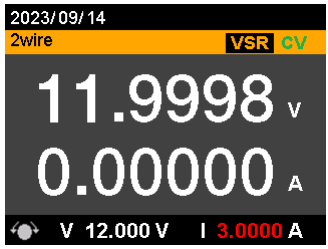
8. Scroll the knob key to move to V Set. Click knob key followed by scrolling knob key, along with the arrow keys to change among digits, to set the voltage. Click knob key to confirm the set value.





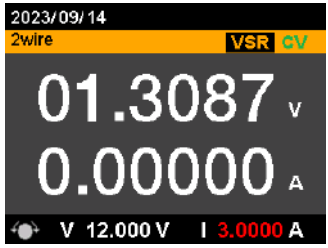
9. Scroll the knob key to move to I (A) Set. Click knob key followed by scrolling knob key, along with the arrow keys to change among digits, to set the current limit (crossover point).Click knob key to confirm the set value.





10. Press the Output key. The Output key becomes illuminated.





Set to C.C. Priority Mode

When setting the power supply to constant current mode, a voltage limit must also be set to determine the crossover point. When the voltage exceeds the crossover point, the mode switches to C.V. mode. For details about C.C. operation, see page20.

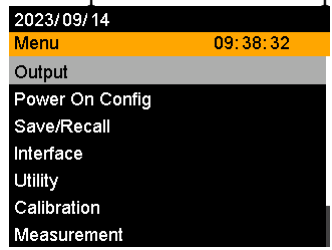
C.C. and C.V. mode have two selectable slew rates: High Speed Priority and Slew Rate Priority. High Speed Priority will use the fastest slew rate for the instrument while Slew Rate Priority will use a user-configured slew rate.

Background Before setting the power supply to C.C. mode, ensure:
- The output is off.
- The load is connected.

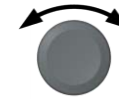
Steps

1. Press the Menu key followed by clicking on Output to enter the Output page.

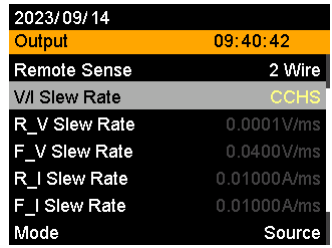




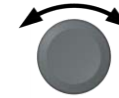
2. Scroll the knob key to move to the V/I Slew Rate field followed by clicking the knob key to enter the field.







3. Scroll the knob key to select between CCHS (CC High Speed Priority) and CCLS (CC Slew Rate Priority) options.



Options

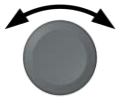
CCHS= CC High Speed Priority

CCLS= CC Slew Rate Priority

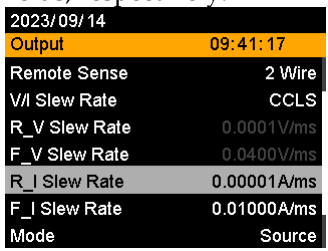
4. Press the knob key to save the selected option.



5. When CC Slew Rate Priority was chosen as the operating mode, scroll knob key to R_C Slew Rate and F_C Slew Rate fields followed by clicking knob key to enter the fields, respectively.







6. Scroll the knob key to adjust value, along with the arrow keys to change among digits followed by clicking the knob key to confirm set value, respectively.





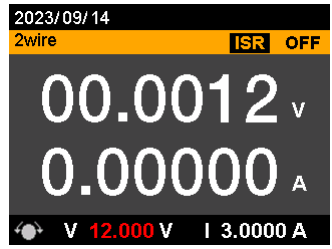
R_C Slew Rate / F_C Slew Rate Setting Range		
Model	Max. Value	Min. Value
GPP-1323	0.00001 A/ms	0.01 A/ms
GPP-1205	0.00001 A/ms	0.01 A/ms

7. Press the Menu key again to return to the main screen.



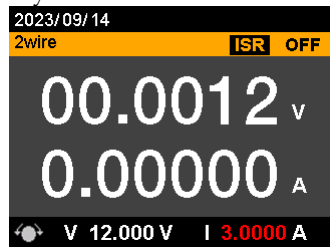
8. Scroll the knob key to move to V Set. Click knob key followed by scrolling knob key, along with the arrow keys to change among digits, to set the voltage limit (crossover point).Click knob key to confirm the set value.





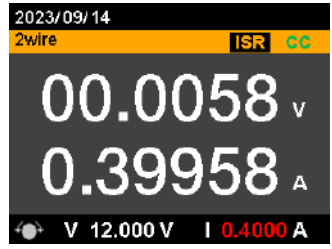
9. Scroll the knob key to move to I (A) Set. Click knob key followed by scrolling knob key, along with the arrow keys to change among digits, to set the current. Click knob key to confirm the set value.





10. Press the Output key. The Output key becomes illuminated.





Display Modes

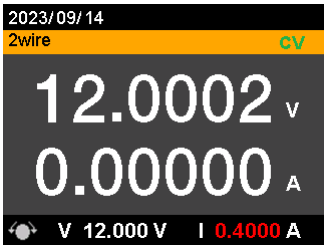
The GPP-1000 series power supplies allow you to view the output in 3 different modes: General (V/A), Power (V/A/W), Sequence(V/A/Sequence).

Steps

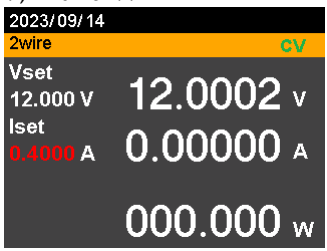
1. Press the Display key on main screen to toggle among each mode.



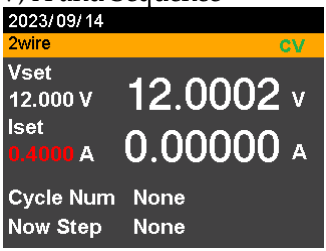
V and A



V, A and W



V, A and Sequence



2. Scroll the knob key to change between V and I (A) Set fields. Click the Knob key followed by scrolling it to adjust value, along with the arrow keys to change among digits followed by click knob key again to confirm value.



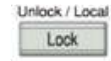
Note

When sequence mode is selected, V and I set can Not be modified here.

Refer to page 79 for details of V, A and Sequence display.

Panel Lock

The panel lock feature prevents settings from being changed accidentally. When activated, all keys including the knob key except the Shift key, Lock(Unlock/Local)key and Output key (if active) will be disabled.
If the instrument is remotely controlled via the USB/LAN/GPIB interface, the panel lock is automatically enabled.

Activate the panel lock	Press the Lock (Unlock/Local)key to activate the panel lock. The lock icon will be shown on display.	
Disable the panel lock	Press the Shift key followed by the Lock (Unlock/Local)key to disable the panel lock. The lock icon will thus be cleared from display.	

Note

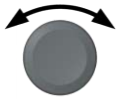
By default, the output key is disabled when lock function is activated. However, if Output On/Off function is selected under Utility section, the output key can be tuned On/Off even though the lock mode is activated. Refer to page 108 for detail.

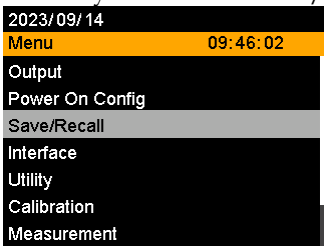
Save Setup

The GPP-1000 has up to 5 memory storage (M1 to M5) to save the set current, set voltage, OVP and OCP settings.

Steps	1. Press the Menu key to enter the Menu page.	

2. Scroll the knob key to move to the Save/Recall field followed by clicking the knob key to enter the Save/Recall page.







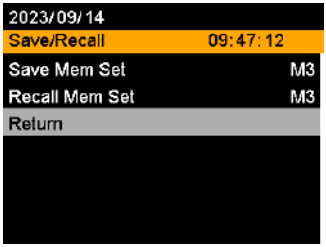
3. Click knob key to enter the Save Mem Set field followed by scrolling knob key to select one of the options for saving setting. Click knob key again to confirm the saving.

Options

M1 ~ M5







Recall Setup

The GPP-1000 has up to 5 memory storage (M1 to M5) to recall the set current, set voltage, OVP and OCP settings.

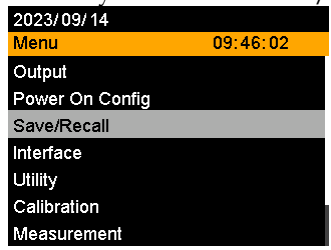
Recall Memory from Save/Recall

1. Press the Menu key to enter the Menu page.



2. Scroll the knob key to move to the Save/Recall field followed by clicking the knob key to enter the Save/Recall page.







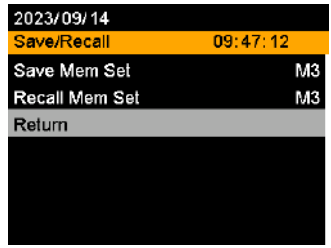
3. Scroll knob key to move to the Recall Mem Set field. Click knob key to enter the field followed by scrolling knob key to select one of the options to recall setting. Click knob key again to confirm.



Options

M1 to M5



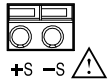
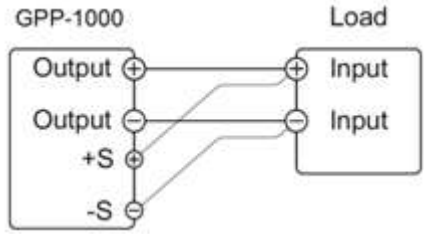
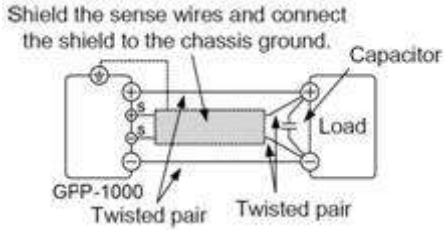


Remote Sense

Remote sense is used to compensate for the voltage drop seen across load cables due to the resistance inherent in the load cables. The remote sense terminals are connected to the load terminals to determine the voltage drop across the load cables.

Remote sense can compensate up to 1 volt for GPP-1000. Load cables should be chosen with a voltage drop less than the compensation voltage.

Warning	Ensure the output is off before handling the remote sense connector. Use sense cables with a voltage rating exceeding the isolation voltage of the power supply. Never connect sensing cables when the output is

	on. Electric shock or damage to the power supply could result.
Output terminal Connector Overview	When using the remote sensing, make sure the wires that are used follow the following guidelines: Wire gauge: AWG 20 to AWG 14 Strip length: 6.5 mm // 0.26 in  +S: + Sense terminal -S: - Sense terminal
⚠ Note	Be sure to remove the Sense joining cables so the units are not using local sensing.
Single Load	1. Connect the +S terminal to the positive potential of the load. Connect the -S terminal to the negative potential of the load.  2. Operate the instrument as normal. See the Basic Operation chapter for details.
Wire Shielding and Load line impedance	To help to minimize the oscillation due to the inductance and capacitance of the load cables, use an electrolytic capacitor in parallel with the load terminals. To minimize the effect of load line impedance use twisted wire pairing. 

Record

The GPP-1000 series can save measured voltage, current and time data into either USB flash disk or send the data to program via remote control.

Steps

1. Press the RECO key to enter the Recorder page.

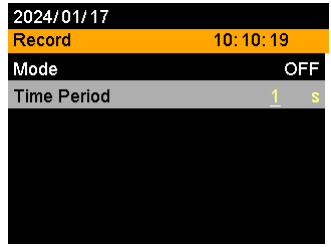


2. Scroll the knob key to move to the Sample Period field, which determines the interval of data log saving. Click knob key followed by scrolling it to adjust value, along with the arrow keys to change among digits. Click knob key again to confirm set period.

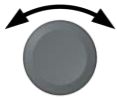




Range
1s to 999s

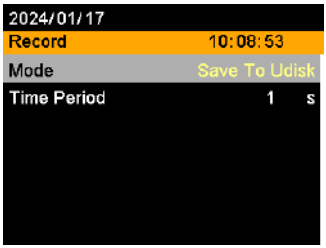


3. Scroll the knob key to move to the Type field. Click knob key followed by scrolling it to select a type for data log saving. Click knob key to confirm setting.



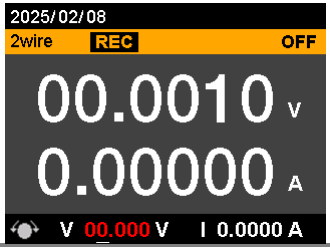


Type	
None	No action will be executed.
Save to Udisk	Save data log into USB disk. It is required to insert USB disk first.
Remote(LAN)	Send data log to remote side via LAN in real time.
Remote(USB)	Send data log to remote side via USB in real time.



Recorder icon in main display

When Recorder is activated, the RECO icon will be shown on the main screen.



Note

When the Save USB is selected, make sure that return to Data Logger page to select None for Type so that the latest data file can be saved properly.

Owing to the fact that data log is being transmitted in real time via remote control, when the Remote is selected, there is no need to return to Data Logger page to select None for Type.

Sequence Test

This section describes how to use the Sequence function to edit, run, load and save sequence scripts for automated testing. The sequence function is useful if you want to perform a number of tests automatically. The GPP-1000 sequence function can store up to 5 test scripts in internal memory and also into the connected USB disk. Each test script can also be programmed in a scripting language. For more information on how to create sequence scripts via programs, please contact GW Instek.

Sequence Script File Format

Background	The sequence script files are saved in the *.csv file format. When saving script file into internal memory, each file is saved as file X.csv where X is the file number from 1 to 5.When saving script file into the USB disk, each file is saved as SEQU_X.csv where X is the file serial number from 1 to 255.

Sequence Script Settings

Background	This section mainly introduces the settings within the Sequence page.
Run	It runs sequence script automatically. A script can be saved in or loaded from the internal memory or USB disk. Once the Run field is turned On, return to the main display followed by pressing Output key to initiate the set sequence script. Run On, Off
Total Step	It determines the total steps for a sequence script. Each step can be edited from the Edit field. Total Step 1 to 999

Mode	Normal It sets Normal Mode. Jump It sets Jump Mode. Cycle It sets cycle Mode. INF Cycle It indicates infinite cycles.
SEQU Start	It sets which step is the starting step of an entire sequence script. Be aware that this Start step can only be set equal to or earlier than the "Cycle Start".
SEQU End	It sets which step is the end step of an entire sequence script. Be aware that this End step can only be set equal to or later than the "Cycle End".
Cycle Number	It sets how many cycles will be repeated. For example, when a script consists of 6 steps and cycle number is set 3, the sequence runs the script, which contains step 1 to 6, for 3 times in a row. Cycle Number 1 to 999 It sets cycle(s) from 1 to 999 times.
Cycle Start	It sets which step is the starting step of cycle. The available steps options vary per total steps. Cycle Start 1 to 999 It sets which step is the starting point of cycle.
Cycle End	It sets which step is the end step of cycle. The available steps options vary per total steps. Cycle End 1 to 999 It sets which step is the end point of cycle.

Save	It saves a select sequence script into either internal memory or the connected USB disk. Save From Edit — To select currently edited script as a source of script to be saved. SEQU_X.csv — If connected USB disk contains saved scripts, the files are available to select. Save To Internal File X.csv — To save the selected source script into a select internal memory from no. 1 to 5. Save To USB SEQU_X.csv — To save the selected source script into the USB disk from no. 001 to 255.
Load	It loads a select sequence script from either connected USB disk or internal memory. Note that when USB disk is plugged in, memory from USB disk will prioritize over internal memory. File X.csv / SEQU_X.csv — To load script from USB disk (SEQU_X.csv) or internal memory (File X.csv).

Note When there is any issue occurred from settings, GPP-1000 series will not be able to run sequence script. The error code along with warning message will be shown within the prompt message box when Run filed is enabled.

Sequence Step Edit Settings

Background	This section mainly introduces the settings within the Sequence Edit page, which is used to edit several parameters for each step.
Step	To select which step to be edited. The available option(s) depends on the total step setting. Step — 1 to 999

Point	It sets a core action for select step. The available options are described as follows.	
	Point	
	None	
	Pause	It sets which step will be paused during a sequence script. When a sequence is paused, press Test key to continue running the sequence.
	Exit	It sets which step is the exit step of an entire sequence script. Generally, a sequence script can be executed again after finishing by pressing Output key. However, when Exit step is set, the sequence function won't be executed again after finishing by Output key directly.
	RECO 0	It sets which step will be executed in stop action for the data log function. This relates to the RECO 1 ,RECO 2 and RECO 3 actions as the following sections.
	RECO 1	It sets which step will be executed in the action of saving data log into USB disk. Once a sequence script runs to this step, data log will be kept saving into USB disk instantly until next RECO 0 action is met. Refer to page 60 for details.
	RECO 2/RECO 3	It sets which step will be executed in the action of sending data log to remote control side. Once a sequence script runs to this step, data log will be kept sending to remote control side until next RECO 0 action is met. Refer to page 60 for details. RECO 2---USB CDC,RECO 3--LAN
	Trigin	It sets which step will be executed by trig-in signal. The Trig in step will be held until trig-in signal is received by GPP-1000 series unit.

Output	It sets if power output will be activated for the select step. Output ON,OFF
Time	It sets time duration of execution for the select step. Time 0.1 s to 999.99 s
Voltage	It sets output voltage of CV mode for the select step. Voltage 0 V to 105 % rated voltage
Current	It sets output limit current of CC mode for the select step. Current 0 V to 105 % rated current
OVP Level	It sets over voltage protection setting for the select step. OVP Level 5 % to 110 % rated voltage
OCP Level	It sets over current protection setting for the select step. OCP Level 5 % to 110 % rated current
Bleeder	It enables or disables discharge loop control for the select step. Bleeder None, ON, OFF
V/I Slew Rate	It sets High Speed Priority and Slew Rate Priority of CV and CC modes for the select step. V/I Slew Rate CVHS It utilizes the fastest slew rate of CV mode. Refer to page 48 for more details. CCHS It utilizes the fastest slew rate of CC mode. Refer to page 51 for more details. CVLS It utilizes the user-configured slew rate of CV mode. When this option is selected, go to configure the R_V slew Rate (rising) and F_V slew rate (falling) settings, respectively. Refer to page 48 for more details. CCLS It utilizes the user-configured slew rate of CC mode. When this option is selected, go to configure the R_C slew Rate (rising) and F_C slew rate (falling) settings, respectively. Refer to page 51 for more details.
Buzzer	It enables or disables buzzer sound for the select step. Buzzer ON, OFF

Measure Average	It sets the speed level of display sampling for the measure average setting for the select step. More the average numbers (High), slower the display update. Refer to page 93 for details. Measure Average Off, Low, Middle, High
Jump To	It sets the target step to jump to. For example, when step 5 is set for Jump To under the step 2 Edit page, it means that when sequence runs to step 2, it will directly jump to step 5 at the end of step 2. The available step option(s) depends on the total step setting. Jump To 1 to 999
Jump Count	It sets the number of times to loop the Jump To step action. Jump Count 1 to 999
Trigger Out	It sets if trigger out signal will be transmitted when the sequence runs to the step. Trigger Out ON, OFF
Save Step	To select which step to be saved.

Note When there is any issue occurred from settings, GPP-1000 series will not be able to run sequence script. The error code along with warning message will be shown within the prompt message box when Run filed is enabled.

Setting Sequence Script Configurations

Steps

1. Press SEQU key followed by clicking on Sequence field via knob key to enter the Sequence page.





2023/09/14	
Sequence	09:47:44
Run	Off
Total Step	4
Mode	Cycle
SEQU Start	1
SEQU End	4
Cycle Number	1
Cycle Start	1

2. Scroll knob key to move to the Total Step field followed by clicking knob key to enter the field. Scroll knob key to adjust value along with arrow keys to change among digits followed by clicking knob key to confirm total steps.





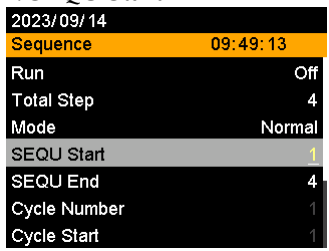
Total Step 1 to 999

2023/09/14	
Sequence	09:47:53
Run	Off
Total Step	4
Mode	Cycle
SEQU Start	1
SEQU End	4
Cycle Number	1
Cycle Start	1

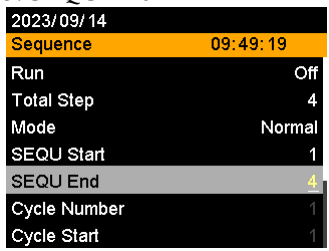
3. Mode

2023/09/14	
Sequence	09:48:48
Run	Off
Total Step	4
Mode	Normal
SEQU Start	1
SEQU End	4
Cycle Number	1
Cycle Start	1

4. SEQU Start



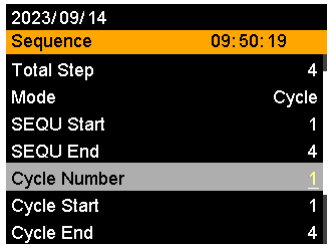
5. SEQU End



6. Scroll knob key to move to the Cycle Number field followed by clicking knob key to enter the field. Scroll knob key to adjust value along with arrow keys to change among digits followed by clicking knob key to confirm cycle number.



Cycle Number 1 to 999

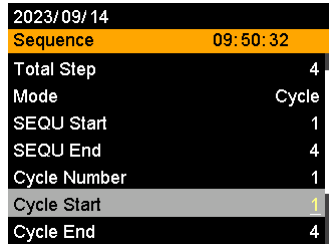


7. Scroll knob key to move to the Cycle Start field followed by clicking knob key to enter the field. Scroll knob key to adjust value along with arrow keys to change among digits followed by clicking knob key to confirm cycle start.

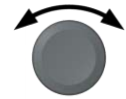




Cycle Start 1 to 999

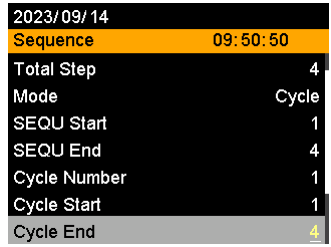


8. Scroll knob key to move to the Cycle End field followed by clicking knob key to enter the field. Scroll knob key to adjust value along with arrow keys to change among digits followed by clicking knob key to confirm cycle end.

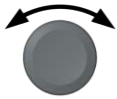




Cycle End 1 to 999



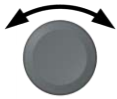
9. Scroll knob key to move to the Edit field followed by clicking knob key to enter the Sequence Edit page.





2023/09/14		
Edit	09:52:03	
Step	1	
Point	None	
Output	On	
Time	0.90	S
Voltage	2.000	V
Current	1.0000	A
OVP Level	21.0	V

10. Scroll knob key to move to the Step field followed by clicking knob key to enter the field. Scroll knob key to select a step along with arrow keys to change among digits followed by clicking knob key to confirm the step to edit.





Step 1 to 999

2023/09/14		
Edit	09:52:20	
Step	1	
Point	None	
Output	On	
Time	0.90	S
Voltage	2.000	V
Current	1.0000	A
OVP Level	21.0	V

11. Scroll knob key to move to the Point field followed by clicking knob key to enter the field. Scroll knob key to select an action followed by clicking knob key to confirm the action for the step to edit.





Point None, Exit, Pause, Trigin, RECO 0, RECO 1,RECO 2,RECO 3

2023/09/14		
Edit	09:53:22	
Step	1	
Point	None	
Output	On	
Time	0.90	S
Voltage	2.000	V
Current	1.0000	A
OVP Level	21.0	V

12. Scroll knob key to move to the Output field followed by clicking knob key to enter the field. Scroll knob key to turn on/off output followed by clicking knob key to confirm output action.





Output ON,OFF

2023/09/14		
Edit	09:53:54	
Step	1	
Point	None	
Output	On	
Time	0.90	S
Voltage	2.000	V
Current	1.0000	A
OVP Level	21.0	V

13. Scroll knob key to move to the Time field followed by clicking knob key to enter the field. Scroll knob key to adjust value along with arrow keys to change among digits followed by clicking knob key to confirm time setting.

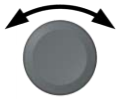




Time 0.1 s to 999.99 s

2023/09/14		
Edit	09:54:08	
Step	1	
Point	None	
Output	On	
Time	0.90	S
Voltage	2.000	V
Current	1.0000	A
OVP Level	21.0	V

14. Scroll knob key to move to the Voltage field followed by clicking knob key to enter the field. Scroll knob key to adjust value along with arrow keys to change among digits followed by clicking knob key to confirm voltage setting.

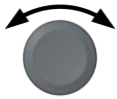




Voltage 0 V to 105 % rated voltage

2023/09/14		
Edit	09:54:20	
Step		1
Point		None
Output		On
Time	0.90	S
Voltage	2.000	V
Current	1.0000	A
OVP Level	21.0	V

15. Scroll knob key to move to the Current field followed by clicking knob key to enter the field. Scroll knob key to adjust value along with arrow keys to change among digits followed by clicking knob key to confirm current setting.





Current 0 A to 105 % rated current

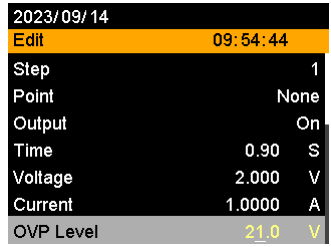
2023/09/14		
Edit	09:54:31	
Step		1
Point		None
Output		On
Time	0.90	S
Voltage	2.000	V
Current	1.0000	A
OVP Level	21.0	V

16. Scroll knob key to move to the OVP Level field followed by clicking knob key to enter the field. Scroll knob key to adjust value along with arrow keys to change among digits followed by clicking knob key to confirm OVP setting.

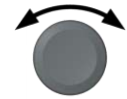




OVP Level 5 % to 110 % rated voltage

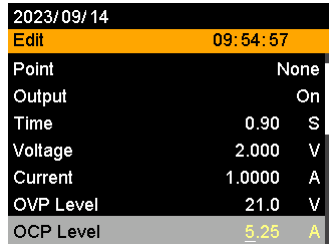


17. Scroll knob key to move to the OCP Level field followed by clicking knob key to enter the field. Scroll knob key to adjust value along with arrow keys to change among digits followed by clicking knob key to confirm OCP setting.





OCP Level 5 % to 110 % rated current



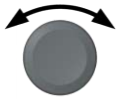
18. Scroll knob key to move to the Bleeder field followed by clicking knob key to enter the field. Scroll knob key to turn on/off bleeder followed by clicking knob key to confirm bleeder action.





Bleeder ON,OFF

19. Scroll knob key to move to the V/I Slew Rate field followed by clicking knob key to enter the field. Scroll knob key to select an option followed by clicking knob key to confirm V/I slew rate setting.

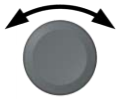




2023/09/14	
Edit	09:55:39
OVP Level	21.0 V
OCP Level	5.25 A
V/I Slew Rate	CVLS
R_V Slew Rate	0.210V/ms
F_V Slew Rate	0.210V/ms
R_I Slew Rate	0.0525A/ms
F_I Slew Rate	0.0525A/ms

V/I Slew Rate	CVHS, CCHS, CVLS, CCLS

When CVLS is selected in previous step, scroll knob key to R_V Slew Rate and F_V Slew Rate fields respectively followed by clicking knob key to enter each field.



Scroll the knob key to adjust value, along with the arrow keys to change among digits followed by clicking knob key to confirm set value, respectively.





2023/09/14	
Edit	09:56:11
OVP Level	21.0 V
OCP Level	5.25 A
V/I Slew Rate	CVLS
R_V Slew Rate	0.001V/ms
F_V Slew Rate	0.001V/ms
R_I Slew Rate	0.0525A/ms
F_I Slew Rate	0.0525A/ms

When CCLS is selected in previous step, scroll knob key to R_C Slew Rate and F_C Slew Rate fields respectively followed by clicking knob key to enter each field.

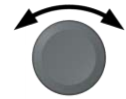


Scroll the knob key to adjust value, along with the arrow keys to change among digits followed by clicking knob key to confirm set value, respectively.



2023/09/14	
Edit	09:56:54
OVP Level	21.0 V
OCP Level	5.25 A
V/I Slew Rate	CCLS
R_V Slew Rate	0.001V/ms
F_V Slew Rate	0.001V/ms
R_I Slew Rate	0.0001A/ms
F_I Slew Rate	0.0125A/ms

20. Scroll knob key to move to the Buzzer field followed by clicking knob key to enter the field. Scroll knob key to turn on/off buzzer followed by clicking knob key to confirm buzzer setting.

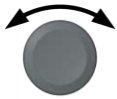




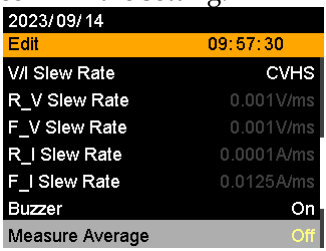
2023/09/14	
Edit	09:57:12
V/I Slew Rate	CVHS
R_V Slew Rate	0.001V/ms
F_V Slew Rate	0.001V/ms
R_I Slew Rate	0.0001A/ms
F_I Slew Rate	0.0125A/ms
Buzzer	On
Measure Average	Off

Buzzer ON,OFF

21. Scroll knob key to move to the Measure Average field followed by clicking knob key to enter the field. Scroll knob key to select an option followed by clicking knob key to confirm the setting.

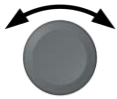






Measure Average	Off, Low, Middle, High

22. Scroll knob key to move to the Trigger Out field followed by clicking knob key to enter the field. Scroll knob key to turn on/off the function followed by clicking knob key to confirm the selection.



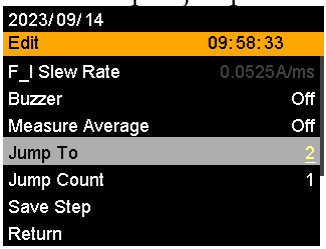


Trigger Out	ON, OFF

23. Scroll knob key to move to Jump To field followed by clicking knob key to enter the field. Scroll knob key to select a step number along with arrow keys to change among digits followed by clicking knob key to confirm step to jump to.





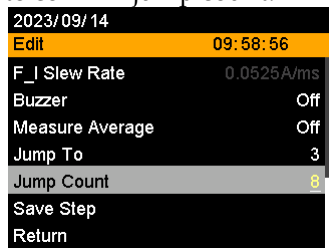


Jump To	1 to 999

24. Scroll knob key to move to Jump Count field followed by clicking knob key to enter the field. Scroll knob key to select a count number along with arrow keys to change among digits followed by clicking knob key to confirm jump count.







Jump Count 1 to 999

25. Repeat the previous step 9 to step 24 for each step individually within a sequence script.

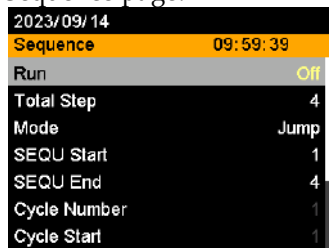
Run Sequence Script

Overview After well setting the relevant configurations from Sequence and Sequence Edit pages, it is ready to launch a sequence script test. Also, it is available to load script from internal memory or the connected USB disk. See page 81 for how to load sequence script.

Steps 1. Press SEQU key followed by clicking on Sequence field via knob key to enter the Sequence page.

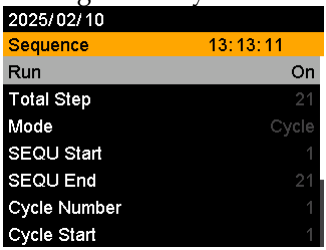






2. Scroll knob key to move to the Run field followed by clicking knob key to enter the field. Scroll knob key to turn On followed by clicking knob key to confirm setting.

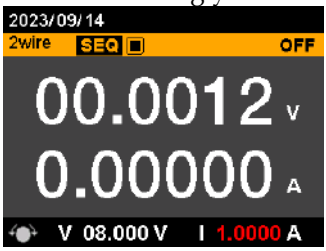






Run ON, OFF

3. The SEQ icon is displayed on the top banner accordingly.



4. Press the SEQU key to switch to display mode in which press Display key repeatedly until the V, A and Sequence mode is shown. The SEQ icon is displayed on the top banner accordingly.







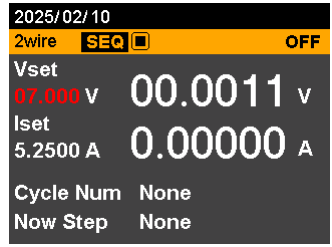
SEQ icon

Sequence info section

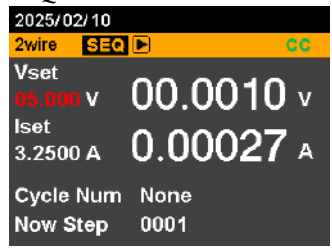
5. Press the Output key to execute the sequence script test. See the figures below for descriptions on varied conditions.



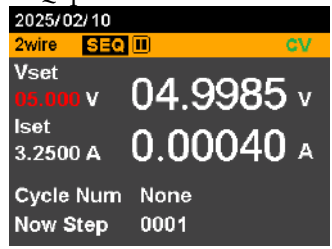
SEQ stop in normal mode



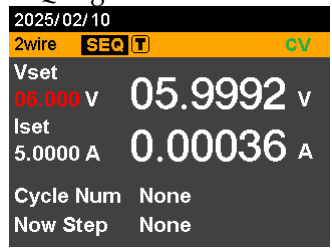
SEQ run in normal mode



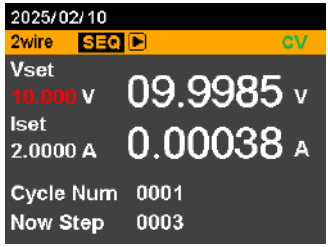
SEQ pause in normal mode



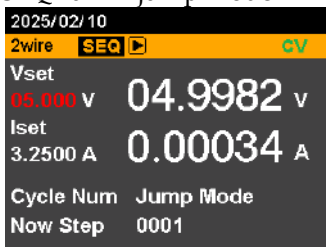
SEQ trigin in normal mode



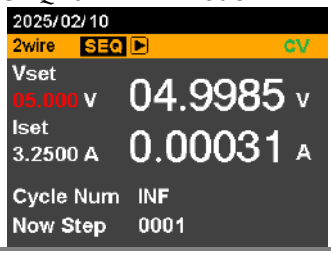
SEQ run in cycle mode



SEQ run in jump mode



SEQ run in inf mode



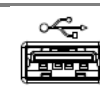
Note	When a script is running, pressing the Output key will abort the execution of the script immediately. The Output key illumination will turn off.

Load Sequence Script

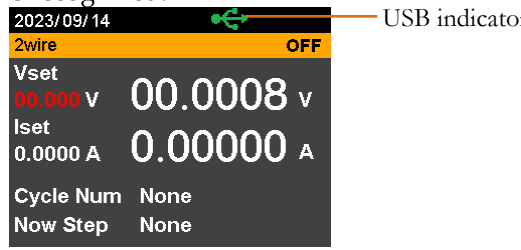
Overview	A sequence script can be loaded from either USB disk or internal memory. When USB disk is connected with GPP-1000 series, the script file in USB disk has higher priority over internal memory; that is, user can only load script file in USB disk when USB disk is plugged in. Prior to loading script from USB disk, ensure the script file is placed in root directory.

Load script from USB disk

1. Insert a USB disk into the front panel USB-A port. Ensure the USB disk contains a test script in root directory.

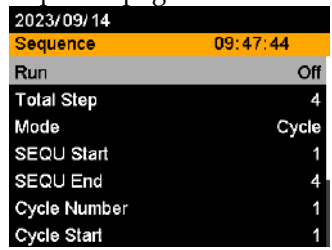


2. The icon of USB disk detection will be displayed on the upper status bar after a few seconds if the USB disk is recognized.



3. Press SEQU key followed by clicking on Sequence field via knob key to enter the Sequence page.

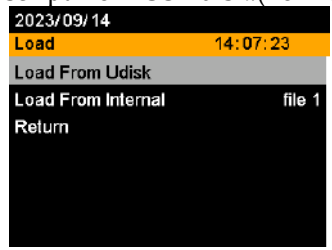






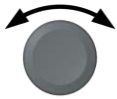
4. Scroll knob key to move to the Load field followed by clicking knob key to enter the field. Scroll knob key to select an available script from USB disk.(Format: SEQU_X.csv).







5. The prompt window appears as follows. Click knob key to confirm loading the select script file.

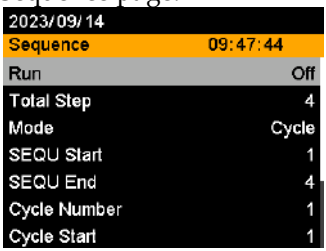




Load script from internal memory

1. Press SEQU key followed by clicking on Sequence field via knob key to enter the Sequence page.

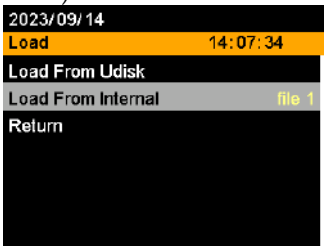






2. Scroll knob key to move to the Load field followed by clicking knob key to enter the field. Scroll knob key to select an available script from internal memory (Format: File X.csv).







3. The prompt window appears as follows. Click knob key to confirm loading the select script file.





Save Sequence Script

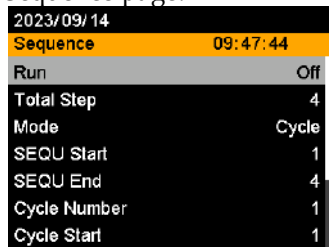
Overview

A sequence script can be saved from either an edited one or USB disk to either internal memory or USB disk. Prior to saving script from USB disk, ensure the script file is placed in root directory. When saving script to USB disk, ensure USB disk is plugged into GPP-1000 series.

Save script from edited one to internal memory

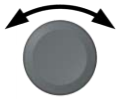
1. Press SEQU key followed by clicking on Sequence field via knob key to enter the Sequence page.

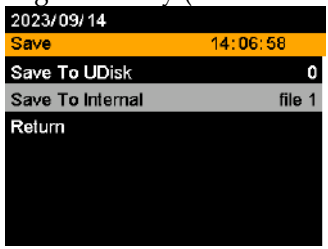






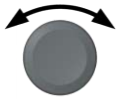
2. Scroll knob key to move to the Save To Internal field followed by clicking knob key to enter the field. Scroll knob key to select a target memory (Format: File X.csv).







3. Click knob key and the prompt window shows as follows. Click knob key again to confirm saving Edit to target File X.csv.





Save script from USB disk to internal memory

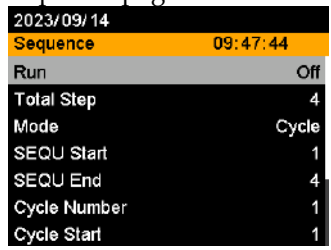
1. Insert a USB disk into the front panel USB-A port. Ensure the USB disk contains a test script in root directory.



2. The icon of USB disk detection will be displayed on the upper status bar after a few seconds if the USB disk is recognized.

3. Press Test key followed by clicking on Sequence field via knob key to enter the Sequence page.





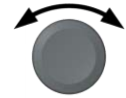


4. Scroll knob key to move to the Load field followed by clicking knob key to enter the Sequence Load page.

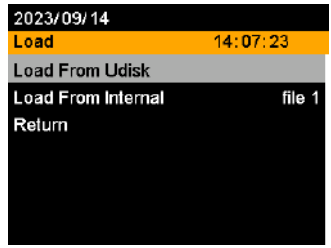




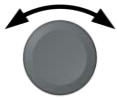
5. Click knob key to enter the Load From Udisk field followed by scrolling knob key to select a script file from USB disk (Format: SEQU_X.csv). Click knob key to confirm selection.

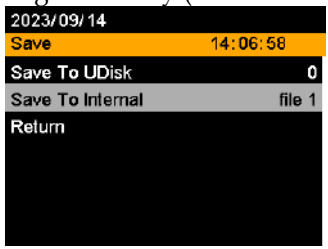






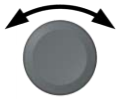
6. Scroll knob key to move to the Save To Internal field followed by clicking knob key to enter the field. Scroll knob key to select a target memory (Format: File X.csv).







7. Click knob key and the prompt window shows as follows. Click knob key again to confirm saving SEQU_X.csv to target File X.csv.





Save script from edited one to USB disk

1. Insert a USB disk into the front panel USB-A port.

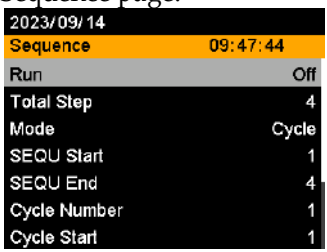


2. The icon of USB disk detection will be displayed on the upper status bar after a few seconds if the USB disk is recognized.

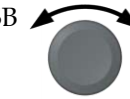
3. Press Test key followed by clicking on Sequence field via knob key to enter the Sequence page.

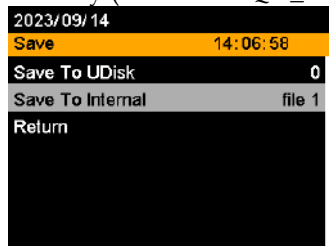






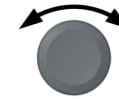
4. Scroll knob key to move to the Save To USB field followed by clicking knob key to enter the field. Scroll knob key to select a target memory (Format: SEQU_X.csv).







5. Click knob key and the prompt window shows as follows. Click knob key again to confirm saving Edit to target SEQU_X.csv.





MENU CONFIGURATION

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Configuration Overview

The MENU configuration of GPP-1000 series consists of Output setting, Measurement setting, TRIG Control setting, PWR On Config setting, Save/Recall setting, Interface setting, Utility setting and Calibration setting. The last Calibration setting, which also includes System firmware update, is generally not recommended for end-user use.

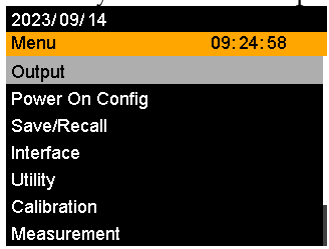
Output

Output On/Off Delay

It delays turning the output on/off for a designated amount of time. Note that this function has a maximum deviation (error) of 20ms and is disabled when the output is set to external control.

1. Press the Menu key followed by scrolling knob key to move to Output field.

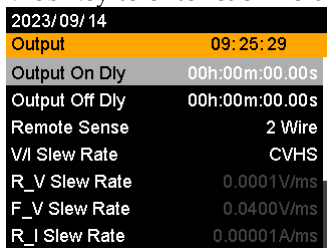


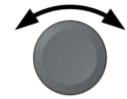




2. Click knob key to enter the Output page. Scroll knob key to move to Output On/Off Dly fields, respectively, followed by clicking knob key to enter each field.

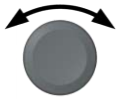






3. Click arrow keys to move among each unit (h:m:s). Scroll knob key to change value followed by clicking the knob key to confirm the set value.





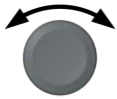


Output On/Off Delay	00h:00m:00.00s to 99h:59m:59.99s

Remote Sense

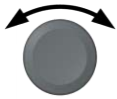
To determine 2 Wire or 4 Wire connection.

4. Scroll knob key to move to Remote Sense field followed by clicking knob key to enter the field.

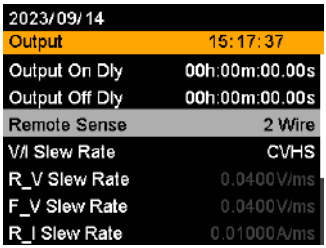




5. Scroll the knob key to select option followed by clicking the knob key to confirm the selection.







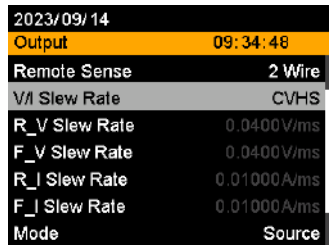
Remote Sense	2 Wire, 4 Wire

V/I Slew Rate

The C.V. and C.C. mode have two selectable slew rates: High Speed Priority(CVHS, CCHS)and Slew Rate Priority(CVLS, CCLS). High Speed Priority will use the fastest slew rate for the instrument while Slew Rate Priority will use a user-configured slew rate.

6. Scroll knob key to move to V/I Slew Rate field followed by clicking knob key to enter the field.







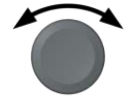
7. Scroll the knob key to select option followed by clicking the knob key to confirm the selection.

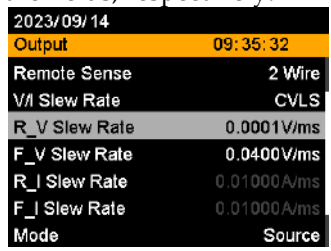
V/I Slew Rate	CVHS, CVLS, CCHS, CCLS





8. When CVLS or CCLS is selected, scroll knob key to R_V Slew Rate or F_V Slew Rate fields followed by clicking knob key to enter the fields, respectively.







9. Scroll the knob key to adjust value, along with the arrow keys to change among digits followed by clicking the knob key to confirm set value, respectively.





R_V Slew Rate / F_V Slew Rate Setting Range

Model	Max. Value	Min. Value
GPP-1323	0.0001 V/ms	0.04 V/ms
GPP-1205	0.0001 V/ms	0.04 V/ms

Mode — It sets basic power function or Load mode function.

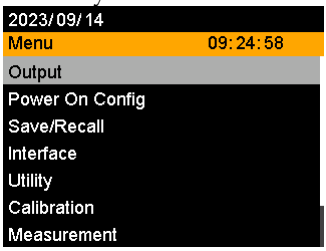
Load Mode — The GPP-1000 series models have additional Load function with 2 modes: CV (Constant Voltage) and CC (Constant Current), all of which can be selected through the function keys on the front panel.

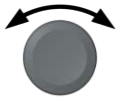
Measurement

Measure Average — It sets the speed level of display sampling for the measure average setting. More the average numbers (High), slower the display update. By contrast, the Off option indicates max sampling average and thus with the lowest speed in display update.

1. Press the Menu key followed by scrolling knob key to move to Measurement field.

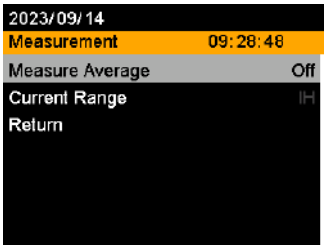






2. Click knob key to enter the Measurement page. Scroll knob key to move to Measure Average field followed by clicking knob key to enter the field.







3. Scroll knob key to change option followed by clicking the knob key to confirm the selection.



Measure Average	High, Middle, Low, Off

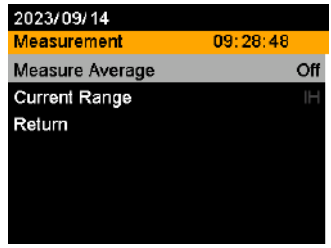


Current Range

It sets display range for current.

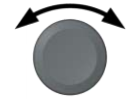
4. Scroll knob key to move to Current Range field followed by clicking knob key to enter the field.







5. Scroll the knob key to select option followed by clicking the knob key to confirm the selection.





Current Range	
IH	0 to rated current
IM	0 to 0.1 * rated current
IL	0 to 0.01 * rated current

TRIG Control

Trigin Level

It determines what signal (High or Low) will trigger the trigger-in action.

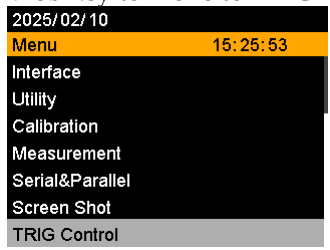
Before setting the TRIG Control, ensure that:

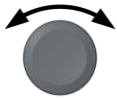
The output is off.

The load is not connected.

1. Press the Menu key followed by scrolling knob key to move to TRIG Control field.

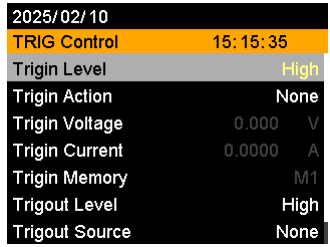






2. Click knob key to enter the TRIG Control page. Scroll knob key to move to Trigin Level field followed by clicking knob key to enter the field.

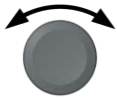






3. Scroll knob key to select option followed by clicking the knob key to confirm the selection.

Trigin Level	High, Low



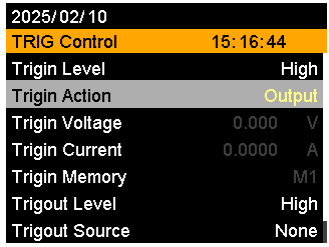


Trigin Action

To determine the ensuing action when trigger-in signal is received.

4. Scroll knob key to move to Trigin Action field followed by clicking knob key to enter the field.







5. Scroll the knob key to select option followed by clicking the knob key to confirm the selection.



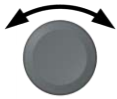


Trigin Action

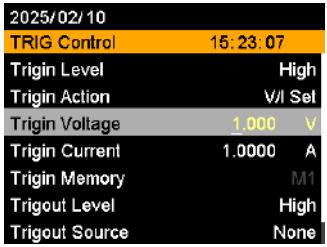
None	None of actions will be executed.
Output	GPP-1000 will turn On/Off power output when trigger-in signal is received.
V/I Set	GPP-1000 will change to the predefined V/I settings when trigger-in signal is received. It is required to set Trigin Voltage and Trigin Current, individually before enabling V/I Set.
Memory	GPP-1000 will change to the predefined Trigin Memory when trigger-in signal is received. It is required to set Trigin Memory before enabling Memory.

Trigin Voltage & Trigin Current

6. Scroll knob key to move between Trigin Voltage and Trigin Current fields. Click the knob key to enter each field, respectively. Scroll the knob key to adjust value, along with the arrow keys to change among digits followed by clicking the knob key to confirm set value.





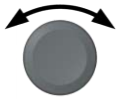


Setting Range

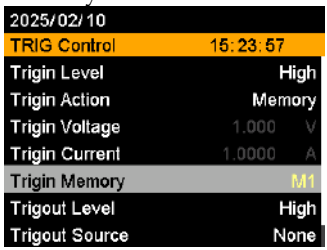
Model	Trigin Voltage	Trigin Current
GPP-1323	0 V to 33.600 V	0 A to 3.1500 A
GPP-1205	0 V to 21.000 V	0 A to 5.2500 A

Trigin Memory

7. Scroll knob key to move to Trigin Memory field. Click the knob key to enter the field. Scroll the knob key to selection option followed by clicking knob key to confirm the memory selection.







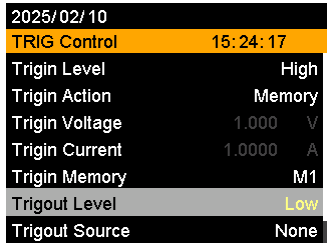
Trigin Memory	M1 to M5

Trigout Level

It determines what trigger-out signal (High or Low) will be transmitted after execution of predefined Trigout Source from GPP-1000 series.

8. Scroll knob key to move to Trigout Level field followed by clicking knob key to enter the field.

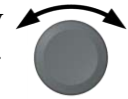






9. Scroll knob key to select option followed by clicking the knob key to confirm the selection.

Trigout Level	High, Low

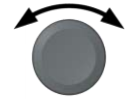


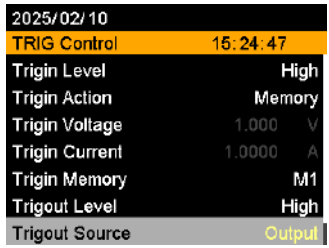


Trigout Source

To determine what source of action to launch the trigger-out signal.

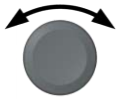
10. Scroll knob key to move to Trigout Source field followed by clicking knob key to enter the field.







11. Scroll the knob key to select option followed by clicking the knob key to confirm the selection.





Trigout Source	
None	No trigger-out signal will be sent out.
Output	When power output is turned On/Off, a trigger-out signal will be sent out.
V/I Set	When V/I set is adjusted from GPP-1000, a trigger-out signal will be sent out.
Memory	When one of memories is recalled on GPP-1000, a trigger-out signal will be sent out.

PWR On Config

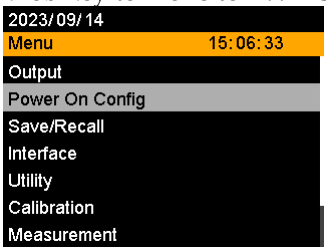
Power On Status — It determines power output Default value when GPP-1000 unit is starting up.

Default: non-modifiable factory default setting.

Save: the last shut down status.

1. Press the Menu key followed by scrolling knob key to move to PWR On Config field.

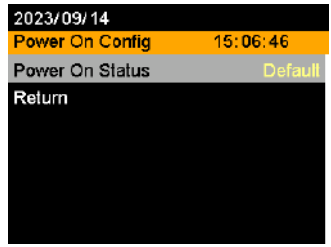






2. Click knob key to enter the PWR On Config page. Scroll knob key to move to Power On Status field followed by clicking knob key to enter the field.

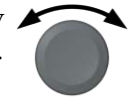






3. Scroll knob key to select option followed by clicking the knob key to confirm the selection.

Power On Status — Save, Default





Save/Recall

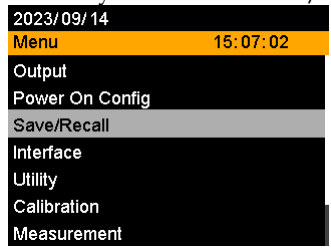
Save Mem Set

Up to 5 memory setups (M1 to M5) can be saved to the internal storage.

1. Press the Menu key followed by scrolling knob key to move to Save/Recall field.

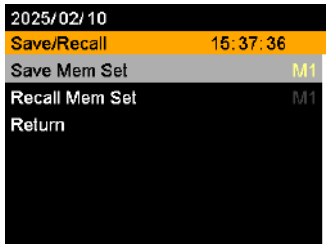






2. Click knob key to enter the Save/Recall page. Scroll knob key to move to Save Mem Set field followed by clicking knob key to enter the field.







3. Scroll knob key to select an option followed by clicking the knob key to confirm the selection .Scroll knob key to move to OK followed by clicking knob key again to confirm save.



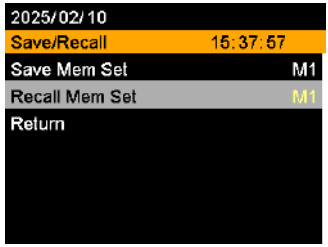
Save Mem Set M1 to M5



Recall Mem Set Up to 10 memory setups (M1 to M5) can be recalled from the internal storage

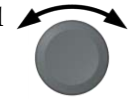
4. Scroll knob key to move to Recall Mem Set field followed by clicking knob key to enter the field.







5. Scroll knob key to select an option followed by clicking the knob key to confirm the selection .Scroll knob key to move to OK followed by clicking knob key again to confirm recall.





Recall Mem Set	M1 to M5	From the internal memory M1 to M5.

Interface

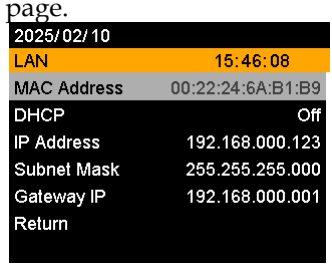
LAN

The GPP-1000 series use the Ethernet LAN (Local Area Network) port for a number of different applications. Ethernet can be configured for basic remote control or monitoring using a web server or it can be configured as a socket server.

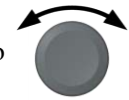
1. Scroll knob key to move to LAN field followed by click knob key to enter the LAN page.







2. There are several relevant settings for LAN interface as following details. Use knob key to scroll and click to configure each setting.

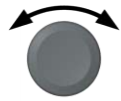


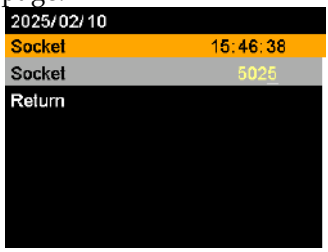


MAC Address	Displays the MAC address in 6 parts. This setting is not configurable. 0x00 to 0xFF
DHCP	Turns DHCP on or off .When DHCP is Off, the following IP Address, Subnet Mask, Gateway IP and DNS Address are configurable. Off, On
IP Address	Sets the default IP address. IP address 1 to 4 splits the IP address into four sections. 0 to 255, 0 to 255, 0 to 255, 0 to 255
Subnet Mask	Sets the subnet mask. The subnet mask is split into four parts. 0~255, 0~255, 0~255, 0~255
Gateway IP	Sets the gateway address. The gateway address is split into 4 parts. 0 to 255, 0 to 255, 0 to 255, 0 to 255
Socket	The Socket port is fixed in 5025 (Not configurable) and is specifically for when Ethernet LAN is configured as a socket server.

3. Scroll knob key to move to Socket field followed by click knob key to enter the Socket page.







4. The Socket info is as follows

Select Port	The Socket port is fixed in 5025.

5. Scroll knob key to move to Return field followed by clicking knob key to return back to the previous page. Also, it is available to return by clicking the left arrow key.



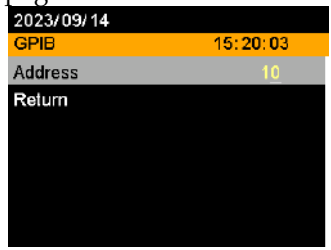




GPIB The GPP-1000 series use the GPIB connector for basic remote control.

6. Scroll knob key to move to GPIB field followed by click knob key to enter the GPIB page.







7. There is only an Address field for GPIB interface as the following detail. Use knob key to scroll and click to configure Address setting.





Address Displays the GPIB address.
1 to 30

8. Scroll knob key to move to Return field followed by clicking knob key to return back to the previous page. Also, it is available to return by clicking the left arrow key.





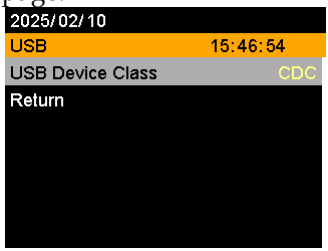


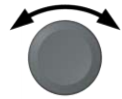
USB

The GPP-1000 series use the USB B-type port for basic remote control.

9. Scroll knob key to move to USB field followed by click knob key to enter the USB page.







10. There is only an USB field for USB interface as the following detail. Use knob key to scroll and click to configure USB setting.





USB Device Class

Sets the USB Device Class.
CDC,TMC

11. Scroll knob key to move to Return field followed by clicking knob key to return back to the previous page. Also, it is available to return by clicking the left arrow key.





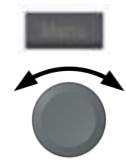


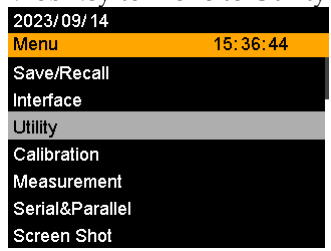
Utility

System Information

The system information including Model Name, Serial Number as well as Version of GPP-1000 series are shown in this section.

1. Press the Menu key followed by scrolling knob key to move to Utility field.

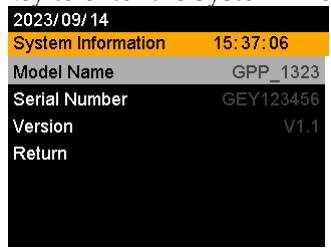




2. Click knob key to enter the Utility page. Scroll knob key to move to System Information field followed by clicking knob key to enter the System Information page.





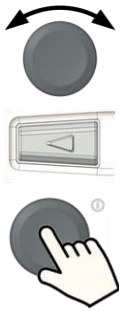


3. There is several information as the following details, which are displayed only and not configurable.



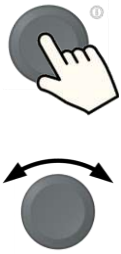
Model Name	The specific model's name of GPP-1000 series.
Serial Number	The serial number of GPP-1000 series.
Version	The firmware version of GPP-1000 series.

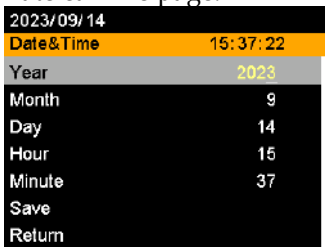
4. Scroll knob key to move to Return field followed by clicking knob key to return back to the previous page. Also, it is available to return by clicking the left arrow key.



Date & Time	The system time of GPP-1000 series can be configured within this section.

5. Scroll knob key to move to Date & Time field followed by click knob key to enter the Date & Time page.





6. There are several relevant settings for Date & Time setting as following details. Use knob key to scroll and click to configure each setting.





Year	To configure year field.
Month	To configure month field.
Day	To configure day field.
Hour	To configure hour field.
Minute	To configure minute field.
Save	To save the configured system time.

7. Scroll knob key to move to Return field followed by clicking knob key to return back to the previous page. Also, it is available to return by clicking the left arrow key.





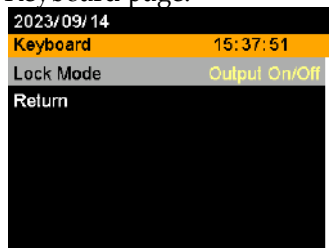


Keyboard Basically this section relates to Lock mode .It determines if power output is available when lock mode is activated.

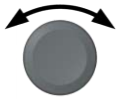
8. Scroll knob key to move to Keyboard field followed by click knob key to enter the Keyboard page.







9. There is only a Lock Mode field for Keyboard setting as the following detail. Use knob key to scroll and click to configure Lock Mode setting.





Lock Mode	Output On/Off	Power output can be turned On/Off when lock mode is activated.
	Output Off	Power output can only be turned Off when lock mode is activated.

10. Scroll knob key to move to Return field followed by clicking knob key to return back to the previous page. Also, it is available to return by clicking the left arrow key.



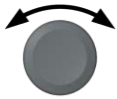


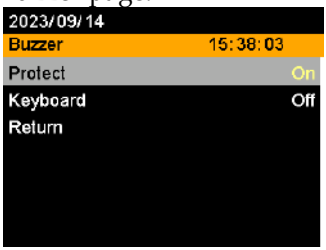


Buzzer It turns the buzzer sound On or Off when either protection alarm function is tripped or keyboard entry is engaged.

11. Scroll knob key to move to Buzzer field followed by click knob key to enter the Buzzer page.







12. There are two relevant settings for Buzzer setting as following details. Use knob key to scroll and click to configure each setting.





Protect — To turn On or Off the buzzer sound for protection alarm.
On, Off

Keyboard — To turn On or Off the buzzer sound for keyboard entry.
On, Off

13. Scroll knob key to move to Return field followed by clicking knob key to return back to the previous page. Also, it is available to return by clicking the left arrow key.





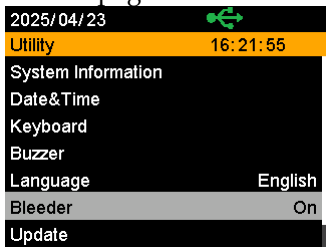


Bleeder — It turns the bleeder control On or Off for the bleeder resistor, which is critical for discharge. For more details, refer to page 22.

14. Scroll knob key to move to Bleeder field followed by click knob key to enter the Bleeder page.







15. There is only a Bleeder field for Bleeder setting as following detail. Use knob key to scroll and click to configure the setting.





Bleeder — To turn On or Off the bleeder control for the bleeder resistor.
On, Off

16. Scroll knob key to move to Return field followed by clicking knob key to return back to the previous page. Also, it is available to return by clicking the left arrow key.







Calibration

System Update	The Calibration section is used to access to the calibration function, which requires a password to enter the menu. Please see your distributor or dealer for details when necessary.

DIGITAL CONTROL

The Digital Control chapter describes how to control the voltage or current output using an external trigger signal, monitor the voltage or current output as well as remotely turning off the output or shutting down the power supply.

External Trigger In / Out..... 113
External Operation and Status Monitoring 113

External Trigger In / Out

Background

The trigger input can be configured to perform an action such as toggling the output on/off, load a memory setting or apply a voltage/current setting when a trigger is received.

The trigger output can be configured to be active when the output is turned on/off, a voltage/current setting is changed or when a memory setting has been recalled. The trigger output pulse width can also be configured.

See page 94 for details on the trigger input and trigger output configuration settings.

Pinout

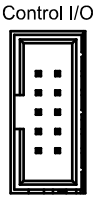
Name and Pin	Description
TRIG OUT	Trigger output: approx. 3.3 V Pulse width: approx. 4 ms, Output impedance: approx. 50 Ω It outputs a pulse when power output, V/I set operation or memory recall is executed.
TRIG IN	A high or low level TTL signal is applied for 100 us or longer. It receives a pulse to perform actions like power output, V/I set operation or memory recall.

External Operation and Status Monitoring

Overview

The Control I/O Connector is a 10-pin connector that can be used with the plug for wiring connection. The pins used determine what remote control mode is used.

Pin Assignment

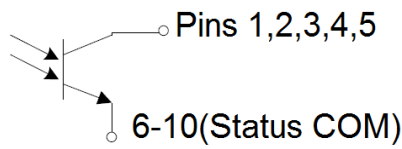


Pinout

Name and Pin		Description
OUT ON Status	1	On when the output is on (open-collector photocoupler output).
CV Status	2	This line is On when the GPP-1000 is in CV mode (open-collector photocoupler output).
PWR OFF Status	3	Outputs a low level signal when power is turned off. (open-collector photocoupler output).
CC Status	4	This line is On when the GPP-1000 is in CC mode (open-collector photocoupler output).
Alarm Status	5	On when a protection function (OVP, OCP,OTP or Sense Alarm) has been activated or when an output shutdown signal is being applied (open-collector photocoupler output).
Status COM	6 to 10	This is the common line for the status signal pins 6 to 10.

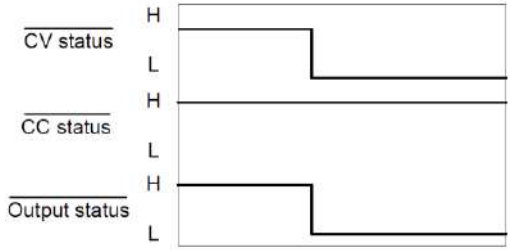
Open collector output: Maximum voltage of 30 V and maximum current of 8 mA. The common line for the status pins is floating (isolated voltage of 60 V or less). It is isolated from the output and control circuits.

Schematic

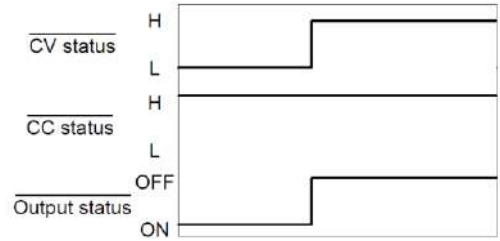


Timing diagrams: Below are 4 example timing diagrams covering a number of scenarios.

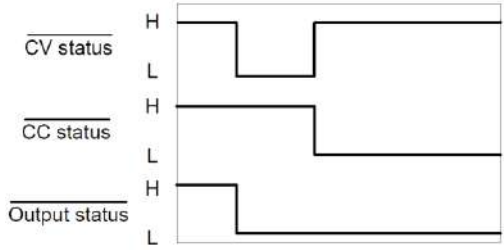
CV MODE: Output turned on: The diagram below shows the timing diagram when the output is turned on when the GPP-1000 is set to CV mode.



CV MODE: Output turned off: The diagram below shows the output status lines when the output is turned off in CV mode.

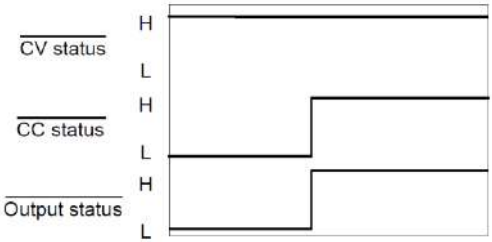


CC MODE: Output turned on: The diagram below shows the timing diagram when the output is turned on when the GPP-1000 is set to CC mode.



CCMODE: Output turned off

The diagram below shows the output status lines when the output is turned off in CC mode.



Parallel/Series Operation

This section describes the basic operations required to operate the power supply in series or parallel. Operating the GPP-1000 in parallel increases the total current output of the power supply units. When used in series, the total output voltage of the power supplies can be increased.

When the units are used in parallel or in series, a number of precautions and limitations apply. Please read the following sections before operating the power supplies in parallel or series.

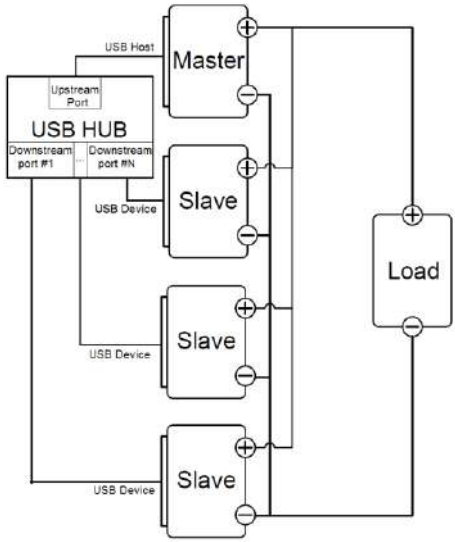
Master-Slave Parallel Overview 118
Parallel Connection 119
Parallel Operation 121
Master-Slave Series Overview.....122
Series Connection 124
Series Operation 126

Master-Slave Parallel Overview

Background

When connecting the GPP-1000 power supplies in parallel, up to 4 units can be used in parallel and all units must be of the same model with similar output settings.

To use the power supplies in parallel, units must be used in a "master-slave" configuration. In the master-slave configuration a "master" power supply controls any other connected "slave" power supplies. In order for the master unit to control the slave units, the master unit must use the USB cable via USB HUB to connector on the rear panel to control the slave units.



Limitations

Display

Only the master unit will display the voltage and current. The total current is the sum of the units .

OVP/ OCP

The master unit can shut down the slave unit when OVP/OCP is tripped on the master unit.

OVP and OCP level is determined by the master OVP and OCP level. The OVP and OCP level on the slave unit is ignored.

Bleeder Control

The Master unit is used to control the bleeder settings. The bleeder resistor is always turned off for the slave unit in parallel mode.

Output Voltage/ Output Current

	Number of parallel units:			
Model	1 unit	2 units	3 units	4 units
GPP-1205	20 V / 5 A	20 V / 10 A	20 V / 15 A	20 V / 20 A
GPP-1323	32 V / 3 A	32 V / 6 A	32 V / 9 A	32 V / 12 A

Parallel Connection

Remote Interface Connection

1.Master unit connect the USB cable to the rear panel USB A port. The other end is connected to the USB HUB B port.

2. Slave unit connect the USB cable to the rear panel USB B port. The other end is connected to the USB HUB A port.

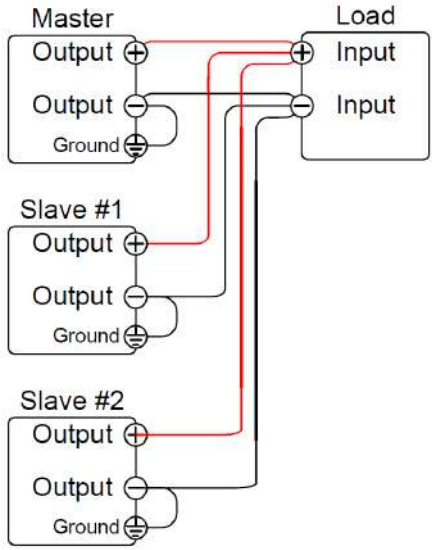
3. Set the USB Device Class setting as CDC.

4. The indicator will be shown when a remote connection has been established.

Parallel Output Connection

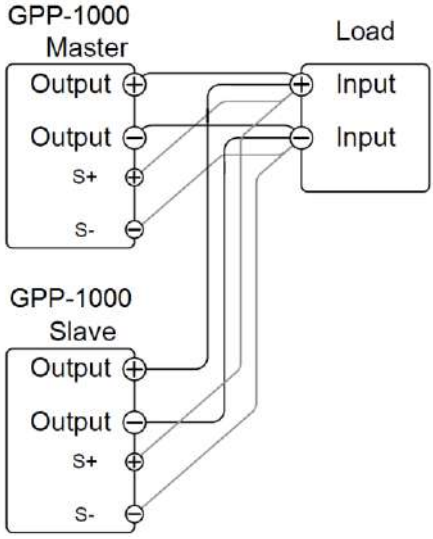
If grounding the positive or negative terminals to the reference ground, be sure to ground the appropriate terminal on each unit (either positive or negative).

Example with negative terminal connected to ground



Parallel Sense Connections

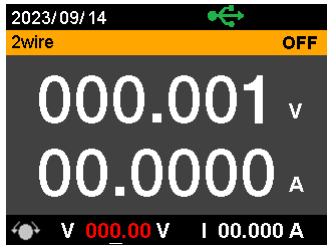
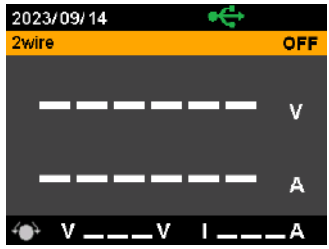
For remote sense connections, connect the S+ terminals to the positive potential of the load. Connect the S- terminals to the negative potential of the load.



Steps	1. Ensure the power is off on all power supplies. 2. Choose the master and the slave unit(s). 3. Connect the USB cables for the master and slave units as shown above. 4. Connect the master and slave unit in parallel as shown above. 5. If using remote sense, connect the master and slave sense cables as shown above.
Note	Ensure the load cables have sufficient current capacity. The load wires and remote sense wires should use twisted-paired wiring of the shortest possible length.

Parallel Operation

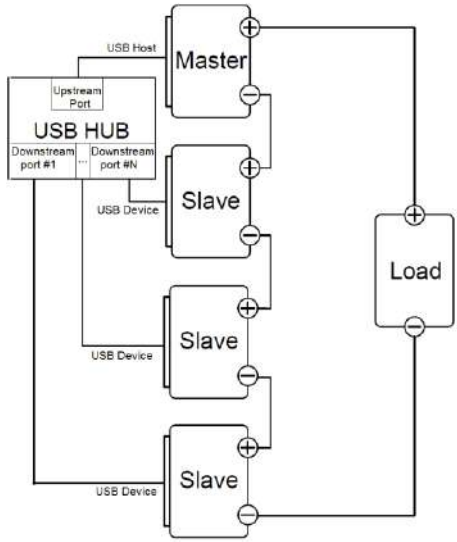
Master-Slave Configuration	Before using the power supplies in parallel, the master and slave units need to be configured.
Steps	1. Configure the OVP and OCP settings for the master unit. 2. Enter the Power ON Configuration settings and set the Tracking configuration for the master and each connected slave. 3. If using voltage sense, disable local sense in the Power ON Configuration settings. 4. Cycle the power on the units (reset the power).
Note	Set Tracking to Local to return the units to local (independent) operation. Only the Master OVP and OCP settings are used for protection. Slave protection levels are disregarded. OTP works independently for each unit.
Master-Slave Operation	Only operate the power supplies in parallel if the units are configured correctly.

Steps	1. Turn on the master and slave units. The slave unit(s) will show a blank display. Master unit  Slave units  2. Operation of all units is controlled via the master unit. Operation of the master unit is the same as for a single unit. See the Basic Operation chapter. 3. Press the Output key to begin. The output key will turn green. 
Caution	Only operate the power supplies in parallel if using units of the same model number.
Note	The panel controls are disabled on slave units, including the output key.
Caution	Ensure that the insulation capacity of the wiring is sufficient when connected in parallel. See page 30 for insulation capacity and grounding details.

Master-Slave Series Overview

Background

When connecting GPP-1000 power supplies in series, up to 4 units can be used in series and all units must be of the same model. When operated in series, the power supplies can be used to increase the voltage output or setup the power supplies to output both positive and negative polarities. Series operation only requires configuration of the slave, the master unit remains in local mode.



Limitations

Display

Only the master unit will display the voltage and current. The total current is the sum of the units .

OVP/OCP

The master unit can shut down the slave unit when OVP/OCP is tripped on the master unit .

OVP and OCP level is determined by the master OVP and OCP level. The OVP and OCP level on the slave unit is ignored.

Bleeder Control

The Master unit is used to control the bleeder settings. The bleeder resistor is always turned on for the slave unit in series mode.

Output Voltage/ Output Current

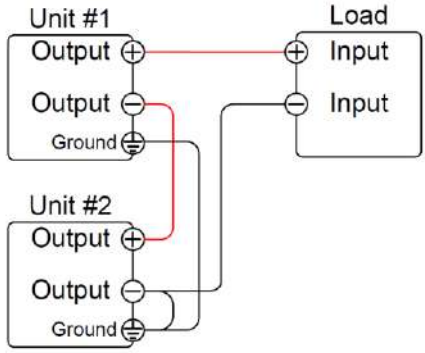
Model	Number of Series units: 1 unit	2 units	3 units	4 units
GPP-1205	20 V / 5 A	40 V / 5 A	60 V / 5 A	80 V / 5 A
GPP-1323	32 V / 3 A	64 V / 3 A	96 V / 3 A	128 V / 3 A

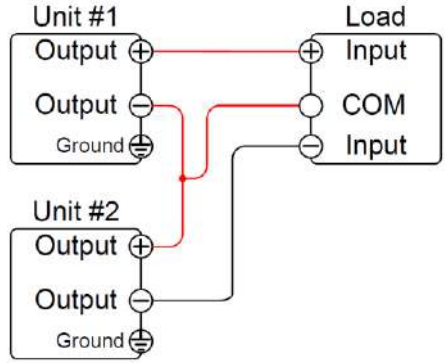
Series Connection

Remote Interface Connection

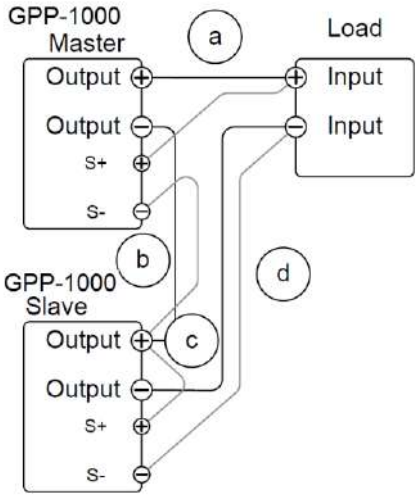
1.Master unit connect the USB cable to the rear panel USB A port. The other end is connected to the USB HUB B port.
2. Slave unit connect the USB cable to the rear panel USB B port. The other end is connected to the USB HUB A port.
3. Set the USB Device Class setting as CDC.
4. The indicator will be shown when a remote connection has been established.

Series Connection to increase Voltage Output



Series Connection to Output Positive and Negative Polarity	 Note: The output reference ground (COMMON) can be grounded at the power supply side instead of the load, depending on the requirements. Local sensing should be used in this configuration.
Caution	When connecting the units in series, diodes should be connected across each output to prevent reverse voltage.

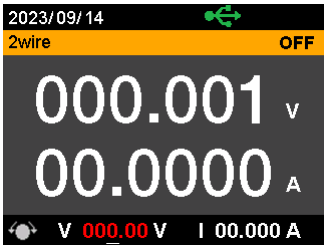
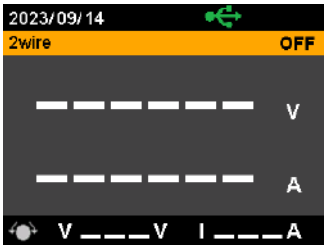
Series Sense Connection	For remote sense connections, connect the sense terminals as shown below: a. Connect the Master S+ terminal to the positive potential of the load. b. Connect the Master S- terminal to the positive output terminal of the slave unit. c. Connect the slave S+ terminal to the positive terminal of the slave unit. d. Connect the slave S- terminal to negative terminal of the load.



Steps	1. Ensure the power is off on both power supplies. 2. Connect the master and slave unit in series as shown above to either increase the voltage output or to create a positive and negative output. Remember that how the units are grounded depends on the configuration of the series connection.
Note	Ensure load cables have sufficient current capacity.

Series Operation

Series Configuration	Before using the power supplies in series, the master and slave units need to be configured.
	1. Configure the OVP and OCP settings for the master unit. 2. Enter the Power ON Configuration settings and set the Tracking configuration for the master and each connected slave. 3. If using voltage sense, disable local sense in the Power ON Configuration settings. 4. Cycle the power on the units (reset the power).
Note	Set Tracking to Local to return the slave units to local (independent) operation.
Master-Slave Operation	Only operate the power supplies in series if the units are configured correctly.

Steps	5. Turn on the master and slave units. Turn on both units. When connected in series, each unit will show the voltage of their own unit. The V Set, A Set, OVP and OCP settings will only be shown on the master unit. Master unit  Slave units  6. Operation of both units is controlled by the master unit. Operation of the master unit is the same as for a single unit. Please see the basic operation chapter for details. 7. Press the Output key to begin. The output key will turn green. 
Caution	Only operate the power supplies in series if using units of the same model number. Only a maximum of 4 units can be used in series.
Caution	Ensure that the insulation capacity of the wiring is sufficient when connected in series. See page 30 for insulation capacity and grounding details.

COMMUNICATION INTERFACE

This chapter describes basic configuration of IEEE488.2 based remote control. For a command list, refer to the programming manual, downloadable from GW Instek website, www.gwinstek.com

Interface Configuration 130
USB CDC Function Check 130
USB TMC Function Check 134
GPIB Remote Interface 137
Configure Ethernet Connection 142

Interface Configuration

USB Remote Interface Configuration

USB Configuration	PC side connector	Type A, host
	GPP-1000 side connector	Rear panel Type B, slave
	Speed	2.0 (full speed)
	USB Class	CDC (communications device class)/TMC
Steps	1. Connect the USB cable to the rear panel USB B port. 2. Set the USB Device Class setting as CDC Page 105 3. The indicator will be shown when a remote connection has been established.	

USB CDC Function Check

Background	To test the USB CDC functionality, National Instruments Measurement and Automation Explorer can be used. This program is available on the NI website, www.ni.com., via a search for the VISA Run-time Engine page, or "downloads" at the following URL, http://www.ni.com/visa/
Requirements	Operating System: Windows 10,11

Functionality check

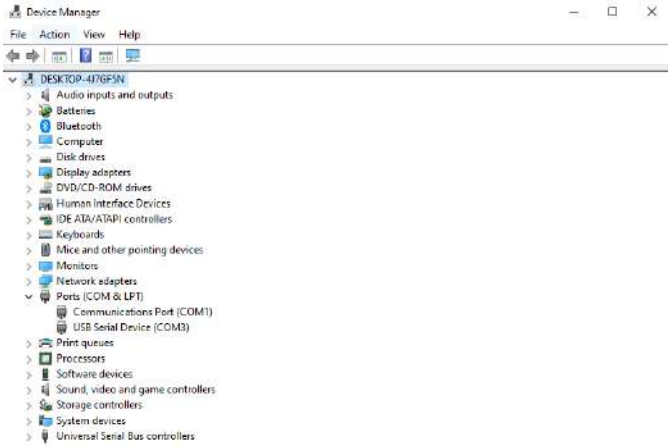
1. In case of Window 10 64 bits, once the USB Cable was connected to PC correctly for a while (around 1 min). It may show below message at the lower right area of display.



2. Then it will automatically grab the device driver and appear" Device is ready".



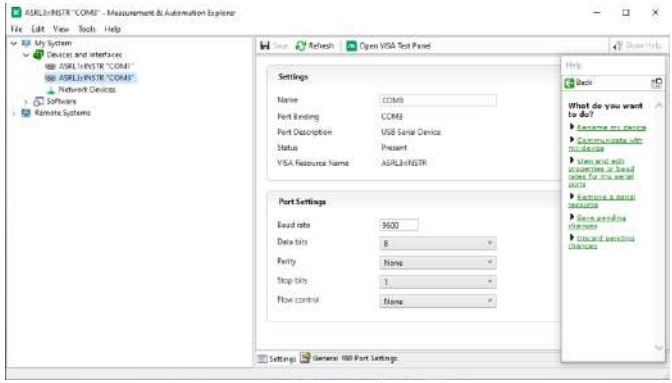
3. Double check the "Device Manager". The port should like below.



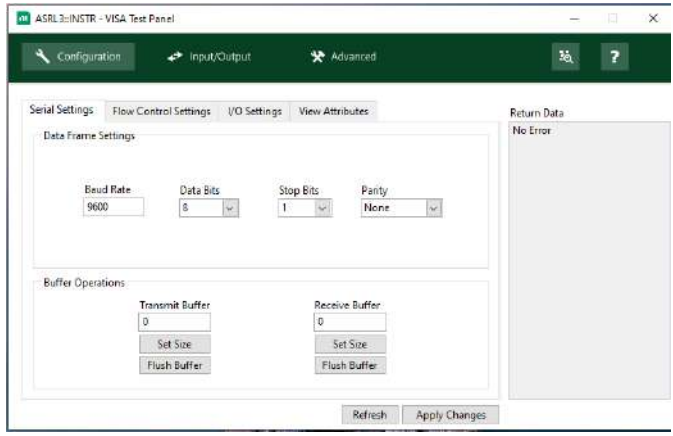
4. Start the NI MAX, Start > NI MAX



5. From the Configuration panel access; My System > Devices and Interfaces > ASRL3::INSTR "COM3" (for this example)

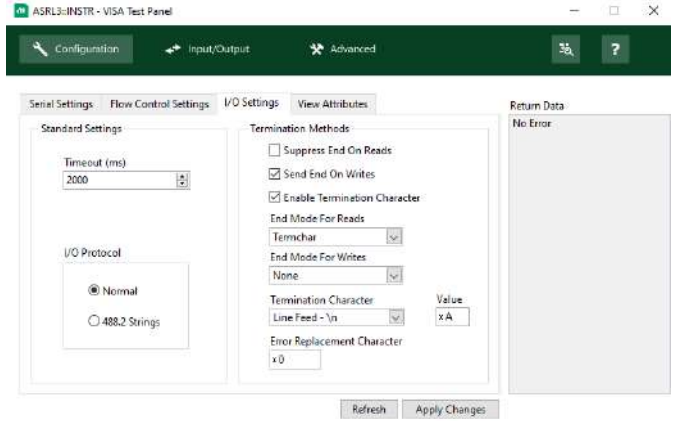


6. Click Open VISA Test Panel
7. Click Configuration, set the "Serial Settings", when the setting is complete, customer needs to press "Apply Changes".



8. Click Configuration > I/O Settings
9. Make sure the Enable Termination Character check box is checked, and the terminal character is \n (Value: xA).

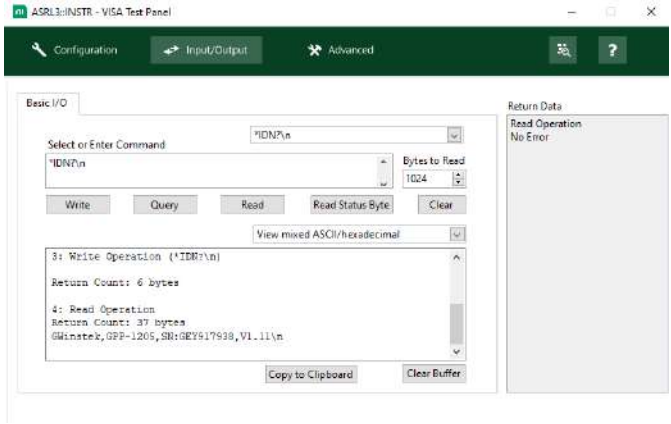
When the setting is complete, press "Apply Changes".



10. Click the Input/Output icon.
11. Enter *IDN? in the Select or Enter Command dialog box if it is not already.
12. Click the Query button.

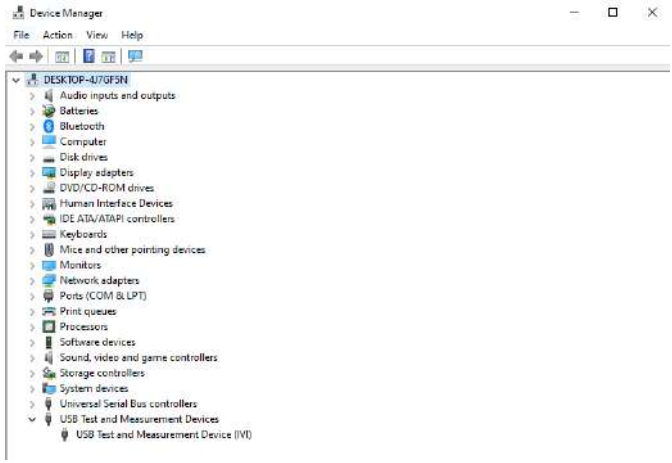
13. The *IDN? query will return the Manufacturer, model name, serial number and firmware version in the dialog box.

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USB TMC Function Check

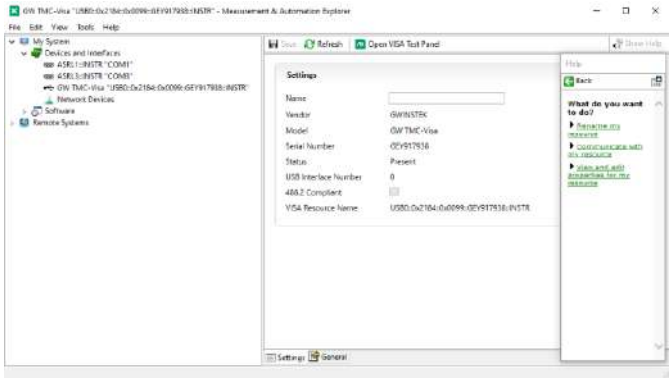
Background	To test the USB TMC functionality, National Instruments Measurement and Automation Explorer can be used. This program is available on the NI website, www.ni.com., via a search for the VISA Run-time Engine page, or "downloads" at the following URL, http://www.ni.com/visa/
Requirements	Operating System: Windows XP, 7, 8,10
Functionality check	1. If it has already been installed NI VISA, Then the driver program will automatically appear.



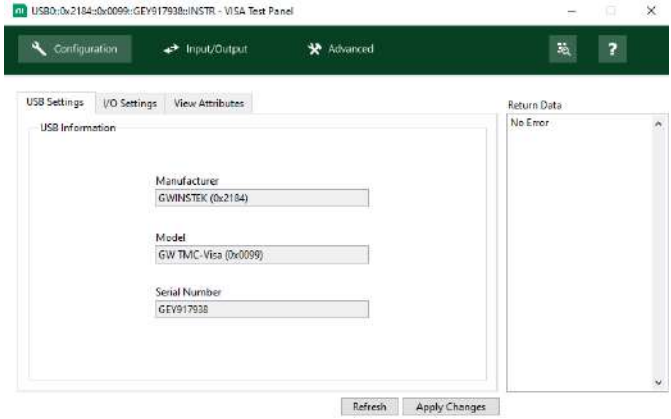
2. Start the NI MAX, Start > NI MAX



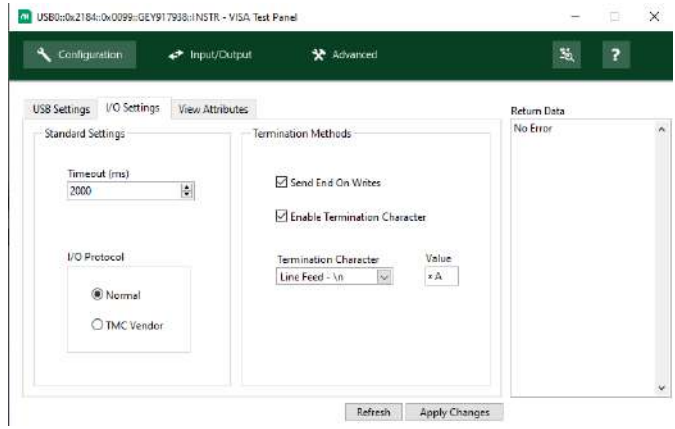
3. From the Configuration panel access; My System > Devices and Interfaces > GW TMC-Visa USB0:0x2184::0x0099::GEY917938::INSTR (for this example)



4. Click Open VISA Test Panel
5. Click Configuration, set the "USB Settings", when the setting is complete, customer needs to press "Apply Changes".

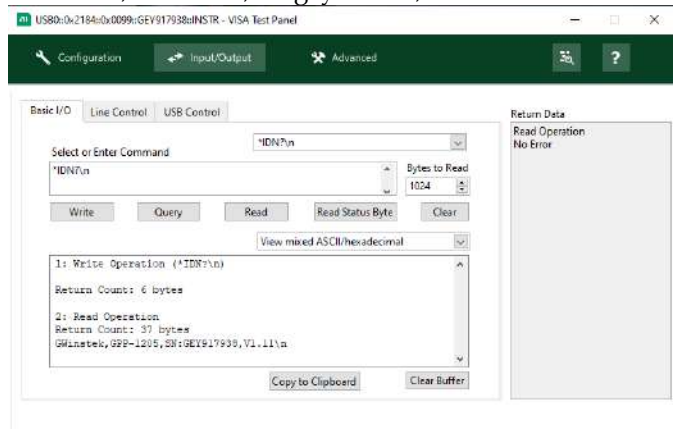


6. Click Configuration > I/O Settings
7. Make sure the Enable Termination Character check box is checked, and the terminal character is \n (Value: xA).
When the setting is complete, press "Apply Changes".



8. Click the Input/Output icon.
9. Enter *IDN? in the Select or Enter Command dialog box if it is not already.
10. Click the Query button.
11. The *IDN? query will return the Manufacturer, model name, serial number and firmware version in the dialog box.

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GPIB Remote Interface

Configuration

To use GPIB, the optional GPIB option (GW Instek part number: Option 1) must be installed. This is a factory installed option and cannot be installed by the end-user. Only one GPIB address can be used at a time.

Configure GPIB	1. Ensure the GPP-1000 is off before proceeding. 2. Connect the GPIB cable (GW Instek part number: GTL-258) from a GPIB controller to the GPIB port on the GPP-1000. 3. Turn the GPP-1000 on. 4. Set the GPIB Address setting per application. Page 104 5. The indicator will be shown when a remote connection has been established.
GPIB constraints	●Maximum 15 devices altogether, 20m cable length, 2m between each device ●Unique address assigned to each device ●At least 2/3 of the devices turned On ●No loop or parallel connection

GPIB Function Check

Background	To test the GPIB functionality, National Instruments Measurement and Automation Explorer can be used. This program is available on the NI website, www.ni.com., via a search for the VISA Run-time Engine page, or "downloads" at the following URL, http://www.ni.com/visa/
Requirements	Operating System: Windows XP, 7, 8, 10

Functionality check

1. Start the NI Measurement and Automation Explorer (MAX) program. Using Windows, press:

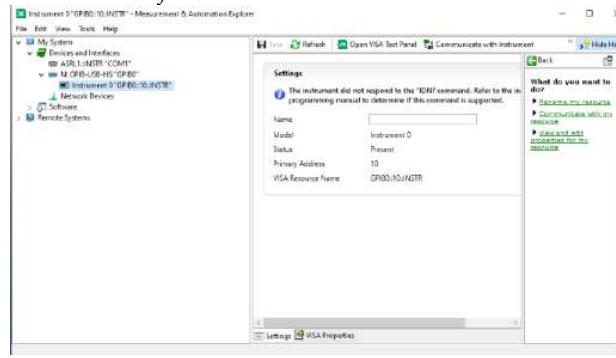
Start>All Programs>National Instruments>Measurement & Automation



2. From the Configuration panel access;

My System>Devices and Interfaces>GPIB

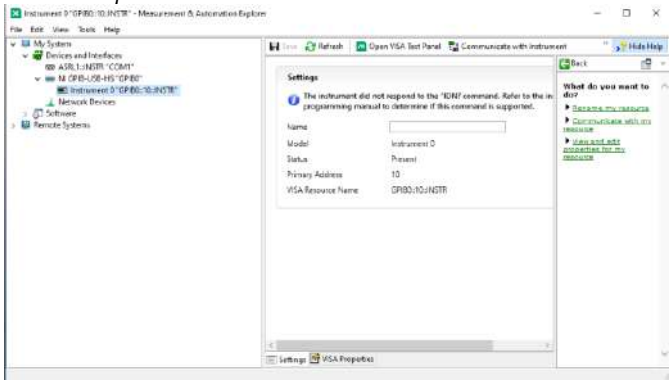
3. Press *Scan for Instruments.*



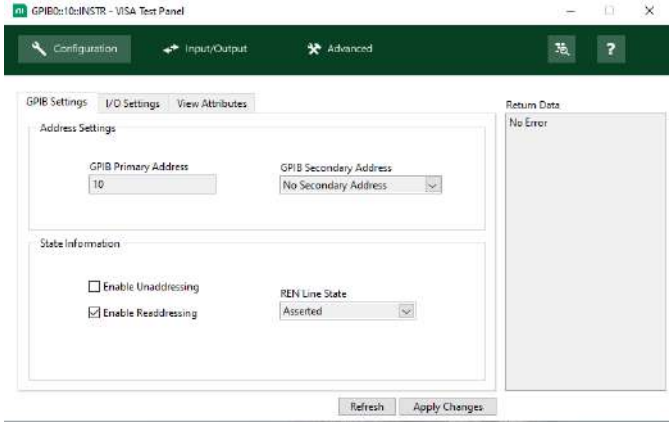
4. Select the device (GPIB address of GPP-1000) that now appears in the *System>Devices and Interfaces* > *GPIB-USB-HS "GPIBX"*node.

5. Click on the *VISA Properties*tab on the bottom.

6. Click *Open Visa Test Panel*.

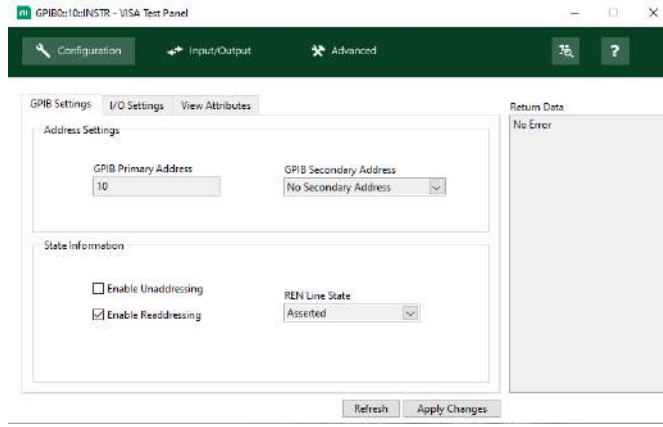


7. Click on *Configuration*.
8. Click on the *GPIB Settings*tab and confirm that the GPIB settings are correct.



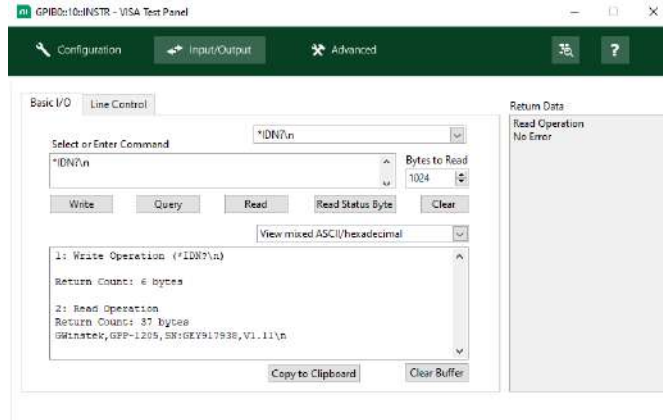
9. Click on the *I/O Settings*tab.
10. Make sure the *Enable Termination Character*check box is checked, and the terminal character is \n (Value: xA).

11. Click *Apply Changes*.



12. Click on *Input/Output*.
13. Click on the *BasicI/O*tab.
14. Enter *IDN? in the *Select or Enter Command* drop down box.
15. Click *Query*.
16. The *IDN? query will return the Manufacturer, model name, serial number and firmware version in the dialog box.

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Note For further details, please see the programming manual, available on the GW Instek web site @ www.gwinstek.com.

Configure Ethernet Connection

The GPP-1000 series supports both DHCP connections so the instrument can be automatically connected to an existing network or alternatively, network settings can be manually configured.

Ethernet configuration	For details on how to configure the Ethernet settings, please see the configuration chapter on page 102.

Parameters	MAC Address (display only)	
	DHCP On/Off	IP Address
	Subnet Mask	Gateway IP

Sockets Server Configuration

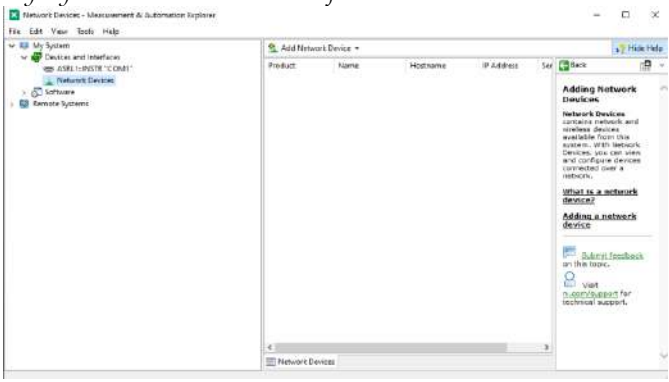
Configuration	This configuration example will configure the GPP-1000 socket server. The following configuration settings will manually assign the GPP-1000 an IP address and enable the socket server. The socket server port number is fixed at 5025. 1. Connect an Ethernet cable from the network to the rear panel Ethernet port. 2. Turn Off DHCP setting followed by setting the relevant settings including IP Address, Subnet Mask, Gateway IP. 3. The indicator will be shown when a remote connection has been established.

Socket Server Function Check

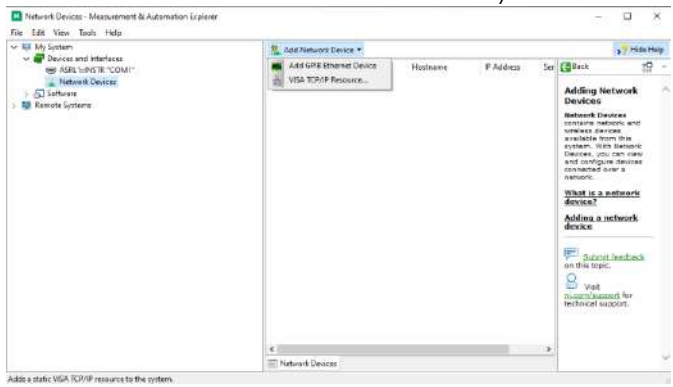
Background	To test the socket server functionality, National Instruments Measurement and Automation Explorer can be used. This program is available on the NI website, www.ni.com., via a search for the VISA Run-time Engine page, or "downloads" at the following URL, http://www.ni.com/visa/
Requirements	Operating System: Windows 10, 11
Functionality check	1. Start the NI Measurement and Automation Explorer (MAX) program. Using Windows, press. *Start>All Programs>National Instruments>Measurement & Automation*



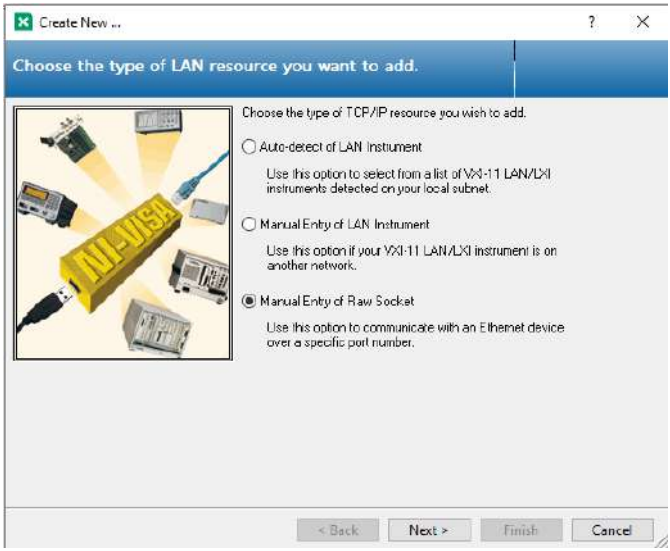
2. From the Configuration panel access;
My System>Devices and Interfaces>Network Devices



3. Press *Add New Network Device>Visa TCP/IP Resource…*

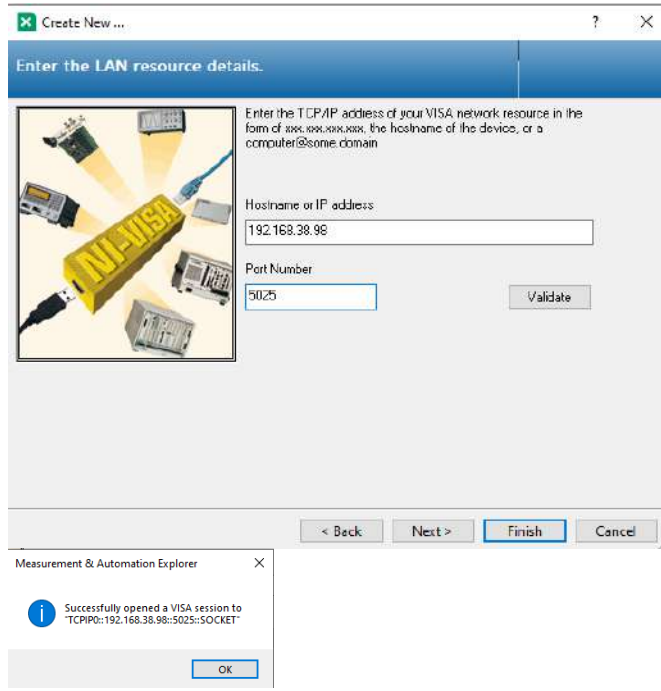


4. Select *Manual Entry of Raw Socket* from the popup window.



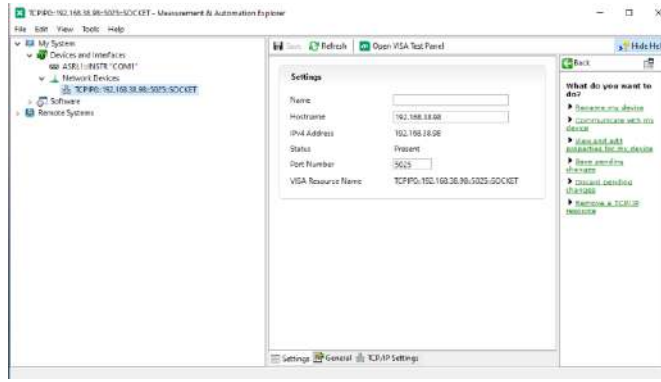
5. Enter the IP address and the port number of the GPP-1000. The port number is default at 5025.
6. Click the Validate button.
7. A popup will appear if a connection is successfully established.

8. Click Next.



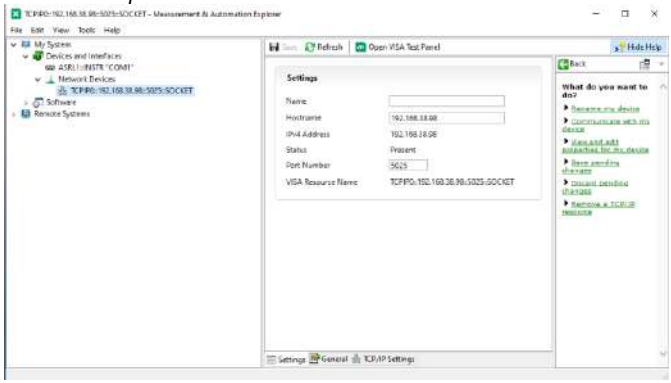
9. Next configure the Alias (name) of the GPP-1000 connection. In this example the Alias is: GPP_DC1

10. Click finish.

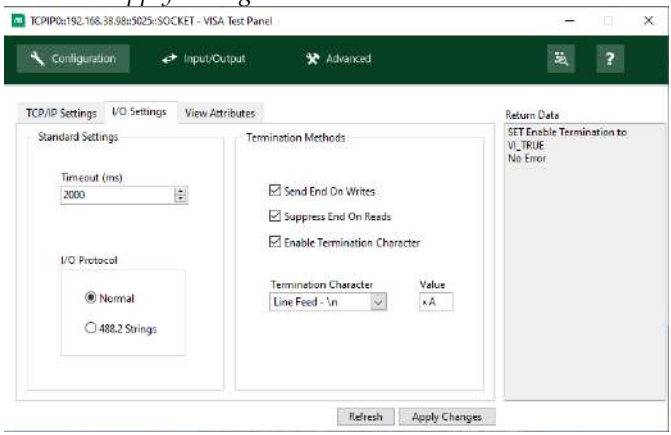


11. The IP address of the GPP-1000 will now appear under Network Devices in the configuration panel. Select this icon now.

12. Click *Open VISA Test Panel*.

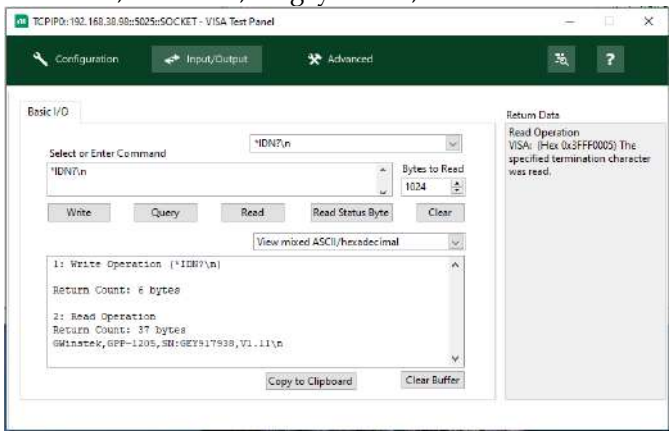


13. Click the *Configuration* icon,
14. Click on *I/O Settings*.
15. Make sure the *Enable Termination Character* check box is checked, and the terminal character is \n (Value: xA).
16. Click *Apply Changes*.



17. Click the *Input/Output* icon.
18. Enter *IDN? in the *Select or Enter Command* dialog box if it is not already.
19. Click the *Query* button.

20. The *IDN? query will return the Manufacturer, model name, serial number and firmware version in the dialog box.
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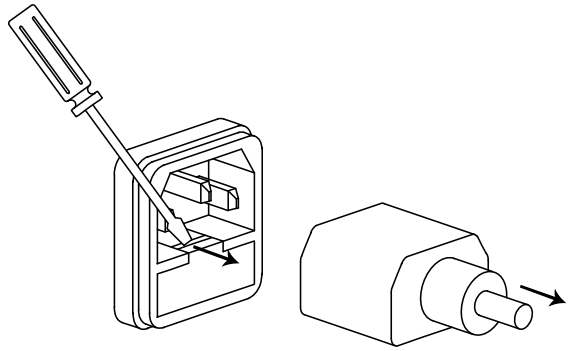


APPENDIX

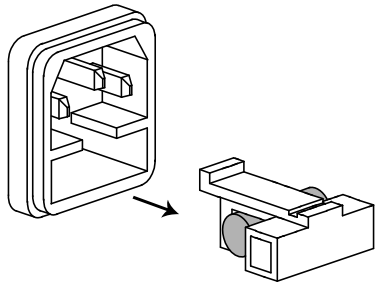
Fuse Replacement

Steps

1. Take off the power cord and remove the fuse socket using a minus driver.



2. Replace the fuse in the holder.



Rating

- 100 V / 120 V : T3.15 A / 250 V
- 220 V / 240 V : T1.6 A / 250 V

GPP-1000 Factory Default Settings

The following default settings are the factory configuration settings for the power supply.

For details on how to return to factory default settings, see page 34.

Initial	Default Setting
Output	Off
LOCK	Disabled
Voltage Set	0.000 V
Current Set	0.0000 A
Output	**Default Setting**
Output On Dly(Delay)	00(hour):00(minute):00.00(sec)
Output Off Dly(Delay)	00(hour):00(minute):00.00(sec)
Remote Sense	2 Wire
V/I Slew Rate	CVHS = CV high speed priority
R_V(Rising Voltage) Slew Rate	0.04 V/ms
F_V(Falling Voltage) Slew Rate	0.04 V/ms
R_C(Rising Current) Slew Rate	0.01 A/ms
F_C(Falling Current) Slew Rate	0.01 A/ms
Measurement	**Default Setting**
Measure Average	Off
Current Range	IH
Mode Control	**Default Setting**
Mode	Source
TRIG(Trigger Control)	**Default Setting**
Trigin Level	High
Trigin Action	None
Trigin Voltage	0.000 V
Trigin Current	0.0000 A

Trigin Memory	M1
Trigout Level	Low
Trigout Source	None
PWR(Power) On Config	Default Setting
Power On Status	Default
Save/Recall	Default Setting
Save Mem(Memory) Set	M1
Recall Mem(Memory) Set	M1
Utility -Buzzer	Default Setting
Protect	On
Keyboard	Off
Utility -Bleeder	Default Setting
Bleeder	On
Protect	Default Setting
Voltage Limit	On
OVP Level	1.1 X Vrate
Current Limit	On
OCP Level	1.1 X Irate
OCP Delay	0.20 s

Specifications

The specifications apply when the GPP-1000 are powered on for at least 30 minutes under +20 °C to +30 °C.

Output Rating	Output voltage	32.000 V(GPP-1323) 20.000 V(GPP-1205)
	Output current	3.0000 A(GPP-1323) 5.0000 A(GPP-1205)
	Output power	96 W(GPP-1323) 100 W(GPP-1205)
Load	Power	96 W(GPP-1323) 100 W(GPP-1205)
	Current	3.0000 A(GPP-1323) 5.0000 A(GPP-1205)
	Setting range(CV)	3.000 V to 32.000 V(GPP-1323) 3.000 V to 20.000 V(GPP-1205)
	Setting/Readback accuracy(CV)	≤ 0.1 % + 30 mV
	Resolution(CV)	1 mV
	Setting range(CC)	0 A to 3.0000 A(GPP-1323) 0 A to 5.0000 A(GPP-1205)
	Setting/Readback accuracy(CC)	≤ ±0.3 % + 10 mA
	Resolution(CC)	0.1 mA
Voltage	Line regulation	±（0.01 % of setting + 3 mV)
	Load regulation	≤ 0.01 % + 3 mV (rating current ≤ 3 A) ≤ 0.02 % + 5 mV (rating current > 3 A)
	Transient response	< 100 us
	Ripple noise	0.8 mVrms

	Setting range	33.6 V(GPP-1323) 21 V(GPP-1205)
	Rise time	⩽ 100 ms
	Fall time	⩽ 100 ms
	Maximum remote sensing compensation voltage (single line)	0.5 V
	Temperature Coefficient (TYP.)	300 ppm/℃
Current	Line regulation	⩽ 0.1 % + 3 mA
	Load regulation	⩽ 0.1 % + 3 mA
	Setting range	3.15 A(GPP-1323) 5.25 A(GPP-1205)
	Ripple noise (Arms)	⩽ 2 mArms
	Temperature Coefficient (TYP.)	300 ppm/℃
Resolution	Voltage	programming 1 mV,readback 0.1 mV
	Current	programming 0.1 mA,readback 0.01 mA (H) programming 10 uA,readback 1 uA (M) programming 1 uA,readback 0.1 uA (L)
Accuracy	Setting accuracy	Voltage: ± (0.03 % of reading + 10 mV) Current: ± (0.3 % of reading + 10 mA) (H) Current: ± (0.3 % of reading + 1 mA) (M) Current: ± (0.3 % of reading + 0.1 mA) (L)
	Readback accuracy	Voltage: ± (0.03 % of reading + 10 mV) Current: ± (0.3 % of reading + 10 mA) (H) Current: ± (0.3 % of reading + 1 mA) (M) Current: ± (0.3 % of reading + 0.1 mA) (L)
OVP	Setting range	1.8 V - 35.2 V(GPP-1323) 1.0 V - 22.0 V(GPP-1205)

	Setting Accuracy	±100 mV
	Operation	Turns the output off, displays OVP
OCP	Setting range	0.15 A - 3.3 A(GPP-1323) 0.25 A - 5.5 A(GPP-1205)
	Setting Accuracy	±20 mA
	Operation	Turns the output off, displays OCP
OTP	Operation	Turns the output off, displays OTP
Trigger Signal*1	Trigger Input	A high or low level CMOS signal is applied for 100 us or longer. It receives a pulse to perform actions like power output, V/I set operation or memory recall.
	Trigger Output	Trigger output: approx. 3.3 V Pulse width: approx. 1ms, Output impedance: approx. 50 Ω It outputs a pulse when power output, V/I set operation or memory recall is executed.
Status Signal Out*1*2	OUT ON/OFF STATUS	Turns on when the output is on
	CV STATUS	Turns on during CV operation
	CC STATUS	Turns on during CC operation
	ALM STATUS	Turns on when an alarm has been activated
	PWR ON STATUS	Turns on when the power is turned on
Interface Capabilities	LAN	MAC Address, Gateway IP Address, Instrument IP Address, Subnet Mask
	USB	Type A: Host, Type B: Slave, Speed: 1.1/2.0, USB-CDC/TMC
	GPIB (Factory Optional)	SCPI-1993, IEEE 488.2 compliant interface
Series and Parallel Capability	Parallel number	4 units
	Series number	4 units

Input Characteristics	Nominal input voltage	100 Vac / 120 Vac / 220 Vac / 240 Vac(±10 %)
	Input frequency range	50 Hz / 60 Hz
	Max. Inrush current	30 A max or less
	Max. power consumption	300 VA
General Specifications	Operating environment	Indoor use, Overvoltage Category II
	Altitude	Maximum 2000 m
	Operating temperature	0 ℃ - 40 ℃
	Storage temperature	-20 ℃ to 70 ℃
	Operating humidity	20 % to 80 % RH;No condensation
	Storage humidity	20 % to 85 % RH;No condensation
	Dimensions	107 mm x 124 mm x 313 mm (W x H x D) (not including protrusions)
	Weight	Approx.5.5 kg
Insulation resistance	Between chassis and terminal	20 MΩ or above (DC 500 V)
	Between chassis and AC power cord	30 MΩ or above (DC 500 V)

*1. EXT I/O connector on the rear panel.

*2. Open collector output: Maximum voltage of 30 V and maximum current of 8 mA. The common line for the status pins is floating (isolated voltage of 60 V or less), it is isolated from the output and control circuits.

Declaration of Conformity

We
GOOD WILL INSTRUMENT CO., LTD.
declare that the CE marking mentioned product
satisfies all the technical relations application to the product within the scope of council:
Directive: EMC; LVD; WEEE; RoHS
The product is in conformity with the following standards or other normative documents:

◎ **EMC**

EN 61326-1 :	Electrical equipment for measurement, control and laboratory use — EMC requirements
Conducted & Radiated Emission EN 55011 / EN 55032	Electrical Fast Transients EN 61000-4-4
Current Harmonics EN 61000-3-2 / EN 61000-3-12	Surge Immunity EN 61000-4-5
Voltage Fluctuations EN 61000-3-3 / EN 61000-3-11	Conducted Susceptibility EN 61000-4-6
Electrostatic Discharge EN 61000-4-2	Power Frequency Magnetic Field EN 61000-4-8
Radiated Immunity EN 61000-4-3	Voltage Dip/ Interruption EN 61000-4-11 / EN 61000-4-34

◎**Safety**

EN 61010-1 :	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements

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