Programmable DC Power Supply

GPP-1000 Series

Programming Manual
GW INSTEK PART NO.

ISO-9001 CERTIFIED MANUFACTURER

GW INSTEK

The information in this manual was correct at the time of printing. However, Good Will continues to improve its products and therefore reserves the right to change the specifications, equipment, and maintenance procedures at any time without notice.

Good Will Instrument Co., Ltd.
No. 7-1, Jhongsing Rd., Tucheng Dist., New Taipei City 236, Taiwan.

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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 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

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

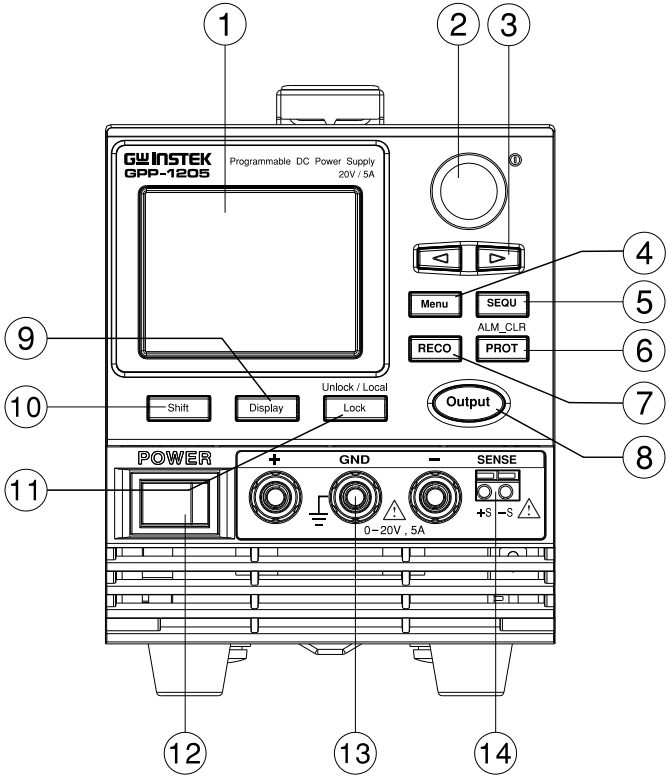
Main Features

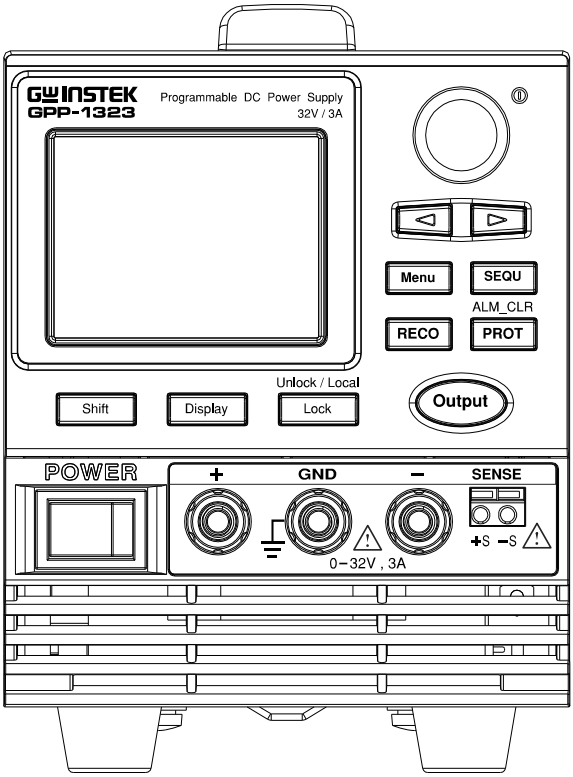
Features	• 2.4-inch TFT-LCD Panel. • Low noise: Temperature controlled cooling fan. • Remote sensing to compensate for voltage drop in load leads . • Output On/Off delay function. • CV, CC priority start function. (prevents overshoot with output ON) • Adjustable voltage and current slew rates. • Bleeder 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

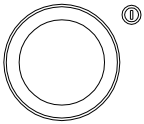
GPP-1205

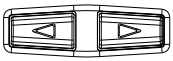
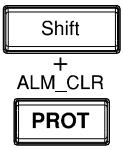
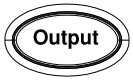




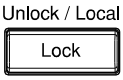
1. Display area — The display area shows set values, output values and parameter settings.

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.
5.	SEQU Button		Used to run customized test sequence.
6.	PROT Button		Used to set OVP, OCP protecting functions.
	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.
7.	RECO Button		Used to run recorder function.
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

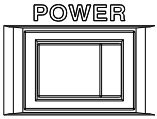


Used to lock all front panel buttons other than the Output Button.

Unlock/Local Button

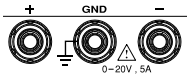
(+Shift) Used to unlock the front panel buttons or it switches to local mode.

12. Power Switch

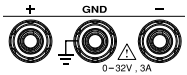


Used to turn the power on/off.

13. Output terminal

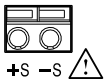


DC output terminal for GPP-1000 .
GPP-1205 the max. output is 20 V/5 A/100 W



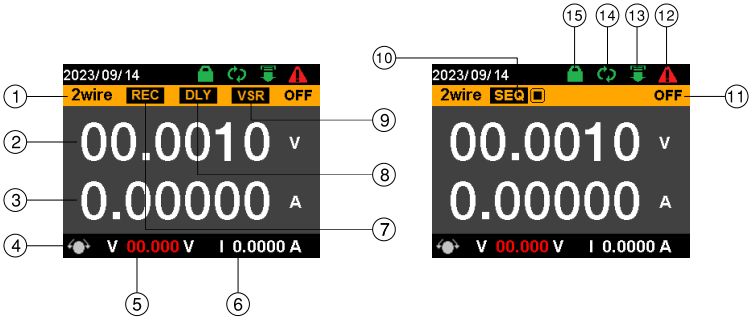
DC output terminal for GPP-1000.
GPP-1323 the max. output is 32 V/3 A/96 W

14. Sensing Terminal



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

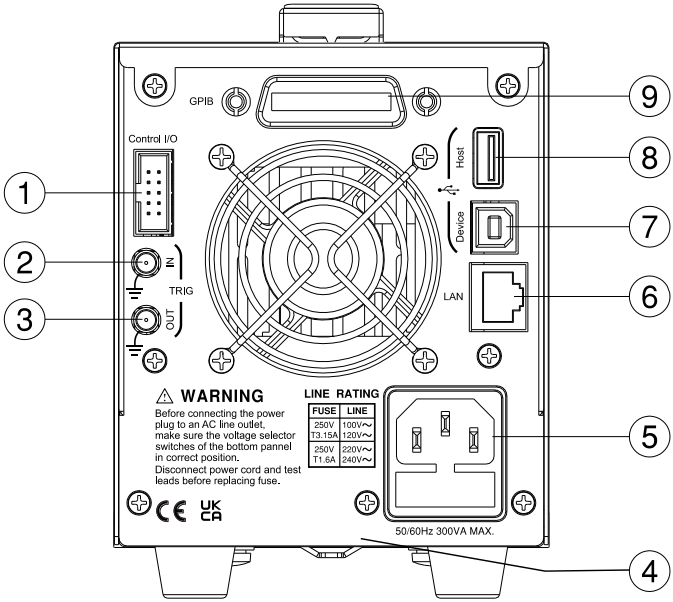
Display Area



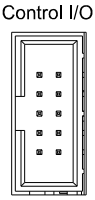
1.	2Wire/4Wire	2-wire or 4-wire indicator.
2.	Voltage Meter	Displays the voltage.
3.	Current Meter	Displays the current.
4.	V/A Set Guidance	The scrolling symbol indicates to select between V and A set via scrolling knob key.
5.	V Set	Manually sets voltage.
6.	I(A) Set	Manually sets current.
7.	REC Icon	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 (Dly) 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.

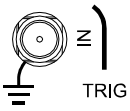
Rear Panel Overview



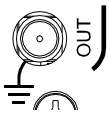
1. Control I/O — External Operation and Status Monitoring



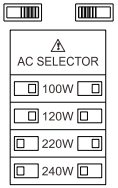
2. Trigger-IN — External Trigger Signal Input Terminal



3. Trigger-OUT — Trigger Signal Output Terminal

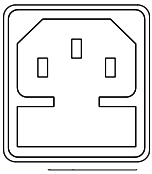


4. AC Select Switch



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

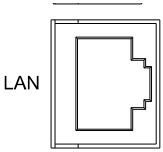
5. Power Cord / Fuse Socket



The power cord socket accepts the AC mains.

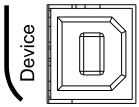
The fuse holder contains the AC mains fuse.

6 LAN



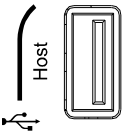
Ethernet port for controlling the GPP-1000 remotely

7. USB



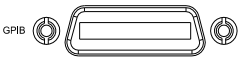
USB port for controlling the GPP-1000 remotely.

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

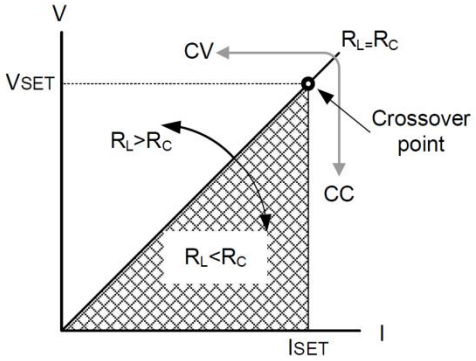
When the power supply is operating in constant current mode (CC) a constant current will be supplied to the load. When in constant current mode the voltage output can vary, whilst the current remains constant. When the load resistance increases to the point where the set current limit (ISET) can no longer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

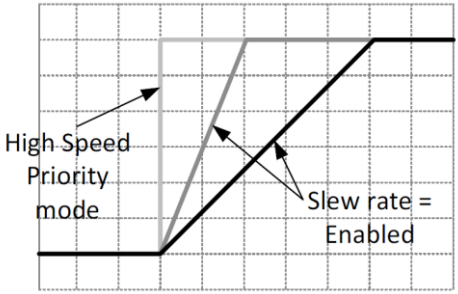
Diagram



Slew Rate

Theory

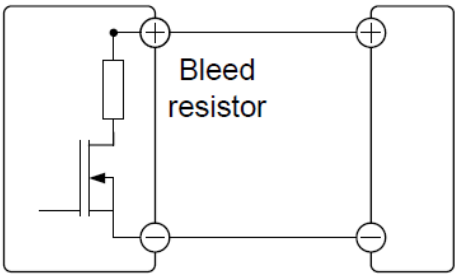
The GPP-1000 has selectable slew rates for CC and CV mode. This gives the GPP-1000 power supply the ability to limit the current/voltage draw of the power supply. Slew rate settings are divided into High Speed Priority and Slew Rate Priority. High speed priority mode will use the fastest slew rate for 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.

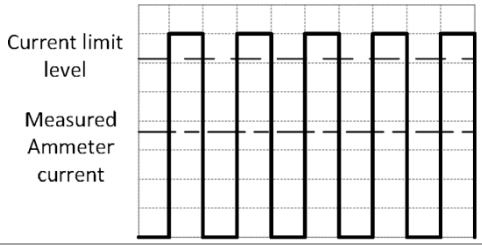
Alarms

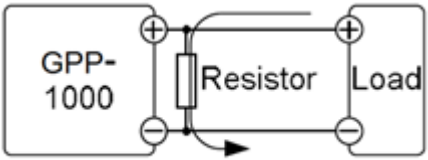
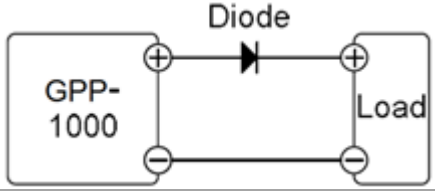
The GPP-1000 power supplies have a number of protection features. When one of the protection alarms are tripped, an alarm message will appear on the display. When an alarm has been tripped the output will be automatically turned off.

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 is a hardware protection function.

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. 

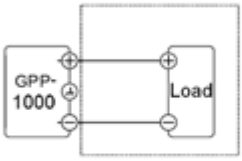
Reverse Current: Regenerative load	When the power supply is connected to a regenerative load such as a transformer or inverter, reverse current will feed back to the power supply. The GPP-1000 power supply cannot absorb reverse current. For loads that create reverse current, connect a resistor in parallel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

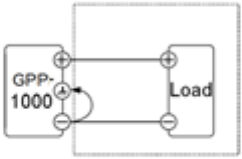
Floating	As the output terminals are floating, the load and all load cables must have an insulation capacity that is greater than the isolation voltage of the power supply.



(——) Insulation capacity > isolation voltage of 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.



(——) Insulation capacity > voltage of power supply with respect to ground

REMOTE INTERFACE

Establishing a Remote Connection

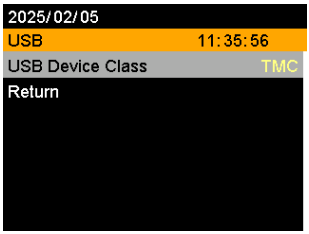
GPP-1000 has 3 remote communication interfaces which are USB, GPIB and LAN. These three communication modes can be used simultaneously.

Configure USB interface

Description	Communication via USB interface, using USB Device TMC mode.
Interface	Connect the USB cable to the rear panel USB B (slave) port. 

Connection and operation

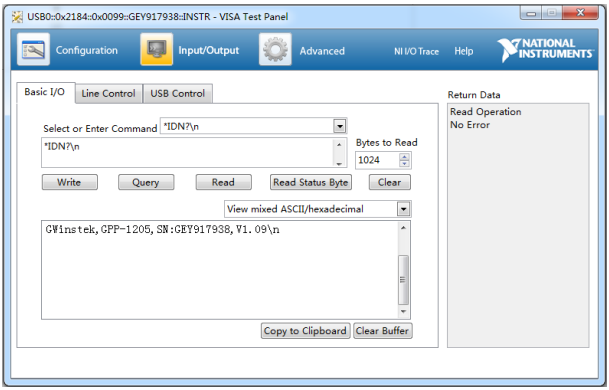
1. Use the USB cable to connect the **USB Device Interface** on the rear panel of the DC power supply to the USB interface of the PC.
2. Press the Menu key followed by Interface and USB. Press USB Devive Class.



3. To use USB communication, you need to use the "NI Visa" software of NI (National Instruments Corporation);
4. After connecting to the host computer through the USB slave interface on the rear panel, open the "NI Visa" software, as shown in the figure above, select View -> Refresh in the menu bar of Measurement & Automation Explorer, when the connection is successful, click on the drop-down arrow of "Devices and Interfaces" in “My System” menu , the serial number of GPP-1000 and the USB Interface number will be displayed on the right side of the page.

Function Measurement

Click the "Open VISA Test Panel" key on the page to pop up the VISA Test Panel, click the Input/Output key in the VISA Test Panel, in the Select or Enter Command box, you can execute all statements including query, setting, measurement, reading and etc. When requiring to query, enter the corresponding query Command and then click the "Query" key to run the Command. Enter the corresponding Command when requiring to operate setting and measurement action and then click the "Write" key. Enter the corresponding Command when requiring to operate reading action and then click the "Read" key. Refer to Command List.



Enter the query Command “*IDN?” as shown above, and the instrument identification information such as manufacturer, model, serial number and software version will be returned. The message "Read Operation No Error" is displayed in the Return Data window.

Exit remote control mode

.Send System:Loacl Command from PC.

.Press the Shift+Unlock/Local keys on the front panel.

NOTE：USB is a hot-swap device, which can be disconnected or connected at any time.

Configure GPIB interface

Description

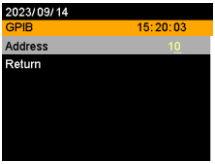
The communication data format, compatibility settings and GPIB address must all be configured before using GPIB remote control.

Interface

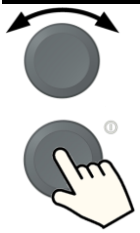
Rear panel GPIB port.

Connection and operation

1. Connect the GPIB cable to the rear panel GPIB port.
2. Press the Menu key followed by Interface and GPIB. Press Address.



3. Use knob key to scroll and click to configure Address setting.



Exit remote control mode

.Send System:Local Command from PC

.Press the Shift+Unlock/Local keys on the front panel.

WARNING：LAN is a hot-swap device, which can be disconnected or connected at any time.

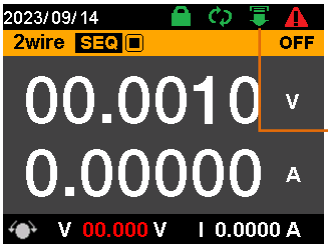
Configure LAN interface

Description

When using the LAN port, the relevant parameters are supposed to be set earlier.

Connection

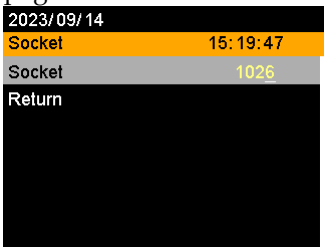
Select LAN port in the Interface after connecting the LAN cable. The indicator will be shown when the first command connects succesfully.



The front panel keys are automatically locked when the connection is successful.

Set port

A. A. Press the Menu key to enter the Menu page.
B. Scroll the knob key to move to the Interface field followed by clicking the knob key to enter the Interface page.
C. Scroll knob key to move to Socket field followed by click knob key to enter the Socket page.

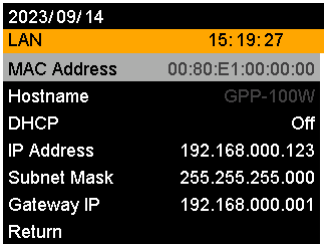


IP Mode

The IP address can be obtained by using either DHCP or Manual IP.

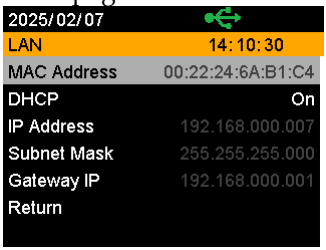
Manual IP

A. Press the Menu key to enter the Menu page.
B. Scroll the knob key to move to the Interface field followed by clicking the knob key to enter the Interface page.
C. Scroll the knob key to move to the LAN field followed by clicking the knob key to enter the LAN page. Turns DHCP off.
D. F.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
E. Sets the subnet mask. The subnet mask is split into four parts.
0 to 255, 0 to 255, 0 to 255, 0 to 255
F. Sets the gateway address. The gateway address is split into 4 parts.
0 to 255, 0 to 255, 0 to 255, 0 to 255



DHCP

A. Press the Menu key to enter the Menu page.
B. Scroll the knob key to move to the Interface field followed by clicking the knob key to enter the Interface page.
C. Scroll the knob key to move to the LAN field followed by clicking the knob key to enter the LAN page. Turns DHCP on.



Exit remote control mode

.Send System:Local Command from PC

WARNING: LAN is a hot-swap device, which can be disconnected or connected at any time.

Command Syntax

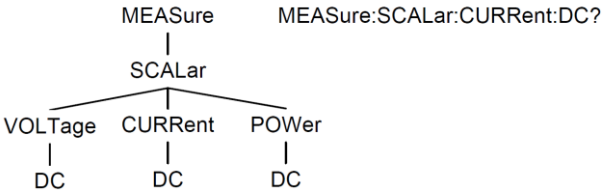
Compatible standard

IEEE488.2	Partial compatibility
SCPI, 1999	Partial compatibility

Command Structure

SCPI commands follow a tree-like structure, organized into nodes. Each level of the command tree is a node. Each keyword in a SCPI command represents each node in the command tree. Each keyword (node) of a SCPI command is separated by a colon (:).

For example, the diagram below shows an SCPI sub-structure and a command example.



Command types

There are a number of different instrument commands and queries. A command sends instructions or data to the unit and a query receives data or status information from the unit.

Command types

Simple	A single command with/without a parameter
Example	*IDN?

	Compound	Two or more commands on the same command line. Compound commands are separated with either a semi-colon (;) or a semi-colon and a colon (;:). A semi-colon is used to join two related commands, with the caveat that the last command must begin at the last node of the first command. A semi-colon and colon are used to combine two commands from different nodes.
	Example	meas:volt:dc?;:meas:curr:dc?
	Query	A query is a simple or compound command followed by a question mark (?). A parameter (data) is returned.
	Example	meas:curr:dc?

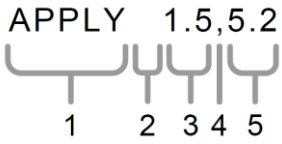
Command forms

Commands and queries have two different forms, long and short. The command syntax is written with the short form of the command in capitals and the remainder (long form) in lower case.

The commands can be written in capitals or lower-case, just so long as the short or long forms are complete. An incomplete command will not be recognized.

Below are examples of correctly written commands:

Long form	SENSe:RECOrder:STATe?
	SENSE:RECORDER:STATE?
	sense:recorder:state?

	Short form	SENS:RECO:STAT? sens:reco:stat?
Command Format		1. Command header 2. Space 3. Parameter 1 4. Comma (no space before/after comma) 5. Parameter 2
Square Brackets []	Commands that contain square brackets indicate that the contents are optional. The function of the command is the same with or without the square bracketed items, as shown below. Both "OUTPut[:STATe]?" and "OUTPut?" are both valid forms.	
Braces {}	Commands that contain braces indicate one item within the braces must be chosen. Braces are not sent with the command.	
Angled Brackets <>	Angle brackets are used to indicate that a value must be specified for the parameter. See the parameter description below for details. Angled brackets are not sent with the command.	
Bars |	Bars are used to separate multiple parameter choices in the command format.	

Parameters	Type	Description	Example
	<Boolean>	Boolean logic	0, 1/ON, OFF
	<NR1>	integers	0, 1, 2, 3
	<NR2>	decimal numbers	0.1, 3.14, 8.5
	<NR3>	floating point	4.5e-1, 8.25e+1
	<NRf>	any of NR1, 2, 3	1, 1.5, 4.5e-1

	<NRf+> <Numeric>	NRf type with a suffix including MINimum, MAXimum or DEFault parameters.	1, 1.5, 4.5e-1 MAX, MIN,
	<aard>	Arbitrary ASCII characters.	
Message terminators	LF CR	line feed code (new line) and carriage return.	
	LF	line feed code (new line)	
	EOI	IEEE-488 *EOI* (End-Or-Identify)	

Command List

Common Commands

*IDN?

Query

Description	Returns the power supply manufacturer, model name, serial number and firmware version number in the following format: Manufacturer, Model,SN:XXXXXXXX,Vm.mm
Query Syntax	***IDN?**
Return parameter	<string>
Example	***IDN?** Manufacturer, Model,SN:XXXXXXXX,Vm.mm Returns the identification of the power supply.

*RST

Set →

Description	Reset the power supply to its factory default state.
Note	Note the *RST command will not delete instrument save states in memory.
Syntax	***RST**

*TST?

→ Query

Description	Performs a system self-test and returns a pass or fail judgment. An error message will be generated if the self test fails.	
Note	The error message can be read with the SYST:ERR? query.	
Query Syntax	***TST?**	
Return parameter	0	Pass judgment
	1	Fail judgment
Example	***TST?**	
	0	
	The power supply passed the self-test.	

*OPC

Set →

Description	This command sets the Operation Complete Bit (bit 0) of the Standard Event Status Register after the power supply has completed all pending operations. For the GPP-1000, the *OPC command is used to indicate when a sequence has completed.
Note	Before the OPC bit is set, other commands may be executed.
Syntax	***OPC**

*OPC?

Query

Description	Returns the OPC bit to the output buffer when all pending operations have completed. I.e. when the OPC bit is set.
Note	Commands cannot be executed until the *OPC? query has completed.
Query Syntax	***OPC?**
Return parameter	1
Example	***OPC?** **1** Returns a "1" when all pending operations are complete.

*TRG

Set

Description	Generate a trigger event for power supply.
Note	Before the OPC bit is set, other commands may be executed.
Syntax	***TRG**

*CLS

Set

Description	The *CLS command clears all the event registers, the error queue and cancels an *OPC command.
Syntax	***CLS**

*ESE

Set

Query

Description	The Standard Event Status Enable command determines which events in the Standard Event Status Event register can set the Event Summary Bit (ESB) of the Status Byte register. Any bit positions set to 1 enable the corresponding event. Any enabled events set bit 5 (ESB) of the Status Byte register.	
Note	The *CLS command clears the event register, but not the enable register.	
Syntax	***ESE <enable value>**	
Parameter	<enable value>	0 to 255
Example	***ESE 20** Sets a bit weight of 20 (bits 2 and 4).	
Query Syntax	***ESE?**	
Return Parameter	<NR1>	Returns the bit sum of the Standard Event Status Enable register.
Example	***ESE?** 4 Bit 2 is set.	

*ESR? → Query

Description	Reads and clears the Standard Event Status Register. The bit weight of the standard event status register is returned.	
Note	The *CLS will also clear the standard event status register.	
Query Syntax	***ESR?**	
Return Parameter	<NR1>	Returns the bit sum of the Standard Event Status (Event) register and clears the register.
Query Example	***ESR?** 5	

Returns the bit weight of the standard event status register (bit 0 and 2).

*STB?

Query

Description	Reads the Status byte condition register.
Note	Bit 6, the master summary bit, is not cleared.
Syntax	***STB?**

*SRE

Set

Query

Description	The Service Request Enable Command determines which events in the Status Byte Register are allowed to set the MSS (Master summary bit). Any bit that is set to "1" can cause the MSS bit to be set.
Note	The *CLS command clears the status byte event register, but not the enable register.
Syntax	***SRE <enable value>**
Parameter	<enable value> 0 to 255
Example	***SRE 12** Sets a bit weight of 12 (bits 2 and 3) for the service request enable register.
Query Syntax	***SRE?**
Return Parameter	<NR1> Returns the bit sum of the Service Request Enable register.
Query Example	***SRE? 12** Returns the bit weight of the status byte enable register.

*SAV

Set

Description	Saves the settings into memory slot M1 to M5.
Syntax	***SAV <NR1>**

parameter	<NR1>	1 to 5 (as memory M1 to M5)

*RCL

Set →

Description	Recalls the contents stored in memory slot M1 to M5.
Syntax	***RCL <NR1>**

parameter	<NR1>	1 to 5 (as memory M1 to M5)	1 ~ 5 (as m

Measure Commands

:MEASure:ALL

Query

Description	Takes a measurement and returns the average output current and voltage.
Syntax	**:MEASure:ALL?**
Example	**:MEASure:ALL?** 0.0000,0.00000,0.000 00 <voltage>, <current>, <pow er> Returns the voltage (V), current (A), power (W) respectively.

:MEASure:CURRent

Query

Description	Takes a measurement and returns the average output current.
Syntax	**:MEASure:CURRent?**
Example	**:MEASure:CURRent?** 0.0000 Returns the current in amps.

:MEASure:VOLTage

Query

Description	Takes a measurement and returns the average output voltage.
Syntax	**:MEASure:VOLTage?**
Example	**:MEASure:VOLTage?** 0.0000 Returns the voltage in volts.

:MEASure:POWer

Query

Description	Takes a measurement and returns the average output power.
Syntax	**:MEASure:POWer?**
Example	**:MEASure:POWer?** 0.0000 Returns the power measured in watts.

:MEASure:CURRent:RANGe

Set / Query

Description	Sets or queries the current measurement range.
Syntax	**:MEASure:CURRent:RANGe {<NR1>|IH|IM|IL}**
Query Syntax	**:MEASure:CURRent:RANGe?**
Parameter	IH|1 Current measurement IH range. IM|2 Current measurement IM range. IL |3 Current measurement IL range.
Return parameter	<NR1> Returns the current measurement range.

Output Commands

:OUTPut:DELay:ON

Set / Query

Description	Sets the Delay Time in seconds for turning the output on. The delay is set to 0.00 by default.
Syntax	**:OUTPut:DELay:ON {<NR2>|MINimum|MAXimum}**
Query Syntax	**:OUTPut:DELay:ON?**

Parameter	<NR2>	0.00 to 359999.99 seconds, where 0 = no delay.
Return parameter	"0.00"	Returns the delay on time in seconds until the output is turned on.

:OUTPut:DELay:OFF

Set →
→ Query

Description	Sets the Delay Time in seconds for turning the output off. The delay is set to 0.00 by default.
Syntax	**:OUTPut:DELay:OFF {<NR2> |MINimum|MAXimum}**
Query Syntax	**:OUTPut:DELay:OFF?**

Parameter	<NR2>	0.00 to 359999.99 seconds, where 0 = no delay.
Return parameter	"0.00"	Returns the delay on time in seconds until the output is turned off.

:OUTPut:MODE

Set →
→ Query

Description	Sets the GPP-1000 output mode. This is the equivalent to the Output menu (V-I Slew Rate Select) settings.
Syntax	**:OUTPut:MODE {<NR1>|CVHS|CCHS|CVLS|CCLS}**
Query Syntax	**:OUTPut:MODE?**

Parameter	CVHS | 0	CV high speed priority
	CCHS | 1	CC high speed priority
	CVLS | 2	CV slew rate priority
	CCLS | 3	CC slew rate priority
Return parameter	<NR1>	Returns the output mode.

:OUTPut[:STATe]

Set →
→ Query

Description	Turns the output on or off.
Syntax	**:OUTPut[:STATe] { <bool> | OFF | ON }**
Query Syntax	**:OUTPut[:STATe]?**

Parameter	OFF | 0	Turns the output off.
	ON | 1	Turns the output on.

Return parameter	<NR1>	Returns output status of the instrument.

:OUTPut:PROTection:CLEar

Set →

Description	Clears over-voltage, over-current and over-temperature (OVP, OCP, OTP) protection circuits.
Syntax	**:OUTPut:PROTection:CLEar**

:OUTPut:PROTection:TRIPped

→ Query

Description	Queries the unit to see if a protection circuit has been tripped.	
Syntax	**:OUTPut:PROTection:TRIPped?**	
Return	<boolean>	0 = No protection error 1 = A protection error had occured

Sense Commands

:SENSe:AVERage:COUNt

Set →
→ Query

Description	Sets or queries the level of smoothing for the average setting.	
Syntax	**:SENSe:AVERage:COUNt {<NR1>|LOW|MIDDle|HIGH}**	
Query Syntax	**:SENSe:AVERage:COUNt**	
Parameter	OFF | 0	Default setting
	LOW | 1	Low setting
	MIDDle | 2	Middle setting
	HIGH | 3	High setting
Return parameter	<NR1>	Returns the average setting.

:SENSe:RECOrder:STATe

Set →
→ Query

Description	Enables or disables the recorder setting.	
Syntax	**:SENSe:RECOrder:STATe {<NR1>}**	
Query Syntax	**:SENSe:RECOrder:STATe?**	
Parameter	0	Disable recorder.
	1	Enable recorder.The data is stored in the USB storage when USB storage plug in.
	2	Enable recorder, The data is sent to the USB device interface when the remote control read data.
	3	Enable recorder, The data is sent to the LAN interface when the remote control read data.
Return parameter	<NR1>	Returns the recorder setting.

:SENSe:RECOrder:PERiod

Set → / → Query

Description	Sets the sample period in seconds for recorder.	
Syntax	**:SENSe:Recorder:PERiod {<NR2>|MINimum|MAXimum}**	
Query Syntax	**:SENSe:RECOrder:PERiod?**	
Parameter	<NR2>	1 to 999 seconds.
Return parameter	<NR2>	Returns the sample period setting.

Status Commands

For an overview of all the status registers, their associated register contents and the system diagram, please see the status overview on page 74.

:STATus:OPERation[:EVENt]

Query

Description	Queries the Operation Status Event register and clears the contents of the register.
Syntax	**:STATus:OPERation[:EVENt]?**
Return	<NR1> Returns the bit sum of the Operation Status Event register.

:STATus:OPERation:CONDition

Query

Description	Queries the Operation Status register. This query will not clear the register.
Syntax	**:STATus:OPERation:CONDition?**
Return	<NR1> Returns the bit sum of the Operation Condition register.

:STATus:OPERation:ENABle

Set

Query

Description	Sets or queries the bit sum of the Operation Status Enable register.
Syntax	**:STATus:OPERation:ENABle <NR1>**
Query Syntax	**:STATus:OPERation:ENABle?**
Parameter	<NR1> 0 to 32767
Return parameter	<NR1> 0 to 32767

:STATus:QUEStionable[:EVENt]

Query

Description	Queries the bit sum of the Questionable Status Event register. This query will also clear the contents of the register.
Syntax	**:STATus:QUEStionable[:EVENt]?**
Return parameter	<NR1> 0 to 32767

:STATus:QUEStionable:CONDition

Query

Description	Queries the status (bit sum) of the Questionable Status register. This query will not clear the register.
Syntax	**:STATus:QUEStionable:CONDition?**
Return parameter	<NR1> 0 to 32767

:STATus:QUEStionable:ENABle

Set

Query

Description	Sets or queries the bit sum of the Questionable Status Enable register.
Syntax	**:STATus:QUEStionable:ENABle <NR1>**
Query Syntax	**:STATus:QUEStionable:ENABle?**
Parameter	<NR1> 0 to 32767
Return parameter	<NR1> 0 to 32767

:STATus:PRESet

Set

Description	This command resets the ENABle register and Questionable Status Registers. The registers will be reset to a default value.

Default Register/Filter Values	Setting
QUEStionable Status Enable	0x0000
Operation Status Enable	0x0000

Syntax	**:STATus:PRESet**

Source Commands

[:SOURce]:CURRent

Set / Query

Description	Sets or queries the current level in amps.
Syntax	**[:SOURce]:CURRent {<NR2>(A)|MINimum|MAXimum}**
Query Syntax	**[:SOURce]:CURRent?**
Parameter	<NR2> 0 % to 105 % of the rated current output level. MIN Minimum current level. MAX Maximum current level.
Return parameter	<NR2> 0 % to 105 % of the rated current output level. MIN Minimum current level. MAX Maximum current level.
Example	**SOUR:CURR?** 1.00000 Returns the current level in amps.

[:SOURce]:CURRent:PROTection:STATe

Set / Query

Description	Sets or queries the OCP function.
Syntax	**[:SOURce]:CURRent:PROTection:STATe {<bool>|OFF|ON}**
Query Syntax	**[:SOURce]:CURRent:PROTection:STATe?**
Parameter	OFF | 0 Turns OCP off ON | 1 Turns OCP on
Return parameter	<bool> Returns the setting in <bool> format.
Example	**SOUR:CURR:PROT:STAT?** Returns the status of the OCP function

[:SOURce]:CURRent:PROTection:DELay

Set → / → Query

Description	Sets the Delay Time for OCP in seconds. The delay is set to 0.20 by default.
Syntax	**[:SOURce]:CURRent:PROTection:DELay {<NR2>|MINimum|MAXimum}**
Query Syntax	**[:SOURce]:CURRent:PROTection:DELay?**
Parameter	<NR2> 0.20 to 2.5 seconds MAX The maximum allowed delay time MIN The minimum allowed delay time
Return parameter	<NR2> Returns the delay time in seconds
Example	**SOUR:CURR:PROT:DEL MAX** Sets the current protection delay to the maximum.

[:SOURce]:CURRent:PROTection

Set → / → Query

Description	Sets or queries the OCP (over-current protection) level in amps.
Syntax	**[:SOURce]:CURRent:PROTection[:LEVel]{<NR2>(A) |MINimum|MAXimum}**
Query Syntax	**[:SOURce]:CURRent:PROTection[:LEVel]?**
Parameter	<NR2> Current protection level. Minimum: Irated x 0.05 Maximum: Irated x 1.1 MAX Maximum current level. MIN Minimum current level.
Return parameter	<NR2> Returns the current protection level.
Example	**SOUR:CURR:PROT?** 5.00 Returns the current level in amps.

[:SOURce]:CURRent:PROTection:TRIPped

→ Query

Description	Returns the state of the current protection circuits.
Query Syntax	**[:SOURce]:CURRent:PROTection:TRIPped?**

Return parameter	<bool>	Returns protection status.

Example
SOUR:CURR:PROT:TRIP?
0
The protection circuit has not been tripped.

Set → Query

[:SOURce]:CURRent:SLEWrate:RISing

Description
Sets or queries the falling current slew rate. This is only applicable for CC slew rate priority (CCLS) mode.

Syntax
[:SOURce]:CURRent:SLEWrate:RISing {<NR2>(A)|MINimum|MAXimum}

Query Syntax
[:SOURce]:CURRent:SLEWrate:RISing?

Parameter

<NR2>	Per step is between 0.00001 A/msec and depend on the unit type: 0.01 A/msec.
MAX	Maximum: Depend on the unit type: 0.01 A/msec.
MIN	Minimum rising current slew rate is 0.00001 A/msec.

Return parameter
<NR2> Returns the step current in amps.

Example
SOUR:CURR:SLEW:RIS?
0.00200
Sets the rising current slew rate to 0.00200 A/ms.

Set → Query

[:SOURce]:CURRent:SLEWrate:FALLing

Description
Sets or queries the rising current slew rate. This is only applicable for CC slew rate priority (CCLS) mode.

Syntax
[:SOURce]:CURRent:SLEWrate:FALLing {<NR2>(A)|MINimum|MAXimum}

Query Syntax
[:SOURce]:CURRent:SLEWrate:FALLing?

Parameter

<NR2>	Per step is between 0.00001 A/msec and depend on the unit type: 0.01 A/msec.
MAX	Maximum: Depend on the unit type: 0.01 A/msec.
MIN	Minimum rising current slew rate is 0.00001 A/msec.

Return parameter	<NR2>	Returns the step current in amps.

Example **SOUR:CURR:SLEW:FALL MAX**
Sets the falling current slew rate to the maximum.

[:SOURce]:MODE? → Query

Description: Returns the status of the output mode (CC, CV, Off) of the power supply.
The interface will return "CV' if the supply is in Constant Voltage Mode, "CC" if the supply is in Constant Current Mode or "OFF" if the supply output is off.

Query Syntax **[:SOURce]:MODE?**

Return parameter	<string>	Returns the output state as a string, "CC", "CV", "OFF"

Example **:SOUR:MODE?**
CC
The power supply is currently in CC mode.

[:SOURce]:VOLTage → Set / → Query

Description: Sets or queries the voltage level in volts.

Syntax **[:SOURce]:VOLTage {<NR2>(V)|MINimum|MAXimum}**

Query Syntax **[:SOURce]:VOLTage?**

Parameter	<NR2>	0 % to 105 % of the rated output voltage in volts.
	MAX	Maximum voltage level
	MIN	Minimum voltage level
Return parameter	<NR2>	Returns the voltage level in volts

Example **SOUR:VOLT 10**
Sets the voltage level to 10 volts.

[:SOURce]:VOLTage: PROTection:STATe → Set / → Query

Description: Sets or queries the OVP function.

Syntax	**[:SOURce]:VOLTage:PROTection:STATe {<bool>|OFF|ON}**
Query Syntax	**[:SOURce]:VOLTage:PROTection:STATe?**
Parameter	OFF | 0 — Turns OVP off ON | 1 — Turns OVP on
Return parameter	<bool> — Returns the setting in <bool> format.
Example	**SOUR:VOLT:PROT:STAT?** Returns the status of the OVP function

[:SOURce]:VOLTage:PROTection

Set → / → Query

Description	Sets or queries the overvoltage protection level.
Syntax	**[:SOURce]:VOLTage:PROTection {<NR2>(V)|MINimum|MAXimum}**
Query Syntax	**[:SOURce]:VOLTage:PROTection?**
Parameter	<NR2> — Minimum: Vrated x 0.05; Maximum: Vrated x 1.1 MAX — Maximum OVP level MIN — Minimum OVP level
Return parameter	<NR2> — Minimum: Vrated x 0.05; Maximum: Vrated x 1.1 MAX — Maximum OVP level MIN — Minimum OVP level
Example	**SOUR:VOLT:PROT MAX** Sets the OVP level to its maximum.

[:SOURce]:VOLTage:PROTection:TRIPped

→ Query

Description	Sets or queries the overvoltage protection level.
Query Syntax	**[:SOURce]:VOLTage:PROTection:TRIPped?**
Return parameter	<bool> 0 — Protection not tripped 1 — Protection tripped
Example	**SOUR:VOLT:PROT:TRIP?** 0 Indicates that the OVP protection has not been tripped.

[:SOURce]:VOLTage:SLEWrate:RISing

Set → / → Query

Description	Sets or queries the rising voltage slew rate. This is only applicable for CV slew rate priority (CVLS) mode.
Syntax	**[:SOURce]:VOLTage:SLEWrate:RISing {<NR2>(V)|MINimum|MAXimum}**
Query Syntax	**[:SOURce]:VOLTage:SLEWrate:RISing?**
Parameter	<NR2> Per step is between 0.0001 V/msec and depend on the unit type: 0.04 V/msec. MAX Maximum: Depend on the unit type: 0.04 V/msec. MIN Minimum rising voltage slew rate is 0.0001 V/msec.
Return parameter	<NR2> Returns the slew rate in V/msec.
Example	**SOUR:VOLT:SLEW:RIS MAX** Sets the rising voltage slew rate to its maximum.

[:SOURce]:VOLTage:SLEWrate:FALLing

Set → / → Query

Description	Sets or queries the falling voltage slew rate. This is only applicable for CV slew rate priority (CVLS) mode.
Syntax	**[:SOURce]:VOLTage:SLEWrate:FALLing {<NR2>(V)|MINimum|MAXimum}**
Query Syntax	**[:SOURce]:VOLTage:SLEWrate:FALLing?**
Parameter	<NR2> Per step is between 0.0001 V/msec and depend on the unit type: 0.04 V/msec. MAX Maximum: Depend on the unit type: 0.04 V/msec. MIN Minimum rising voltage slew rate is 0.0001 V/msec.
Return parameter	<NR2> Returns the slew rate in V/msec.
Example	**SOUR:VOLT:SLEW:FALL MIN** Sets the falling voltage slew rate to its minimum.

[:SOURce]:VOLTage:SENSe

Set → / → Query

Description	Sets or queries the remote sense.
Syntax	**[:SOURce]:VOLTage:SENSe {<NR2>|INTernal|EXTernal}**
Query Syntax	**[:SOURce]:VOLTage:SENSe?**
Parameter	<NR2> INTernal | 0 Sets remote sense 2 wire EXTernal | 1 Sets remote sense 4 wire
Return parameter	<NR2>
Example	**SOUR:VOLT: SENS EXT** Sets remote sense 4 wire.

System Commands

:SYSTem:CONFigure:BEEPer[:STATe]

Set → / → Query

Description	Sets or queries the protect buzzer state on/off.

Syntax	**:SYSTem:CONFigure:BEEPer[:STATe] {<bool>|OFF|ON}**	
Query Syntax	**:SYSTem:CONFigure:BEEPer[:STATe]?**	
Parameter	OFF | 0	Turns the buzzer off.
	ON | 1	Turns the buzzer on.
Return parameter	<bool>	Returns the buzzer status.

:SYSTem:CONFigure:BLEeder[:STATe]

Set → Query

Description	Sets or queries the status of the bleeder resistor.	
Syntax	**:SYSTem:CONFigure:BLEeder[:STATe] {<NR1>|OFF|ON}**	
Query Syntax	**:SYSTem:CONFigure:BLEeder[:STATe]?**	
Parameter	OFF | 0	Turns the bleeder resistor off.
	ON | 1	Turns the bleeder resistor on.
Return parameter	<NR1>	Returns bleeder resistor status.

:SYSTem:CONFigure:PON[:STATe]

Set → Query

Description	Sets the output state at power-on. This is the equivalent to the PWR On Config menu (Power On Status) settings. These settings only apply after the unit has been reset.	
Syntax	**:SYSTem:CONFigure:OUTPut:PON[:STATe] {<NR1>|{DEFault|OFF}|{SAVE|ON}}**	
Query Syntax	**:SYSTem:CONFigure:OUTPut:PON[:STATe]?**	
Parameter	DEF | 0	The GPP-1000 turns on in the same state the unit was in prior to the factory default setting. The output is set to off (default).
	SAVE | 1	The GPP-1000 turns on in the same state the unit was in prior to the previous shut down.
Return parameter	0	The power on output setting is "DEF".
	1	The power on output setting is "SAVE".

:SYSTem:CONFigure:TRIGger:INPut:SOURce

Set → Query

Description	Sets or queries what action will be performed on receiving a trigger. This is the equivalent to the TRIG Control menu (Trigin Action) settings.	
Syntax	**:SYSTem:CONFigure:TRIGger:INPut:SOURce {<NR1>|NONE|OUTPut|SETTing|MEMory}**	
Query Syntax	**:SYSTem:CONFigure:TRIGger:INPut:SOURce?**	
Parameter	NONE | 0	No input trigger.
	OUTPut | 1	Toggles the output on receiving a trigger.
	SETTing | 2	Sets the voltage/current on receiving a trigger.
	MEMory | 3	Sets the voltage/current on receiving a trigger.
Return parameter	<NR1>	Returns the input source

:SYSTem:CONFigure:TRIGger:INPut:LEVel

Set → Query

Description	Sets or queries the logic used to input trigger level. This is the equivalent to the TRIG Control menu (Trigin Level)settings.	
Syntax	**:SYSTem:CONFigure:TRIGger:INPut:LEVel {<NR1>|LOW|HIGH}**	
Query Syntax	**:SYSTem:CONFigure:TRIGger:INPut:LEVel?**	
Parameter	LOW | 0	Active low.
	HIGH | 1	Active high.
Return parameter	<NR1>	Returns the trigger input level.

:SYSTem:CONFigure:TRIGger:OUTPut:SOURce

Set → Query

Description	Sets or queries the output trigger source. This is the equivalent to the TRIG Control menu (Trigout Source) settings.	
Syntax	**:SYSTem:CONFigure:TRIGger:OUTPut:SOURce {<NR1>|NONE|OUTPut|SETTing|MEMory}**	
Query Syntax	**:SYSTem:CONFigure:TRIGger:OUTPut:SOURce?**	
Parameter	NONE | 0	No output trigger.
	OUTPut | 1	Output trigger is generated by a change in the output.
	SETTing | 2	Output trigger is generated when a setting is changed.
	MEMory | 3	Output trigger is generated when a memory setting is loaded.
Return parameter	<NR1>	Returns the output source.

:SYSTem:CONFigure:TRIGger:OUTPut:LEVel

Set → Query

Description	Sets or queries the logic used to output trigger level. This is the equivalent to the TRIG Control menu (Trigin Level) settings.	
Syntax	**:SYSTem:CONFigure:TRIGger:OUTPut:LEVel {<NR1>|LOW|HIGH}**	
Query Syntax	**:SYSTem:CONFigure:TRIGger:OUTPut:LEVel?**	
Parameter	<NR1>	
Return parameter	LOW | 0	Sets the output trigger to active low.
	High | 1	Sets the output trigger to active high.
	<NR1>	Returns the trigger output level.

:SYSTem:CONFigure:TRIGger:INPut:Voltage

Set → Query

Description	Sets or queries the voltage level in volts when a trigger in/software trigger has been generated.
Syntax	**:SYSTem:CONFigure:TRIGger:INPut:VOLTage{<NR2>(V)|MINimum|MAXimum}**

Query Syntax	**:SYSTem: CONFigure:TRIGger:INPut:VOLTage?**	
Parameter	<NR2>	0 % to 105 % of the rated voltage output in volts.
	MIN	Minimum current level.
	MAX	Maximum current level.
Return parameter	<NR2>	Returns the voltage level.

:SYSTem:CONFigure:TRIGger:INPut:CURRent

Set → / → Query

Description	Sets or queries the current level in amps when a software trigger has been generated.
Syntax	**:SYSTem:CONFigure:TRIGger:INPut:CURRent{<NR2>(A)| MINimum|MAXimum}**
Query Syntax	**:SYSTem: CONFigure:TRIGger:INPut:CURRent?**

Parameter	<NR2>	0 % to 105 % of the rated current output in amps.
	MIN	Minimum current level.
	MAX	Maximum current level.
Return parameter	<NR2>	Returns the current level.

:SYSTem:CONFigure:TRIGger:INPut:MEMory

Set → / → Query

Description	Sets or queries which memory is loaded when a trigger input is received and the trigger input is configured to load a memory setting. This is the equivalent to the TRIG Control menu (Trigin Memory) settings.
Syntax	**:SYSTem:CONFigure:TRIGger:INPut:MEMory <NR1>**
Query Syntax	**:SYSTem:CONFigure:TRIGger:INPut:MEMory?**

Parameter	<NR1>	1 (M1) to 5 (M5).
	MIN	
	MAX	
Return parameter	<NR1>	Returns the memory setting.

:SYSTem:COMMunicate:GPIB:ADDRess

Set → / → Query

Description	Sets or queries the GPIB address. Note: the setting will only be valid after the power has been cycled.
Syntax	**:SYSTem:COMMunicate:GPIB[:SELF]:ADDRess <NR1>**
Query Syntax	**:SYSTem:COMMunicate:GPIB[:SELF]:ADDRess?**
Parameter	<NR1> 1 to 30
Return parameter	<NR1> 1 to 30
Example	**SYST:COMM:GPIB:ADDR 15** Sets the GPIB address to 15.

:SYSTem:COMMunicate:LAN:IPADdress

Set → / → Query

Description	Sets or queries LAN IP address. Note: the setting will only be valid after the power has been cycled.
Syntax	**:SYSTem:COMMunicate:LAN:IPADdress <string>**
Query Syntax	**:SYSTem:COMMunicate:LAN:IPADdress?**
Parameter	<string> LAN IP address in string format ("address") Applicable ASCII characters: 20H to 7EH
Return parameter	<string> LAN IP address in string format ("address") Applicable ASCII characters: 20H to 7EH
Example	**SYST:COMM:LAN:IPAD 172.16.5.111** Sets the IP address to 172.16.5.111.

:SYSTem:COMMunicate:LAN:GATeway

Set → / → Query

Description	Sets or queries the Gateway address. Note: the setting will only be valid after the power has been cycled.
Syntax	**:SYSTem:COMMunicate:LAN:GATeway <string>**
Query Syntax	**:SYSTem:COMMunicate:LAN:GATeway?**
Parameter	<string> Gateway address in string format ("address") Applicable ASCII characters: 20H to 7EH

Return parameter	<string>	Gateway address in string format ("address") Applicable ASCII characters: 20H to 7EH
Example	SYST:COMM:LAN:GAT 172.16.0.254 Sets the LAN gateway to 172.16.0.254.	

:SYSTem:COMMunicate:LAN:SMASk

Set / Query

Description	Sets or queries the LAN subnet mask. Note: the setting will only be valid after the power has been cycled.	
Syntax	:SYSTem:COMMunicate:LAN:SMASk <string>	
Query Syntax	:SYSTem:COMMunicate:LAN:SMASk?	
Parameter	<string>	Subnet mask in string format ("mask") Applicable ASCII characters: 20H to 7EH
Return parameter	<string>	Subnet mask in string format ("mask") Applicable ASCII characters: 20H to 7EH
Example	SYST:COMM:LAN:SMASk 255.255.0.0 Sets the LAN mask to 255.255.0.0.	

:SYSTem:COMMunicate:LAN:MAC

Query

Description	Returns the unit MAC address as a string. The MAC address cannot be changed.	
Query Syntax	:SYSTem:COMMunicate:LAN:MAC?	
Return parameter	<string>	Returns the MAC address in the following format "FF-FF-FF-FF-FF-FF"
Example	SYST:COMM:LAN:MAC? 02-80-AD-20-31-B1 Returns the MAC address.	

:SYSTem:COMMunicate:LAN:DHCP

Set / Query

Description	Turns DHCP on/off. Queries the DHCP status. Note: the setting will only be valid after the power has been cycled.
Syntax	:SYSTem:COMMunicate:LAN:DHCP {<bool>|OFF|ON}
Query Syntax	:SYSTem:COMMunicate:LAN:DHCP?

Parameter	OFF | 0	DHCP off
	ON | 1	DHCP on
Return parameter	<bool>	Returns the DHCP status.

Set →
:SYSTem:COMMunicate:TCPip:CONTrol
→ Query

Description	Queries the socket port number.
Query Syntax	**:SYSTem:COMMunicate:TCPip:CONTrol?**
Return parameter	<NR1> 0000 to 9999
Example	**SYST:COMM:TCP:CONT?** 2268 Returns the socket port number

:SYSTem:ERRor
→ Query

Description	Queries the error queue. The last error message is returned. A maximum of 32 errors are stored in the error queue.
Query Syntax	**:SYSTem:ERRor?**
Return parameter	<string> Returns an error code followed by an error message as a single string.
Example	**SYSTem:ERRor?** -100, "Command error"

Set →
:SYSTem:KLOCk
→ Query

Description	Enables or disables the front panel key lock.	
Syntax	**:SYSTem:KLOCk {<bool>|OFF|ON }**	
Query Syntax	**:SYSTem:KLOCk?**	
parameter	OFF |0	Panel lock: allow output off.
	ON | 1	Panel lock: allow output on/off.
Return parameter	0	Panel lock: allow output off.
	1	Panel lock: allow output on/off.

:SYSTem:ERRor:ENABle
Set →

Description	Clears the Error Queue and enables all error messages to be placed in the System Error Queue.
Syntax	**:SYSTem:ERRor:ENABle**

:SYSTem:VERSion

Set →

Description	Returns the version of the GPP-1000 SCPI version.
Query Syntax	**:SYSTem:VERSion?**
Return parameter	<string> Returns the SCPI version as a string.
Example	**SYST:VERS?** 1999.9

:SYSTem:KEYBoard:BEEPer

Set →
→ Query

Description	Sets or queries the keyboard buzzer state on/off. This is the equivalent to the Buzzer menu (Keyboard)settings.
Syntax	**:SYSTem:KEYBoard:BEEPer {<bool>|OFF|ON}**
Query Syntax	**:SYSTem:KEYBoard:BEEPer?**
parameter	0 | OFF Turns the keyboard buzzer off. 1 | ON Turns the keyboard buzzer on.
Return parameter	<bool> Returns the keyboard buzzer status.

Apply Commands

:APPLy

Set → Query

Description	The apply command sets the voltage and current at the same time.
Syntax	**:APPLy {<NRf>(V)|MINimum|MAXimum[,<NRf>(A)|MINimum|MAXimum]}**
Query Syntax	**:APPLy?**
Parameter	<NRf>(V) Voltage setting. MINimum Minimum voltage level MAXimum Maximum voltage level <NRf>(A) Current setting. MINimum Minimum voltage level MAXimum Maximum voltage level
Return parameter	<NRf>(V) Voltage setting. MINimum Minimum voltage level MAXimum Maximum voltage level <NRf>(A) Current setting. MINimum Minimum voltage level MAXimum Maximum voltage level
Example	**APPL MIN, MIN** Sets the current and voltage to the minimum settings.

Sequence Commands

:SEQUence:ENABle

Set →

Description	Enable or disable sequence function.
Syntax	**:SEQUence:ENABle{ON|OFF}**
Parameter	OFF Turns the sequence function off. ON Turns the sequence function on.
Example	**SEQUence:ENABle ON** Turns the sequence function on.

:SEQUence:SAVE:INTernal

Set →

Description	Saves the sequence output file to the designated location of internal storage. {1|2|3|4|5} represent the storage locations of 5 files within the internal storage individually.
Syntax	**:SEQUence:SAVE:INTernal{1|2|3|4|5 }**
Parameter	<NR1> 1 to 5 (as memory 1 to 5)

:SEQUence:LOAD:INTrenal

Set →

Description	Recalls the sequence output file saved in the designated location from internal storage. {1|2|3|4|5} represent the storage locations of 5 files within the internal storage individually.
Syntax	**:SEQUence:LOAD:INTernal{1|2|3|4|5 }**

Parameter	<NR1>	1 to 5 (as memory 1 to 5)

:SEQUence:SAVE:UDISK

Set →

Description	Saves the sequence output file to the designated location of external storage. SEQU_<NR1>.CSV indicates the designated location of external storage with file format in either usb:\<name>.CSV. Storage location cannot be designated when sequence function is enabled.
Syntax	**:SEQUence:SAVE:UDISK SEQU_<NR1>.CSV**
Parameter	<NR1> 0 to 255

:SEQUence:LOAD:UDISK

Set →

Description	Recalls the sequence output file saved in the designated location from external storage. SEQU_<NR1>.CSV indicates the designated location of external storage.
Syntax	**:SEQUence:LOAD:UDISK SEQU_<NR1> .CSV**
Parameter	<NR1> 0 to 255

:SEQUence:RUN

Set →
Query →

Description	Start output with the first sequence .
Syntax	**:SEQUence:RUN{ON|OFF }**
Parameter	OFF Stop the sequence function. ON Start the sequence function.

:SEQUence:STATe

Set →
Query →

Description	Queries the state of sequence output .
Query Syntax	**:SEQUence:STATe?**

Return parameter	OFF	Sequence not enabled
	ON	The sequence is in a run state.
	Ready	The sequence is in a ready state.
	Pause	The sequence is paused during the execution of the sequence script. When a sequence is paused, transmit instruction SEQUence:RUN ON to continue running the sequence.
	TRIGIN	During the execution of the sequence script, the sequence is in a waiting trigger state. The Trigin status will be held until trig-in signal is received by GPP-1000 series unit.

Load Commands

:LOAD:CV

Set →

Description	Sets Channel as Load CV mode. Automatically switch to power mode after closing LOAD mode.
Syntax	**:LOAD:CV{ON|OFF}**
Parameter	OFF | 0 OFF ON | 1 ON
Example	:LOAD:CV ON Sets Channel as Load CV mode.

Set →

:LOAD:CC

Description	Sets Channel as Load CC mode.
Syntax	**:LOAD:CC{ON|OFF}**

Parameter	OFF | 0	OFF
	ON | 1	ON
Example	:LOAD:CC ON Sets Channel as Load CC mode.	

Status Register Overview

To program the GPP-1000 power supply effectively, the Status registers need to be understood. This chapter explains in detail how the Status registers are used and how to configure them.

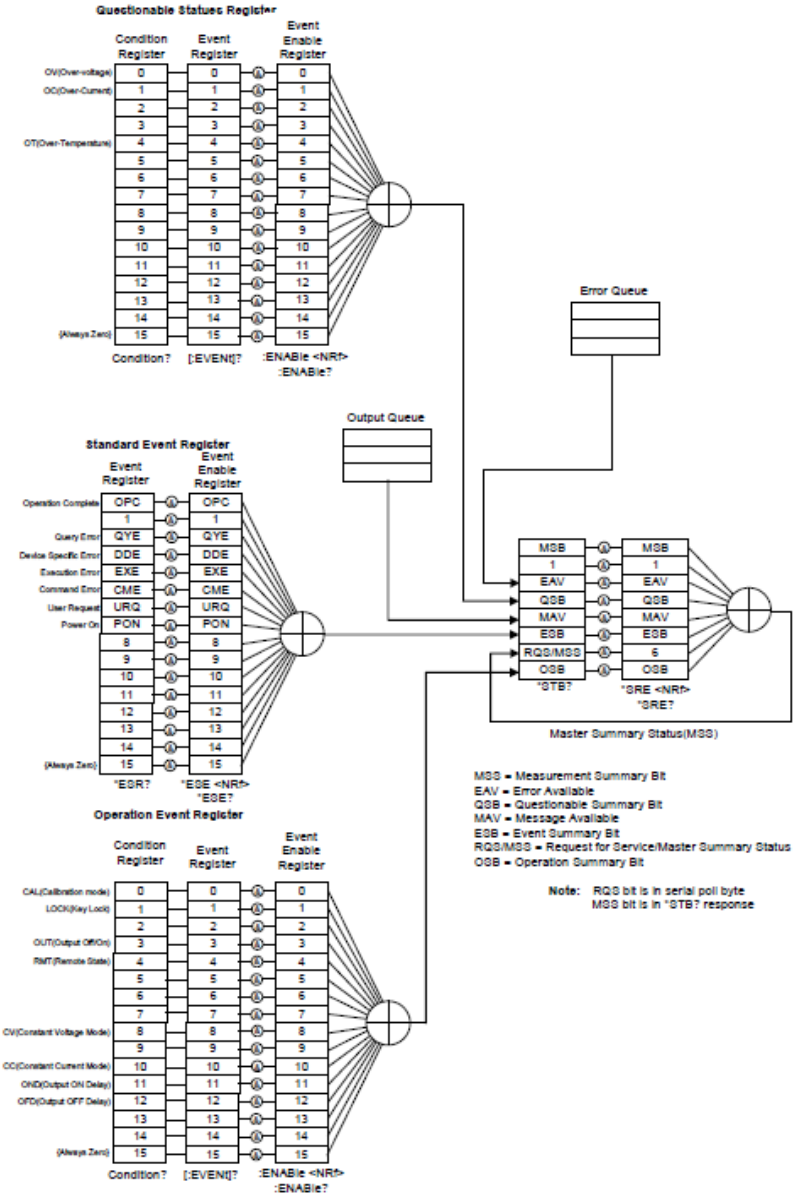
Introduction to the Status Registers

Overview

The status registers are used to determine the status of the power supply. The status registers maintain the status of the protection conditions, operation conditions and instrument errors.
The GPP-1000 Series have a number of register groups:
Questionable Status Register Group
Standard Event Status Register Group
Operation Status Register Group
Status Byte Register
Service Request Enable Register
Service Request Generation
Error Queue
Output Buffer

The next page shows the structure of the Status registers.

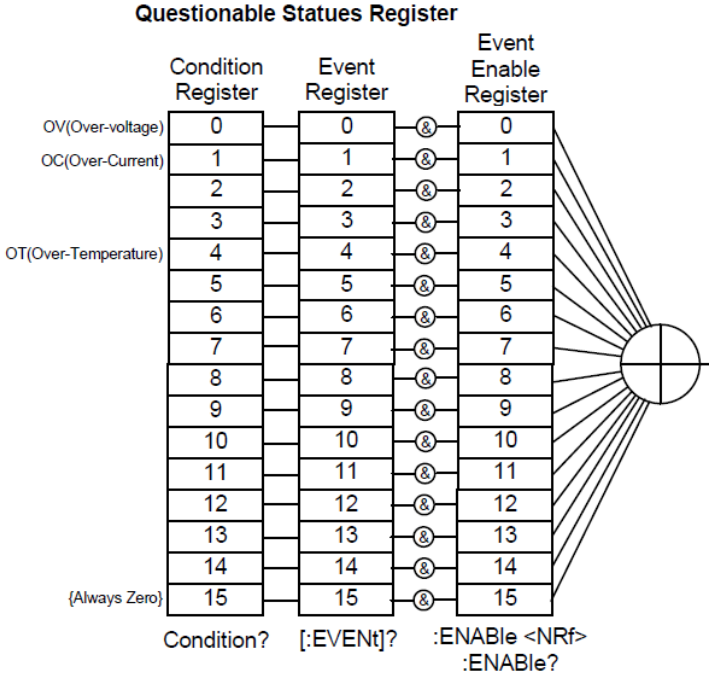
The Status Registers



Questionable Status Register Group

Overview

The Questionable Status Register Group indicates if any protection modes or limits have been tripped.

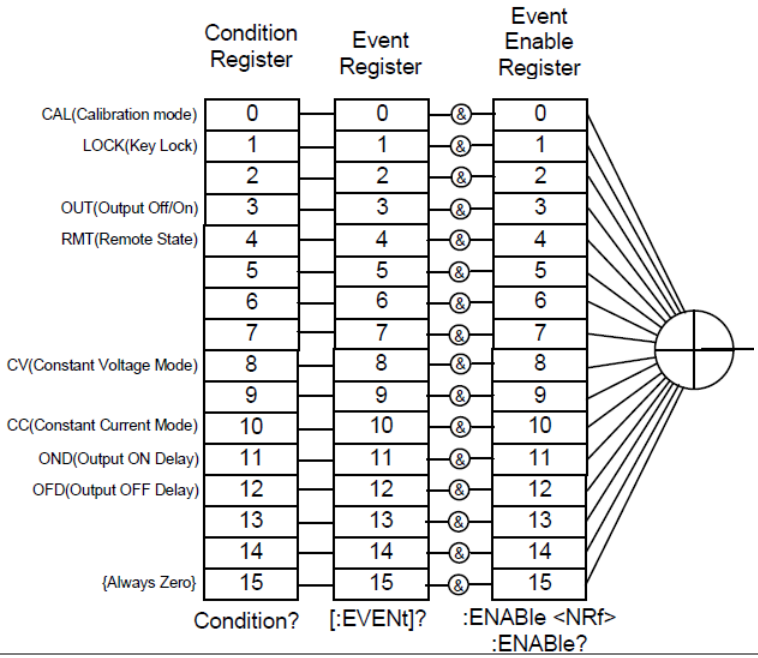


Bit Summary	Event	Bit	Bit Weight
	OV (Over-Voltage) Over voltage protection has been tripped	0	1
	OC (Over-Current) Over current protection has been tripped	1	2
	OTP(Over Temperature Protection) Over temperature protection has been tripped	4	16
Condition Register	The Questionable Status Condition Register indicates the status of the power supply. If a bit is set in the Condition register, it indicates that the event is true. Reading the condition register does not change the state of the condition register.		
Event Register	The type of transition conditions will set the corresponding bits in the Event Register. If the Event Register is read, it will be cleared to 0.		
Enable Register	The Enable register determines which Events in the Event Register will be used to set the QUES bit in the Status Byte Register.		

Operation Status Register Group

Overview	The Operation Status Register Group indicates the operating status of the power supply.

Operation Event Register

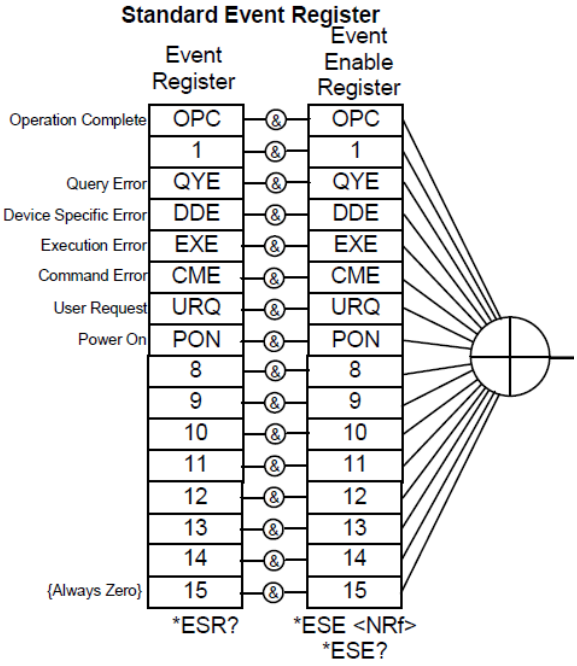


Bit Summary	Event	Bit	Bit Weight
	CAL (Calibration mode) Indicates if the GPP-1000 is in calibration mode.	0	1
	LOCK (Key Lock) Keyboard locked.	1	2
	OUT(Output off/on) Output off/on state.	3	8
	RMT(Remote state) Remote state	4	16
	CV (Constant voltage mode) Indicates if the PPX is in CV mode.	8	256
	CC (Constant current mode) Indicates if the PPX is in CC mode.	10	1024
	OND (Output ON Delay) Indicates if Output ON delay time is active	11	2048
	OFD (Output OFF Delay) Indicates if Output OFF delay time is active	12	4096
Condition Register	The Operation Status Condition Register indicates the operating status of the power supply. If a bit is set in the Condition register, it indicates that the event is true. Reading the condition register does not change the state of the condition register.		
Event Register	The Enable register determines which registered Events in the Event Register will be used to set the OPER bit in the Status Byte Register.		
Enable Register	The Enable register determines which Events in the Event Register will be used to set the QUES bit in the Status Byte Register.		

Standard Event Status Registers

Overview

The Standard Event Status Register Group indicates if any errors have occurred. The bits of the Event register are set by the error event queue.



Bit Summary

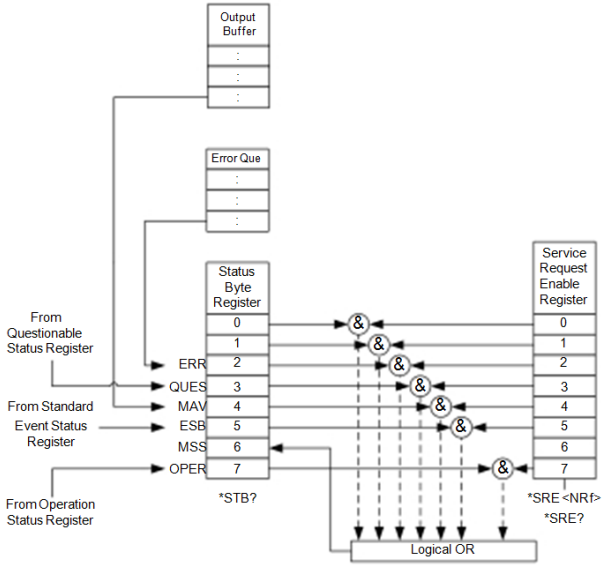
Event	Bit	Bit Weight
OPC (Operation complete) The OPC bit is set when all selected pending operations are complete. This bit is set in response to the *OPC command.	0	1
QYE (Query Error) The Query Error bit is set in response to an error reading the Output Queue. This can be caused by trying to read the Output Queue when there is no data present.	2	4
DDE (Device Dependent Error) Device specific error.	3	8
EXE (Execution Error) The EXE bit indicates an execution error due to one of the following: illegal command parameter, parameter out of range, invalid parameter, the command didn't execute due to an overriding operation condition.	4	16
CME (Command Error) The CME bit is set when a syntax error has occurred. The CME bit can also be set when a <GET> command is received within a program message.	5	32

	PON (Power On) Indicates the power is turned on.	7	128
Event Register	Any bits set in the event register indicate that an error has occurred. Reading the Event register will reset the register to 0.		
Enable Register	The Enable register determines which Events in the Event Register will be used to set the ESB bit in the Status Byte Register.		

Status Byte Register & Service Request Enable Register

Overview

The Status Byte register consolidates the status events of all the status registers. The Status Byte register can be read with the *STB? query and can be cleared with the *CLS command.



Bit Summary	Event	Bit	Bit Weight
	ERR (Error Event/Queue) If data is present in the Error queue, the ERR bit will be set.	2	4
	QUES (Questionable Status Register) The summary bit for the Questionable Status Register group.	3	8
	MAV (Message Available) This is set when there is data in the Output Queue waiting to be read.	4	16
	(ESB) Event Summary Bit. The ESB is the summary bit for the Standard Event Status Register group.	5	32
	MSS Bit The MSS Bit is the summary of the Status Byte Register and Service Request register (bits 1 to 5, 7). This will be set to 1.	6	64
Status Byte Register	Any bits set in the Status byte register acts as a summary register for all the three other status registers and indicates if there is a service request, an error in the Error Queue or data in the Output Queue. Reading the Status Byte register will reset the register to 0.		
Service Request Enable Register	The Service Request Enable Register controls which bits in the Status Byte Register are able to generate service requests.		

Error List

Command Error Codes

Overview

An <error/event number> in the range [-199 , -100] indicates that an IEEE 488.2 syntax error has been detected by the instrument's parser. The occurrence of any error in this class shall cause the command error bit (bit 5) in the event status register (IEEE 488.2, section 11.5.1) to be set. One of the following events has occurred:
An IEEE 488.2 syntax error has been detected by the parser. That is, a controller-to-device message was received which is in violation of the IEEE 488.2 standard. Possible violations include a data element which violates the device listening formats or whose type is unacceptable to the device.

An unrecognized header was received. Unrecognized headers include incorrect device-specific headers and incorrect or unimplemented IEEE 488.2 common commands.

Events that generate command errors shall not generate execution errors, device-specific errors, or query errors; see the other error definitions in this chapter.

-101 Invalid character

An invalid character was used in the command string. Example: #, $, %.

SOURCE:VOLT 12#

-102 Syntax error

Invalid syntax was used in the command string. Example: An unexpected character may have been encountered, like an unexpected space.

SOURCE: VOLT 1

-103 Invalid separator

An invalid separator was used in the command string. Example: a space, comma or colon was incorrectly used.

SOURCE:VOLT 1 2

-108 Parameter not allowed

The command received more parameters than were expected. Example: An extra (not needed) parameter was added to a command

OUTPUT OPEN

-109 Missing parameter

The command received less parameters than expected. Example: A required parameter was omitted.

SOURCE:VOLT

-113 Undefined header

An undefined header was encountered. The header is syntactically correct. Example: the header contains a character mistake.

SOURCE:VOLTA

-131 Invalid suffix

An invalid suffix was used. Example: An unknown or incorrect suffix may have been used with a parameter.

SOURCE:VOLT +A

-148 Character data not allowed

A legal character data element was encountered where prohibited by the device. Example: Using a suffix when not allowed.

SOURCE:VOLT 1ma

-158 String data not allowed

An unexpected character string was used where none were expected. Example: A character string is used instead of a valid parameter.

SOURCE:VOLT "1.1v"

Execution Errors

Overview

An <error/event number> in the range [-299 , -200] indicates that an error has been detected by the instrument's execution control block. The occurrence of any error in this class shall cause the execution error bit (bit 4) in the event status register (IEEE 488.2, section 11.5.1) to be set. One of the following events has occurred:

A <PROGRAM DATA> element following a header was evaluated by the device as outside of its legal input range or is otherwise inconsistent with the device's capabilities.

A valid program message could not be properly executed due to some device condition.

Execution errors shall be reported by the device after rounding and expression evaluation operations have taken place. Rounding a numeric data element, for example, shall not be reported as an execution error. Events that generate execution errors shall not generate Command Errors, device-specific errors, or Query Errors; see the other error definitions in this section.

--223 Data out of range

Indicates that a command was received but the data in the output buffer from a previous command was lost.

Device Specific Errors

Overview

An <error/event number> in the range [-399 , -300] or [1 , 32767] indicates that the instrument has detected an error which is not a command error, a query error, or an execution error; some device operations did not properly complete, possibly due to an abnormal hardware or firmware condition. These codes are also used for self-test response errors. The occurrence of any error in this class should cause the device-specific error bit (bit 3) in the event status register (IEEE 488.2, section 11.5.1) to be set. The meaning of positive error codes is device-dependent and may be enumerated or bit mapped; the <error message>string for positive error codes is not defined by SCPI and available to the device designer.

Note that the string is not optional; if the designer does not wish to implement a string for a particular error, the null string should be sent (for example, 42,""). The occurrence of any error in this class should cause the device-specific error bit (bit 3) in the event status register (IEEE 488.2, section 11.5.1) to be set. Events that generate device-specific errors shall not generate command errors, execution errors, or query errors; see the other error definitions in this section.

-350 Query INTERRUPTED

Indicates that a command was received but the data in the output buffer from a previous command was lost.

Query Errors

Overview

An <error/event number> in the range [-499 , -400] indicates that the output queue control of the instrument has detected a problem with the message exchange protocol described in IEEE 488.2, chapter 6. The occurrence of any error in this class shall cause the query error bit (bit 2) in the event status register (IEEE 488.2, section 11.5.1) to be set. These errors correspond to message exchange protocol errors described in IEEE 488.2, section 6.5. One of the following is true:
An attempt is being made to read data from the output queue when no output is either present or pending;
Data in the output queue has been lost.
Events that generate query errors shall not generate command errors, execution errors, or device-specific errors; see the other error definitions in this section.

-410 Query INTERRUPTED

Indicates that a command was received but the data in the output buffer from a previous command was lost.

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 page62.

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

EC 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

GOODWILL INSTRUMENT CO., LTD.
No. 7-1, Jhongsing Road, Tucheng District, New Taipei City 236, Taiwan
Tel: +886-2-2268-0389 Fax: +886-2-2268-0639
Web: http://www.gwinstek.com Email: marketing@goodwill.com.tw

GOODWILL INSTRUMENT (SUZHOU) CO., LTD.
No. 521, Zhujiang Road, Snd, Suzhou Jiangsu 215011, China
Tel: +86-512-6661-7177 Fax: +86-512-6661-7277
Web: http://www.instek.com.cn Email: marketing@instek.com.cn

GOODWILL INSTRUMENT EURO B.V.
De Run 5427A, 5504DG Veldhoven, The Netherlands
Tel: +31-(0)40-2557790 Fax: +31-(0)40-2541194
Email: sales@gw-instek.eu

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