Multi-Range DC Power Supply

PSB-1000 Series

PROGRAMMING MANUAL

VERSION: 1.0

ISO-9001 CERTIFIED MANUFACTURER

GW INSTEK

The information in this manual was correct at the time of printing. However, Good Will continues to improve products and reserves the rights to change specification, 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 PSB-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 Guideline CAUTION	• Do not place any heavy object on the PSB-1000. • Avoid severe impact or rough handling that leads to damaging the PSB-1000. • Do not discharge static electricity to the PSB-1000. • Use only mating connectors, not bare wires, for the terminals. • Do not block the cooling fan opening. • Do not disassemble the PSB-1000 unless you are qualified. (Measurement categories) EN 61010-1:2010 specifies the measurement categories and their requirements as follows. The PSB-1000 doesn't fall under category II, III or IV. • Measurement category IV is for measurement performed at the source of low-voltage installation. • Measurement category III is for measurement performed in the building installation. • Measurement category II is for measurement performed on the circuits directly connected to the low voltage installation. • 0 is for measurements performed on circuits not directly connected to Mains.
Power Supply WARNING	• AC Input voltage range: 100Vac to 240Vac • Frequency: 47Hz-63Hz • To avoid electrical shock connect the protective grounding conductor of the AC power cord to an earth ground.

Cleaning the PSB-1000	• 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 containing harsh material such as benzene, toluene, xylene, and acetone.
Operation Environment	• Location: Indoor, no direct sunlight, dust free, almost non-conductive pollution (Note below) • Relative Humidity: 20%~ 85%, no condensation • Altitude: Maximum 2000m • Temperature: 0°C to 40°C (Pollution Degree) EN 61010-1:2010 specifies the pollution degrees and their requirements as follows. The PSB-1000 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 • Temperature: -25°C to 70°C • Relative Humidity: ≤90%, no condensation
Disposal 	Do not dispose this instrument as unsorted municipal waste. Please use a separate collection facility or contact the supplier from which this instrument was purchased. Please make sure discarded electrical waste is properly recycled to reduce environmental impact.

Power cord for the United Kingdom

When using the instrument in the United Kingdom, make sure the power cord meets the following safety instructions.

NOTE: This lead/appliance must only be wired by competent persons

⚠ WARNING: THIS APPLIANCE MUST BE EARTHED

IMPORTANT: The wires in this lead are coloured in accordance with the following code:

Green/ Yellow:	Earth
Blue:	Neutral
Brown:	Live (Phase)

As the colours of the wires in main leads may not correspond with the coloured marking identified in your plug/appliance, proceed as follows:

The wire which is coloured Green & Yellow must be connected to the Earth terminal marked with either the letter E, the earth symbol ⏚ or coloured Green/Green & Yellow.

The wire which is coloured Blue must be connected to the terminal which is marked with the letter N or coloured Blue or Black.

The wire which is coloured Brown must be connected to the terminal marked with the letter L or P or coloured Brown or Red.

If in doubt, consult the instructions provided with the equipment or contact the supplier.

This cable/appliance should be protected by a suitably rated and approved HBC mains fuse: refer to the rating information on the equipment and/or user instructions for details. As a guide, a cable of 0.75mm^2 should be protected by a 3A or 5A fuse. Larger conductors would normally require 13A types, depending on the connection method used.

Any exposed wiring from a cable, plug or connection that is engaged in a live socket is extremely hazardous. If a cable or plug is deemed hazardous, turn off the mains power and remove the cable, any fuses and fuse assemblies. All hazardous wiring must be immediately destroyed and replaced in accordance to the above standard.

GETTING STARTED

This chapter describes the power source in a nutshell, including its main features and front / rear panel introduction.

PSB-1000 Series Overview

Series lineup

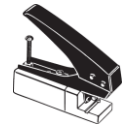
The PSB-1000 Series consists of 4 models: PSB-1400L, PSB-1400M, PSB-1800L, and PSB-1800M. Note that throughout the user manual, the term "PSB-1000" refers to all the models in the PSB-1000 Series lineup, unless stated otherwise.

Model name	Output Voltage	Output Current	Output Power
PSB-1400L	40	40	400
PSB-1400M	160	10	400
PSB-1800L	40	80	800
PSB-1800M	160	20	800

Main Features

Performance	• Maximum output voltage of 160V • Maximum output current of 80A
Features	• OVP, OCP and OTP protection • Low AC input protection • Sequence function • Large 3.5 inch LCD panel • 100V - 240V power inlet • Multi-range output power • Bleeder circuit ON/OFF setting • CV, CC priority start function • Internal resistance setting function • Parallel master/slave operation with active current sharing • Remote sensing to compensate for voltage drop in load leads • Analog output programming and monitoring
Interface	• Ethernet port • USB host • USB CDC • GPIB (optional) • External Control I/O

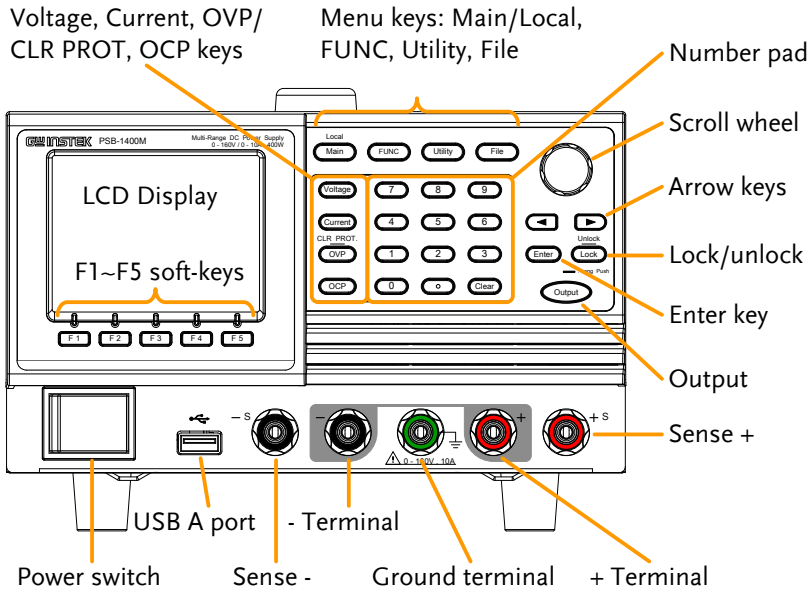
Accessories

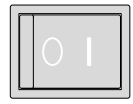
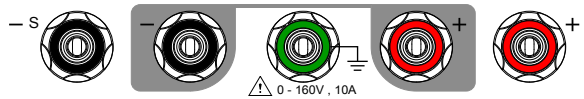
Standard Accessories	Part number	Description
	CD ROM	User manual, programming manual
		Power cord
	PSW-009	Output terminal cover
	GTL-240	Type A - B USB Cable
	PSB-106	Basic Accessory Kit: M4 terminal screws and washers x2, M8 terminal bolts, nuts and washers x2, Analog control protection dummy x1, analog control lock level x2, short bar x1.
Optional Accessories	**Part number**	**Description**
	PSW-001	Analog remote control connector kit: Socket x 1pc Pins x 10pcs Protection cover x 1 set Chassis connection wire x 1
	PSW-002	Simple IDC tool 
	PSW-003	Contact removal tool 

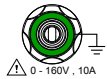
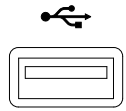
	PSB-101	Cable for 2 units of PSB-1000 units in parallel mode connection
	PSB-102	Cable for 3 units of PSB-1000 units in parallel mode connection
	PSB-103	Cable for 4 units of PSB-1000 units in parallel mode connection
	PSB-104	Cable for 2 units of PSB-1000 units in series mode connection
	PSB-105	GPIB card
	GRA-418-J	Rack-mount adapter(JIS)
	GRA-418-E	Rack-mount adapter(EIA)
	GTL-123	Test leads: 1x red, 1x black
Download	Name	Description
	gw_psb1k.inf	USB driver

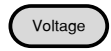
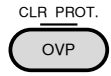
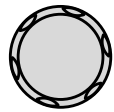
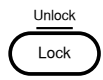
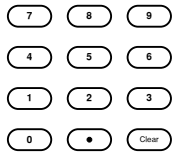
Appearance

Front Panel

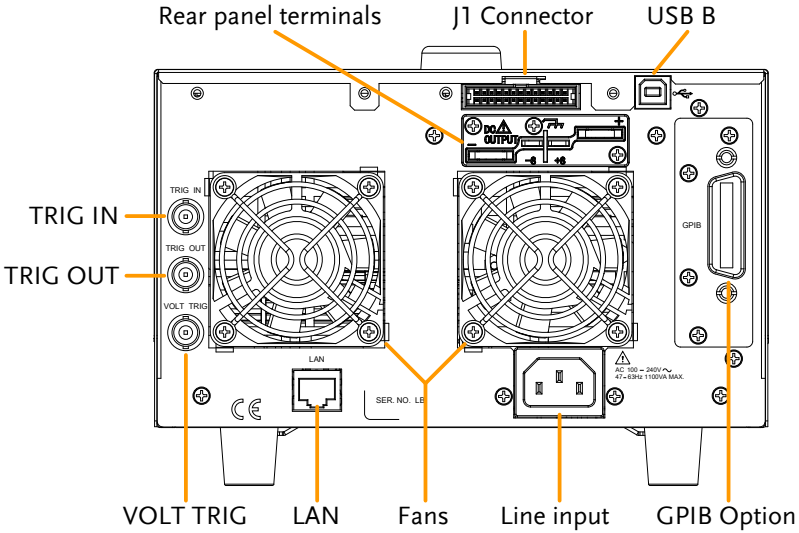


Item	Description	
Power Switch		Turns on the mains power.
Front Panel Output Terminals		
		Positive sense terminal
		Positive terminal

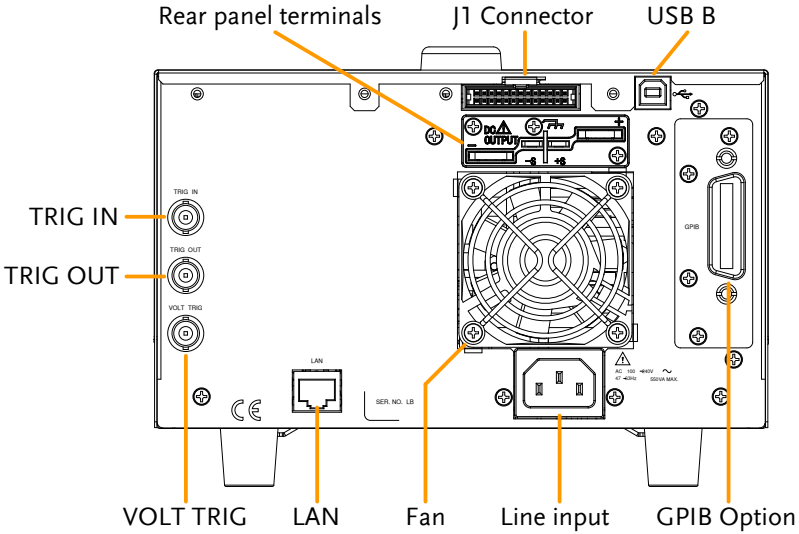
		Ground terminal
		Negative terminal
		Negative sense terminal
USB A Port		The USB port is used for data transfer, loading test scripts etc.
LCD Screen		Displays the voltage/current settings, measurement readings and menu systems.
Function Keys		Assigned to the soft-keys displayed on the bottom of the screen.
Main Key		Returns operation to the main operation screen.
Local Key		Pressing the Main/Local key will also return the unit to local mode from remote control mode.
FUNC Key		Enters the Function menu. The function menu contains Power On Configuration settings, Memory settings, Voltage trigger settings and the Sequence menu.
Utility Key		Enters the Utility menu. The utility menu contains a number of system settings.
File Key		Pressing the file key allows you to copy, rename and delete files.

Voltage		Sets the constant voltage level.
Current		Sets the constant current level.
OVP		Sets the over voltage protection level.
CLR PROT	(Long press)	Holding the OVP key will clear any tripped protection functions.
OCP		Sets the over current protection level.
Scroll Wheel & Arrow Keys	 	Both the scroll wheel and arrow keys are used to navigate menu items, pages or for incrementing/decrementing parameter values.
Enter		Used to confirm settings and menu items.
Lock Key/ Unlock Key		Locks the front panel keys to prevent accidentally changing panel settings. Note: The output can still be turned off when the key lock in active.
Unlock Key	(Long press)	Disables the key lock.
Output Key		Turns the output on or off.
Clear Key		Clears entries that are made in the number entry dialogs.
Number Pad		Used to enter values.

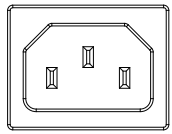
Rear Panel (PSB-1800L/M)



Rear Panel (PSB-1400L/M)

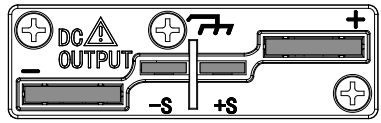


Line Voltage Input



Voltage Input: 100 - 240 VAC
Line frequency: 47 - 63Hz (1100VA MAX)

Rear panel terminals

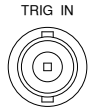


The rear panel terminals contain the positive and negative output terminals, the voltage sense terminals and the ground terminal.

J1 Connector

The J1 Connector is used for external voltage, current control or for parallel/series control.

TRIG IN



Used to receive a signal from an external device.

Apply either a negative-going or a positive-going pulse to the trigger input pin.

TRIG OUT

Used to send a signal to an external device.

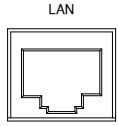
The polarity of the trigger output can also be configured.

VOLT TRIG

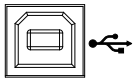
Outputs a signal according to the Voltage Trigger settings in the Function menu.

The polarity of the voltage trigger can also be configured.

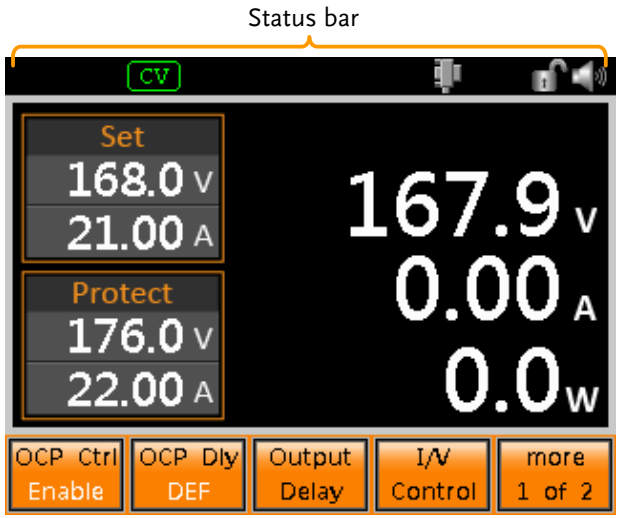
LAN



The Ethernet port is used for remote control and digital monitoring from a PC.

USB-B		The USB-B port is used for remote control.
GPIB Option	Optional GPIB communication card (PSB-105).	
FAN	Temperature controlled fan.	

Status Bar Icons



OFF	Indicates if the output is OFF.	OVP OCP OTP	An alarm icon will appear on the status bar when one of the protection functions is tripped.
CV	Indicates that the output is in CV mode.		
CC	Indicates that the output is in CC mode.	RS	(Remote sense fail) Indicates a problem with the remote sense connection.
ON	Indicates that the output is operating at 105% of rated power (constant power mode).	PF	(Power fail) Indicates that the external shutdown pin was tripped.
RMT	Indicates that the unit is in remote mode.	ALM	Indicates that the instrument has hardware errors.

	Speaker enabled.		Indicates that the GPIB option is installed and enabled.
	Speaker disabled.		Indicates that the GPIB option is installed and disabled.
	Indicates that the panel lock is active.		Indicates that the instrument is connected with a PC.
	Indicates that the panel keys are unlocked.		Indicates that a USB flash drive is inserted in the front panel USB port.
	Indicates that a USB flash drive is inserted in the front panel USB port, but there is an access error. Please re-insert.		Indicates that the instrument is connected to a LAN.
	Indicates that the instrument is connected to a LAN, however, there are configuration errors. Please re-configure the LAN settings.		Indicates that the PSB-1000 is in LAN remote mode.
	Indicates that the PSB-1000 is in LAN remote mode, but there are connection errors. Please re-configure the LAN settings.		

Menu Reference

Level				Function/Operation Description
1st	2nd	3rd	4th	
Main	OCP Ctrl			Enables/Disables OCP
	OCP Dly			Sets OCP delay time
	Output Delay	On Delay		Sets the Output On delay time
		Off Delay		Sets the Output Off delay time.
	I/V Control	CVHS		Sets the CV slew rate to the maximum (High Speed)
		CCHS		Sets the CC slew rate to the maximum (High Speed)
		CVLS		Sets the CV slew rate
		CCLS		Sets the CC slew rate
		Exit		Exits the I/V control menu.
	more 1 of 2	INT-R		Sets the internal resistance.
		Bleeder		Turns the bleeder resistor on or off (of auto).
		Average		Sets the average level for the smoothing function (Low, Middle, High)
		More 2 of 2		Returns to the previous page.

FUNC	View Power On Config.	Modify	CV Control	Sets CV control mode
			CC Control	Sets CC control mode
			PON Run	Sets the Power On output settings (Turns the output on or executes a sequence at start up)
			Track	Sets the tracking mode for multiple units
			Ext-Out	Sets the Ext-Out line active state
			Breaker	Sets the breaker resistor
			Sense	Sets/disables local sense
		Exit		Exits from the View Power On Config. settings
	View Memory	M1		Shows the M1 settings
		M2		Shows the M2 settings
		M3		Shows the M3 settings
		Exit		Exits the View Memory menu.
	Voltage Trigger	Vtrig Control		Enable/Disable voltage trigger control
		Vt1		Sets the leading edge Vtrig level
		Vt2		Sets the trailing edge Vtrig level
		Polarity		Sets the Vtrig polarity as positive or negative

FUNC (cont.)	TRIG IN	POS		Positive edge
		NEG		Negative edge
		Exit		Exits from the FUNC menu.
	TRIG OUT	POS		Positive edge
		NEG		Negative edge
		Exit		Exits from the FUNC menu.
	Sequence	Load		Loads the selected sequence
		Exit		Exits the sequence menu
		more 1 of 2	Copy to USB	Copies the selected sequence to USB.
			Copy to SEQX	Copies the selected sequence to another sequence
			Move to SEQX	Move the selected sequence to another sequence
			Clear	Clears the selected sequence from the memory
			more 2 of 2	Returns to the previous menu level

Utility	System Information			Shows the serial number and software version
	Interface	LAN	MAC Address	Sets the MAC address
			Host Name	Sets the host name
			LAN Control	Enables/disables LAN
			DHCP	Enables/disables DHCP
		Rear USB		Enables/disables USB interface
		GPIB		Enables/disables GPIB interface
	Error Log	LAN Log		Lists LAN errors
		USB Log		Lists USB errors
		GPIB Log		List GPIB errors
		Clear		Clears the error logs
		Exit		Exits to the previous menu
	Speaker			Enables/disables the speaker
	Lock	Mode0		Mode0 disables all panel keys except the ability to turn the load off.
		Mode1		Mode1 disables all panel keys except the ability to turn the load on or off.

Utility (cont.)	Color	Brightness	Sets the brightness level
		Contrast	Sets the contrast level
		Default	Default brightness/contrast settings
		Exit	Exits to the previous menu
	Factory Setting	Restore	Restore the factory settings
		Exit	Exits to the previous menu
	Calibra-tion		Not applicable to end-users.
File	Copy to USB		Copy the selected file to USB
	Copy to Mx		Copy the selected file to memory location M0-9.
	Save		Saves the current settings to the selected memory setting.
	Recall		Recalls the selected memory setting.
	View Memory		Goes to the View Memory menu.
	Copy to memory		Copies the selected file on the USB drive to memory.
	Delete		Deletes the selected file on the USB drive.
	Rename		Renames the selected file on the USB drive.

Voltage	Sets the voltage output settings
Current	Sets the current output settings
OVP	Sets the OVP settings
OCP	Sets the OCP settings

REMOTE CONTROL

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

Note

If the instrument is remotely controlled via the USB/LAN/GPIB interface, the remote panel lock is automatically enabled. Press the Main/Local key on the front panel to return to local control.

Interface Configuration

USB Remote Interface

USB configuration	PC side connector	Type A, host
	PSB-1000 side connector	Rear panel Type B, slave
	USB Class	CDC (communications device class)
Settings	Disable	Disables the rear panel USB port
	Auto	Sets the rear panel USB port to auto. This will automatically set the port to full or high speed.
	Full	Manually sets the port to full speed.

Steps

1. Connect the Type A-Type B USB cable from the PC to the rear panel USB B port.

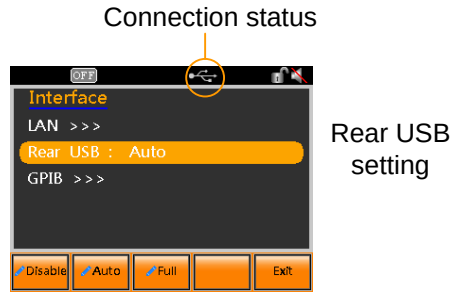
2. Press the *Utility* key. The Utility menu will appear on the display.

3. Go to the *Interface* >>> setting using the scroll wheel and press *Enter.*

4. Use the scroll wheel to go to the *Rear USB* setting and use the soft-keys to set the USB interface.

Rear USB	Disable, Auto, Full.

5. When the USB port is connected to the PC the USB icon will appear at the top of the display to show the connection status.



Exit

6. Press *Exit[F5]* to exit from the rear panel USB settings.

USB Remote Control Function Check

Functionality check	Invoke a terminal application such as Realterm. For USB communication the PSB-1000 emulates a COM port. The UART settings for the USB connection can be seen in the Windows Device Manager. To check the COM settings in Windows, see the Device Manager. For example, in Win7 go to the Control panel → Hardware and Sound → Device Manager.
⚠ Note	If you are not familiar with using a terminal application to send/receive remote commands from via a USB connection, please see page 31 for more information.
	Run this query command via the terminal after the instrument has been configured for USB remote control (page 28): *IDN? This should return the manufacturer, model number, software version and serial number: GW_INSTEK,PSB-1400L,TWXXXXXXXXXX, X.XX.XXXXXXXX Manufacturer: GWINSTEK Model number : PSB-1400L Serial number : TWXXXXXXXXXX Software version : X.XX.XXXXXXXX
⚠ Note	For further details, please see the programming manual, available on the GW Instek web site @ www.gwinstek.com.

Using Realterm to Establish a Remote Connection

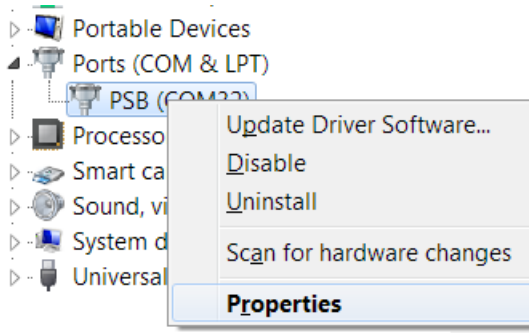
Background	Realterm is a terminal program that can be used to communicate with a device attached to the serial port of a PC or via an emulated serial port via USB. The following instructions apply to version 2.0.0.70. Even though Realterm is used as an example to establish a remote connection, any terminal program can be used that has similar functionality.
⚠ Note	Realterm can be downloaded on Sourceforge.net free of charge. For more information please see http://realterm.sourceforge.net/

Operation

1. Download Realterm and install according to the instructions on the Realterm website.
2. Connect the PSB-1000 via USB (page 28).
3. Go to the Windows device manager and find the COM port number for the connection. For example, go to the Start menu > Control Panel > Hardware and Sound > Device Manager.

   Double click the *Ports* icon to reveal the connected serial port devices and the COM port for the each connected device.

   When using USB, the baud rate, stop bit and parity settings can be viewed by right-clicking the connected device and selecting the *Properties* option.



4. Start Realterm on the PC as an administrator. Click:
   Start menu>All Programs>RealTerm>realterm

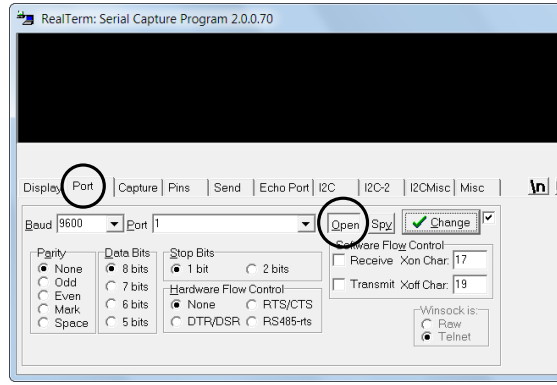
   Tip: to run as an administrator, you can right click the Realterm icon in the Windows Start menu and select the *Run as Administrator* option.

5. After Realterm has started, click on the *Port* tab.

   Enter the *Baud*, *Parity*, *Data bits*, *Stop bits* and *Port* number configuration for the connection as shown in the Device Manager.

   The *Hardware Flow Control*, *Software Flow Control* options can be left at the default settings.

   Press *Open* to connect to the PSB-1000.

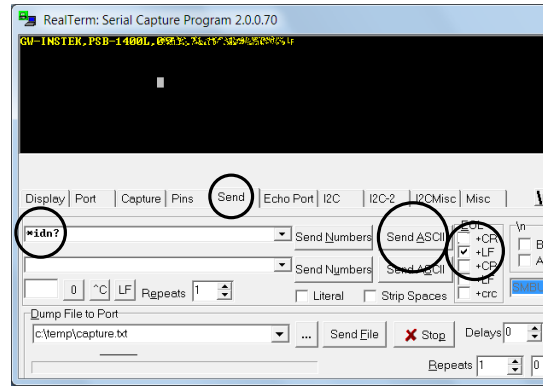


6. Click on the *Send* tab.

   In the *EOL* configuration, check on the *+LF* check boxes.

   Enter the query:
   **idn?*

   Click on *Send ASCII*.



7. The terminal display will return the following:

   GW_INSTEK,PSB-1400L,TWXXXXXXXXXX, X.XX.XXXXXXXX

(manufacturer, model, serial number, software version)

8. If Realterm fails to connect to the PSB-1000, please check all the cables and settings and try again.

Configure GPIB Interface - Optional

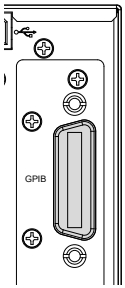
To use GPIB, the optional PSB-105 GPIB interface card must first be installed.

Note

The GPIB interface card (PSB-105) must first be installed before the GPIB interface can be used for remote control. Please see the user manual for installation details.

GPIB Configuration

1. Connect a GPIB cable from the PC to the GPIB on the interface card.



2. Press the *Utility* key. The Utility menu will appear on the display.

3. Go to the *Interface* >>> setting using the scroll wheel and press *Enter.*
4. Use the scroll wheel to go to the *GPIB* setting and press *Enter*.
5. Go to the *GPIB Control* setting and select Enable.

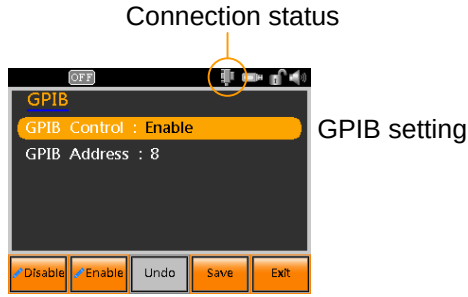
GPIB Control	Disable, Enable.

6. Go to the GPIB Address, key in the address using the keypad and then press *Enter*.

GPIB Address	0 - 30

7. Press the *[F4] Save* soft-key to save the GPIB settings.

8. The GPIB icon will appear in the status bar to indicate that the GPIB connection is enabled.



Exit

9. Press *Exit[F5]* to exit from the GPIB settings.

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

Functionality check	Please use the National Instruments Measurement & Automation Controller software to confirm GPIB/LAN functionality. See the National Instrument website, http://www.ni.com for details.
⚠ Note	For further details, please see the programming manual, available on the GW Instek web site @ www.gwinstek.com.
Operation	1. Start the NI Measurement and Automation Explorer (MAX) program. Using Windows, press: 

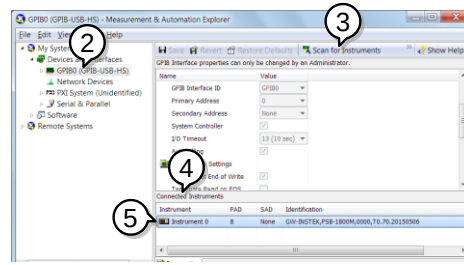
Start>All Programs>NI MAX

2. From the Configuration panel access;
   My System>Devices and Interfaces>GPIB0

3. Press the *Scan for Instruments* button.

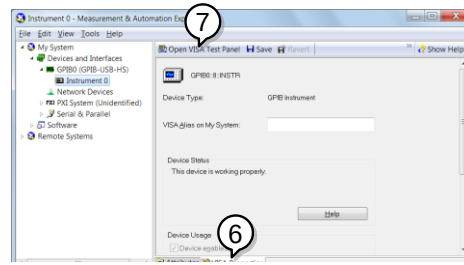
4. In the *Connected Instruments* panel the PSB-1000 should be detected as *Instrument 0* with the address the same as that configured on the PSB-1000.

5. Double click the *Instrument 0* icon.



6. Click on *Visa Properties*.

7. Click on *Open Visa Test Panel*.



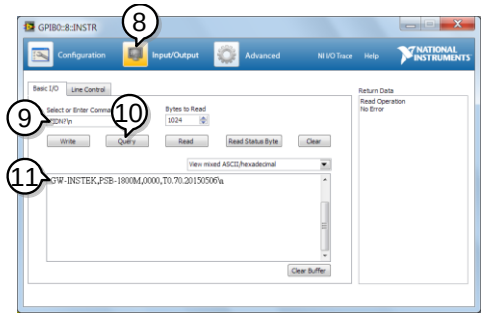
8. Click on the *Input/Output* icon.

9. Under the Basic I/O tab, ensure **IDN?* is written in the *Select or Enter Command* text box.

10. Click on the *Query* button to send the **IDN?* query to the instrument.

11. The instrument identification string will be returned to the buffer area:

    GW_INSTEK,PSB-1400L,TWXXXXXXXXXX, X.XX.XXXXXXXX
    (manufacturer, model, serial number, software version)



12. The function check is complete.

Configure Ethernet Connection

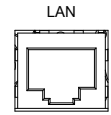
The Ethernet interface can be configured for a number of different applications. Ethernet can be configured for basic remote control or monitoring using a web server or it can be configured as a socket server.

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

Ethernet Parameters	MAC Address (display only)	Host Name (display only)
	LAN Control	DHCP
	IP Address	Subnet Mask
	Gateway	DNS Server
	Socket Control	Socket port (fixed:2268)
	Web Control	Password Control
	Web Password	

Ethernet Configuration

1. Connect a LAN cable from the PC to the Ethernet port on the rear panel.



2. Press the *Utility* key. The Utility menu will appear on the display.

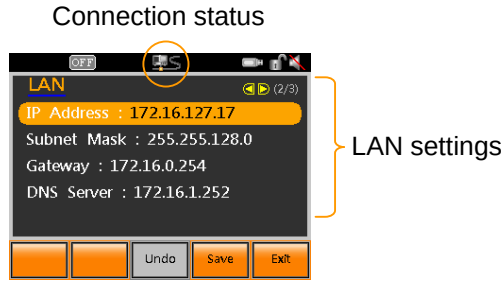
3. Go to the *Interface* >>> setting using the scroll wheel and press *Enter*.
4. Use the scroll wheel to go to the *LAN* setting and press *Enter*.
5. If the LAN cable is installed correctly, a LAN icon will appear in the status bar.

6. To automatically have the network assign an IP address, set DHCP to ON. Otherwise set DHCP to OFF to manually set the Ethernet settings.

DHCP	ON, OFF

7. If DHCP was set to OFF, configure the remaining LAN parameters.

LAN Control
IP Address
Subnet Mask
Gateway
DNS Server
Socket control
Socket port (fixed:2268)
Web control
Password control
Web password



Exit

8. Press *Exit[F5]* to exit from the LAN settings.

Web Server Remote Control Function Check

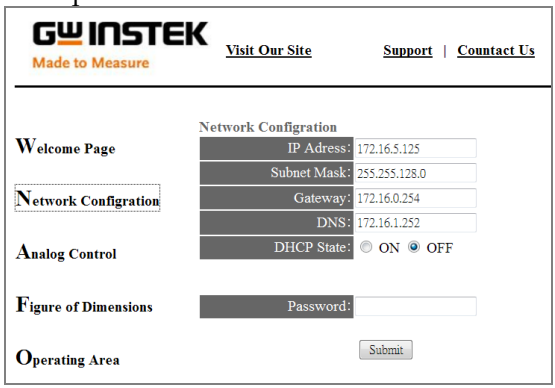
Functionality check

Enter the IP address of the power supply (for example: http:// XXX.XXX.XXX.XXX) in a web browser after the instrument has been configured for LAN(page 39).

The web interface allows you to:

- View the system and information and the network configuration.
- View the analog control pinout.
- View the dimensions of the unit.
- View the operating area

Example:



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	Firmware: V1.12 Operating System: Windows XP, 7, 8, 8.1

Functionality check

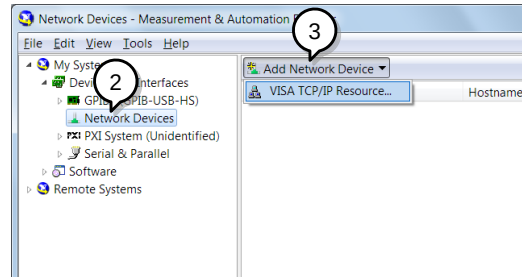
1. Start the NI Measurement and Automation Explorer (MAX) program. Using Windows, press:

   Start>All Programs>NI MAX

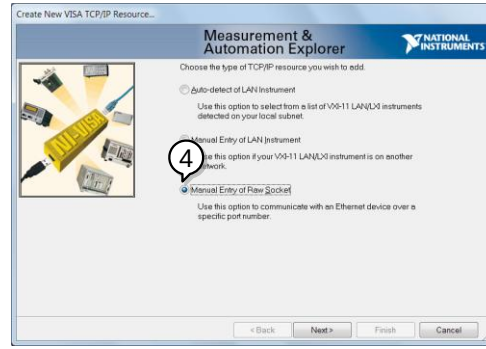
2. From the Configuration panel access;

   My System>Devices and Interfaces>Network Devices

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

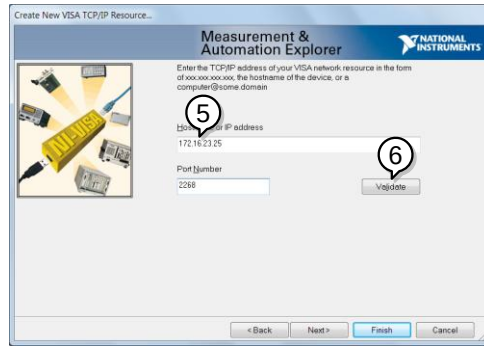


4. Select *Manual Entry of Raw Socket* from the popup window.



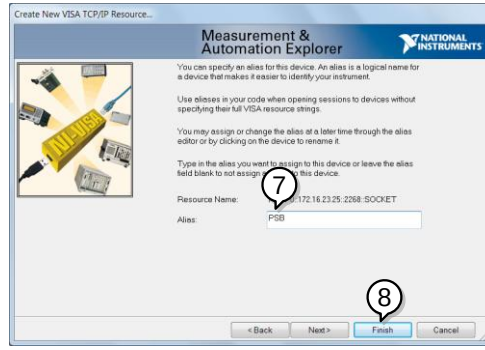
5. Enter the IP address and the port number of the PSB-1000. The port number is fixed at 2268.

6. Double click the Validate button and press *Next*.



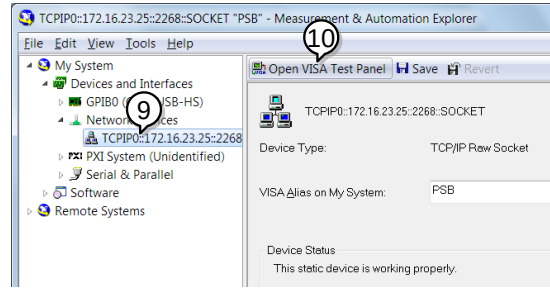
7. Next configure the Alias (name) of the PSB-1000 connection. In this example the Alias is: PSB

8. Click finish.

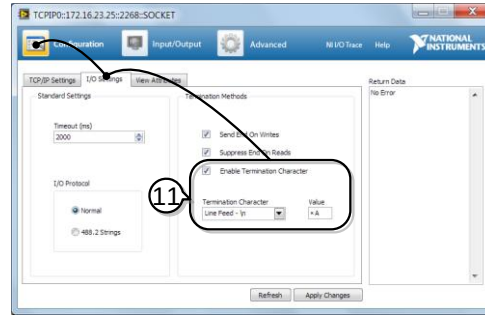


9. The IP address of the power supply will now appear under Network Devices in the configuration panel. Select this icon now.

10. Press *Open VISA Test Panel.*



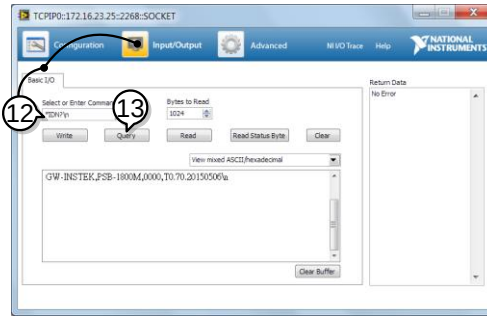
11. Click the *Configuration* Icon. Under the *IO Settings* tab check *Enable Termination Character*. The termination character should be set as *Line Feed -\n*.



12. Click the *Input/Output* icon. Under the *Basic I/O* tab, make sure **IDN?\n* is entered in the *Select or Enter Command* drop box.

13. Click Query.

    The PSB-1000 will return the machine identification string into the buffer area: *GWINSTEK,PSB-1800M, XXXX,TX.XX.XXXXXXXX*



Note

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

Error Log

The Error Log function logs the error messages from the LAN, GPIB and USB remote control and displays them on the screen.

Steps

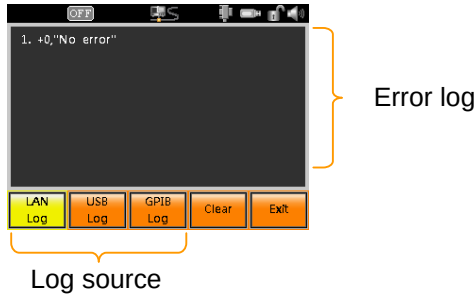
1. Press the *Utility* key. The Utility menu will appear on the display.

2. Go to the *Error Log* >>> setting using the scroll wheel and press *Enter*.

3. Use the F1 - F3 soft-keys to error log source.

Log source	LAN, USB, GPIB

4. To clear the selected log from the screen, press [F4] Clear.



Exit

5. Press *Exit[F5]* to exit from the Error Log screen.

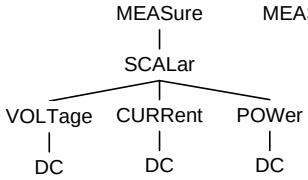
Command Syntax

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?

Query	A query is a simple or compound command followed by a question mark (?). A parameter (data) is returned.
Example	meas:curr:dc?
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?

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.

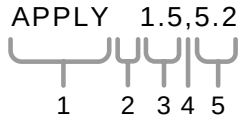
Long form	STATus:OPERation:NTRansition? STATUS:OPERATION:NTRANSITION? status:operation:ntransition?
Short form	STAT:OPER:NTR? stat:oper:ntr?

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.

For the *DISPlay[:WINDow][:STATe]* command, both "DISPlay:WINDow:STATe?" and "DISPlay?" are valid forms.

Command Format



1. Command header
2. Space
3. Parameter 1
4. Comma (no space before/after comma)
5. Parameter 2

Parameters

Type	Description	Example

<Boolean>	Boolean logic	0, 1
<NR1>	Integers	0, 1, 2, 3
<NR2>	Floating point	0.1, 3.14, 8.5
<NR3>	Exponent	4.5e-1, 8.25e+1
<NRf>	any of NR1, 2, 3	1, 1.5, 4.5e-1
<block data>	Definitive length arbitrary block data. A single decimal digit followed by data. The decimal digit specifies how many 8-bit data bytes follow.	

Message Terminator	LF	Line feed code

Command List

Source Commands

Trigger Commands

System Commands

Common Commands

Abort Commands

ABORt

Set

Description	The ABORt command will cancel any triggered actions.
Syntax	ABORt

APPLy Commands

APPLy

Set
Query

Description	The APPLy command is used to set both the voltage and current. The voltage and current will be output as soon as the function is executed if the programmed values are within the accepted range. An execution error will occur if the programmed values are not within accepted ranges.	
Syntax	APPLy {<voltage>|MIN|MAX}[,{<current>|MIN|MAX}]	
Query Syntax	APPLy?	
Parameter	<voltage>	<NRf> 0% - 105% of the rated output voltage.
	<current>	<NRf> 0% - 105% of the rated output current.
	MIN	0 volts/0 amps
	MAX	Maximum value for the present range.
Return parameter	<NRf>	Returns the voltage and current.
Example	APPL 5.05,1.1 Sets the voltage and current to 5.05V and 1.1A.	

Query Example	APPL? +5.050, +1.100 Returns voltage (5.05V) and current (1.1A) setting.

Display Commands

DISPlay:BRIGhtness

Set → Query →

Description	Controls the brightness of the display as a percentage.
Syntax	DISPlay:BRIGhtness <NR1>
Query Sytax	DISPlay:BRIGhtness?

Parameter/ Return parameter	<NR1>	Description
	1 to 100	Brightness as a percentage from 1% to 100%.

Example	DISP:BRIG 50 Sets the display brightness to 50%.

DISPlay:CONTrast

Set → Query →

Description	Controls the contrast level of the display as a percentage.
Syntax	DISPlay:CONTrast <NR1>
Query Sytax	DISPlay:CONTrast?

Parameter/ Return parameter	<NR1>	Description
	1 to 100	Contrast as a percentage from 1% to 100%.

Example	DISP:CONT 50 Sets the display contrast to 50%.

DISPlay:ENABle

Set → / → Query

Description	Controls whether the whole display is visible.	
Syntax	DISPlay:ENABle { 0 | 1 | OFF | ON }	
Query Sytax	DISPlay:ENABle?	
Parameter	0	<NR1>Display is invisible
	OFF	Display is invisible
	1	<NR1> Display is visible
	ON	Display is visible
Return parameter	0	<NR1>Display is visible
	1	<NR1> Display is invisible
Example	DISP:ENAB ON Display is visible.	

DISPlay[:WINDow][:STATe]

Set → / → Query

Description	Disables or enables the visibility of the user text window.	
Syntax	DISPlay[:WINDow][:STATe] { 0 | 1 | OFF | ON }	
Query Sytax	DISPlay[:WINDow][:STATe]?	
Parameter	0	<NR1>Window is invisible
	OFF	Window is invisible
	1	<NR1> Window is visible
	ON	Window is visible
Return parameter	0	<NR1> Window is visible
	1	<NR1> Window is invisible
Example	DISP ON Enables the display.	

DISPlay[:WINDow]:TEXT:COLor

Set → / → Query

Description	Sets or returns the color of the user text window.	
Syntax	DISPlay[:WINDow]:TEXT:COLor { <NR1> | BLACK | BLUE | CYAN | GRAY | GREEN | LIME | MAGENTA | MAROON | NAVY | OLIVE | PURPLE | RED | SILVER | TEAL | WHITE | YELLOW}	
Parameter	BLACK BLUE CYAN GRAY GREEN LIME MAGENTA MAROON NAVY OLIVE PURPLE RED SILVER TEAL WHITE YELLOW	
Query Syntax	DISPlay[:WINDow]:TEXT:COLor?	
Return parameter	<NR1>	Color
	0	BLACK
	1	BLUE
	2	CYAN
	3	GRAY
	4	GREEN
	5	LIME
	6	MAGENTA
	7	MAROON
	8	NAVY
	9	OLIVE
	10	PURPLE
	11	RED
	12	SILVER

	13	TEAL
	14	WHITE
	15	YELLOW

Example DISP:TEXT:COL RED

Sets the text color to red.

DISPlay[:WINDow]:TEXT:STATe

Set → / → Query

Description	Controls whether the TEXT is visible or not in the user text window.	
Syntax	DISPlay[:WINDow]:TEXT:STATe { 0 | 1 | OFF | ON }	
Query Sytax	DISPlay[:WINDow]:TEXT:STATe?	
Parameter	0	<NR1>Text is invisible
	OFF	Text is invisible
	1	<NR1> Text is visible
	ON	Text is visible
Return parameter	0	<NR1> Text is visible
	1	<NR1> Text is invisible

Example DISP:TEXT:STAT ON

Text is set to visible.

DISPlay[:WINDow]:TEXT:CLEar

Set →

Description	Clears the text on the main screen from the DISPlay[:WINDow]:TEXT[:DATA] command .
Syntax	DISPlay[:WINDow]:TEXT:CLEar

DISPlay[:WINDow]:TEXT[:DATA]

Set → / → Query

Description	Sets or queries the data text that will be written to the display in the user text window. Writing to the display will overwrite data that is currently on the screen. Overwriting a display area with a shorter string may or may not overwrite the screen. The string must be enclosed in quotes: "STRING". Only ASCII characters 20H to 7EH can be used in the <string>.	
Syntax	DISPlay[:WINDow]:TEXT[:DATA] <string>	
Query Syntax	DISPlay[:WINDow]:TEXT[:DATA]?	
Parameter/ Return parameter	<string>	ASCII character 20H to 7EH can be used to in the string parameter. The string must be enclosed in quotes: "STRING"
Example	DISP:WIND:TEXT:DATA "STRING" Writes STRING to the display.	
Query Example	DISP:WIND:TEXT:DATA? "STRING" Returns the text data string on the screen.	

DISPlay:BLINk

Set → / → Query

Description	Turns blink on or off for the user text window.	
Syntax	DISPlay:BLINk { 0 | 1 | OFF | ON }	
Query Syntax	DISPlay:BLINk?	
Parameter	0	<NR1>Turns blink OFF
	OFF	Turns blink OFF
	1	<NR1> Turns blink ON
	ON	Turns blink ON
Return parameter	0	<NR1>Turns blink OFF
	1	<NR1>Turns blink ON
Example	DISP:BLIN 1 Turns blink ON.	

Initiate Commands

INITiate[:IMMediate]:NAME

Set →

Description	The INITiate command starts the TRANsient or OUTPut trigger. See the trigger commands on page 86 for usage details.	
Syntax	INITiate[:IMMediate]:NAME {TRANsient|OUTPut}	
Parameter	TRANSient	Starts the TRANsient trigger.
	OUTPut	Starts the OUTPut trigger.
Example	INITiate:NAME TRANient Starts the TRANSient trigger.	

Measure Commands

MEASure[:SCALar]:CURRent[:DC] → Query

Description	Takes a measurement and returns the average output current
Syntax	MEASure[:SCALar]:CURRent[:DC]?
Return parameter	<NRf> Returns the current in amps.

MEASure[:SCALar]:VOLTage[:DC] → Query

Description	Takes a measurement and returns the average output voltage.
Syntax	MEASure[:SCALar]:VOLTage[:DC]?
Return	<NRf> Returns the voltage in volts.

MEASure[:SCALar]:POWer[:DC] → Query

Description	Takes a measurement and returns the average output power.
Syntax	MEASure[:SCALar]:POWer[:DC]?
Return	<NRf> Returns the power measured in watts.

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 <NRf>	
Query Syntax	OUTPut:DELay:ON?	
Parameter	<NRf>	0.00-100.00 seconds, where 0=no delay.
Return parameter	<NRf>	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 <NRf>	
Return Syntax	OUTPut:DELay:OFF?	
Parameter	<NRf>	0.00-100.00 seconds, where 0=no delay.
Return parameter	<NRf>	Returns the delay off time in seconds until the output is turned off.

OUTPut:MODE

Set → / → Query

Description	Sets or returns the slew rate control settings.	
Syntax	OUTPut:MODE {<NR1>|CVHS|CCHS|CVLS|CCLS}	
Return Syntax	OUTPut:MODE?	
Parameter	0	CV high speed priority
	CVHS	CV high speed priority
	1	CC high speed priority
	CCHS	CC high speed priority
	2	CV slow speed priority
	CVLS	CV slow speed priority
	3	CC slow speed priority
	CCLS	CC slow speed priority
Return parameter	<NR1>	Returns the output mode.

OUTPut[:STATe][:IMMediate]

Set → / → Query

Description	Turns the output on or off.	
Syntax	OUTPut[:STATe][:IMMediate] { OFF | ON | 0 | 1 }	
Query Syntax	OUTPut[:STATe][:IMMediate]?	
Parameter	0	<NR1> Turns the output off.
	OFF	Turns the output off.
	1	<NR1> Turns the output on.
	ON	Turns the output on.
Return parameter	<NR1>	Returns output status of the instrument.

OUTPut[:STATe]:TRIGgered

Set → / → Query

Description	Turns the output on or off when a software trigger is generated.	
Syntax	OUTPut[:STATe]:TRIGgered { OFF | ON | 0 | 1 }	
Query Syntax	OUTPut[:STATe]:TRIGgered?	
Parameter	0	<NR1>Turns the output off when a software trigger is generated.

	OFF	Turns the output off when a software trigger is generated.
	1	<NR1>Turns the output on when a software trigger is generated.
	ON	Turns the output on when a software trigger is generated.
Return parameter	<NR1>	Returns output trigger status of the instrument.

OUTPut:PROTection:CLEar

Set

Description	Clears over-voltage, over-current and over-temperature (OVP, OCP, OTP) protection circuits. It also clears the shutdown protection circuit. The AC failure protection cannot be cleared.
Syntax	OUTPut:PROTection:CLEar

OUTPut:PROTection:TRIPped

Query

Description	Returns the state of the protection circuits (OVP, OCP, OTP).	
Query Syntax	OUTPut:PROTection:TRIPped?	
Return parameter	0	<NR1>Protection circuits are not tripped.
	1	<NR1>Protection circuits are tripped.

OUTPut:TRIGger:POLarity

Set

Query

Description	Sets or returns the polarity of the trigger signal output (TRIG OUT).	
Syntax	OUTPut:TRIGger:POLarity {0 | 1 | POSitive | NEGative}	
Query Syntax	OUTPut:TRIGger:POLarity?	
Parameter	0	<NR1> Positive polarity.
	POSitive	Positive polarity
	1	<NR1> Negative polarity
	NEGative	Negative polarity

Return parameter	<NR1>	Returns the polarity of the trigger signal output (TRIG OUT).

OUTPut:VTRigger:CONTrol

Set → / → Query

Description	Sets or returns the voltage trigger output control settings (VOLT TRIG).	
Syntax	OUTPut:VTRigger:CONTrol {0 | 1 | DISable | ENABle}	
Query Syntax	OUTPut:VTRigger:CONTrol?	
Parameter	0 DISable 1 ENABle	<NR1> Disable. Disable <NR1> Enable Enable
Return parameter	<NR1>	Returns the voltage trigger output control settings (VOLT TRIG).

OUTPut:VTRigger:POLarity

Set → / → Query

Description	Sets or returns the polarity of voltage trigger output (VOLT TRIG).	
Syntax	OUTPut:VTRigger:POLarity {0 | 1 | POSitive | NEGative}	
Query Syntax	OUTPut:VTRigger:POLarity?	
Parameter	0 POSitive 1 NEGative	<NR1> Positive Positive <NR1> Negative Negative
Return parameter	<NR1>	Returns the polarity of the voltage trigger output (VOLT TRIG).

OUTPut:VTRigger:STATe?

→ Query

Description	Returns the state of the voltage trigger output (VOLT TRIG).
Query Syntax	OUTPut:VTRigger:STATe?

Return parameter	0	<NR1>LOW.
	1	<NR1>HIGH.

OUTPut:VTRigger:VT<1|2>

Set → / → Query

Description	Sets or returns the Vt1 or Vt2 setting of the voltage trigger output (VOLT TRIG).
Syntax	OUTPut:VTRigger:VT<1|2> {<NRf>|MIN|MAX}
Query Syntax	OUTPut:VTRigger:VT<1|2>? [MIN|MAX]

Parameter/Return	<NRf>	0~105% of the rated output voltage in volts.
	MIN	Minimum voltage level.
	MAX	Maximum voltage level.

Input Commands

INPut:TRIGger:POLarity

Set
Query

Description	Sets or returns the polarity of the trigger signal input (TRIG IN).	
Syntax	INPut:TRIGger:POLarity {0 | 1 | POSitive | NEGative}	
Query Syntax	INPut:TRIGger:POLarity?	
Parameter	0	<NR1> Positive
	POSitive	Positive
	1	<NR1> Negative
	NEGative	Negative
Return parameter	<NR1>	Returns the polarity of the trigger signal input (TRIG IN).

Sense Commands

SENSe:AVERage:COUNt

Set
Query

Description	Determines the level of smoothing for the average setting.	
Syntax	SENSe:AVERage:COUNt {<NR1>| LOW | MIDDle | HIGH}	
Query Syntax	SENSe:AVERage:COUNt?	
Parameter	0 | LOW	Low level of smoothing.
	1 | MIDDle	Middle level of smoothing.
	2 | HIGH	High level of smoothing.
Return parameter	<NR1>	Returns the level of smoothing.
	0	Low level of smoothing.
	1	Middle level of smoothing.
	2	High level of smoothing.
Example	SENSe:AVERage:COUNt 1 Sets the level of smoothing to middle.	

Status Commands

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 <NRf>	
Query Syntax	STATus:OPERation:ENABle?	
Parameter	<NRf>	0-32767
Return parameter	<NR1>	0-32767

STATus:OPERation:PTRansition

Set → / → Query

Description	Sets or queries the bit sum of the positive transition filter of the Operation Status register.	
Syntax	STATus:OPERation:PTRansition <NRf> STATus:OPERation:PTRansition?	
Parameter	<NRf>	0-32767
Return parameter	<NR1>	0-32767

STATus:OPERation:NTRansition

Set → / → Query

Description	Sets or queries the bit sum of the negative transition filter of the Operation Status register.	
Syntax	STATus:OPERation:NTRansition <NRf>	
Query Syntax	STATus:OPERation:NTRansition?	
Parameter	<NRf>	0-32767
Return parameter	<NR1>	0-32767

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.	
Query Syntax	STATus:QUEStionable[:EVENt]?	
Parameter	<NRf>	0-32767
Return parameter	<NR1>	0-32767

STATus:QUEStionable:CONDition → Query

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

STATus:QUEStionable:ENABle → Set / → Query

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

STATus:QUEStionable:PTRansition → Set / → Query

Description	Sets or queries the bit sum of the positive transition filter of the Questionable Status register.	
Syntax	STATus:QUEStionable:PTRansition <NRf>	
Return Syntax	STATus:QUEStionable:PTRansition?	
Parameter	<NRf>	0-32767
Return parameter	<NR1>	0-32767

STATus:QUEStionable:NTRansition → Set / → Query

Description	Sets or queries the negative transition filter of the Questionable Status register.
Syntax	STATus:QUEStionable:NTRansition <NRf>
Query Syntax	STATus:QUEStionable:NTRansition?

Parameter	<NRf>	0-32767
Return parameter	<NR1>	0-32767

STATus:PRESet

Set

Description

This command resets the ENABle register, the PTRansistion filter and NTRansistion filter on the Operation Status and Questionable Status Registers. The registers/filters will be reset to a default value.

Default Register/Filter Values	Setting
QUEStionable Status Enable	0x0000
QUEStionable Status Positive Transition	0x7FFF
QUEStionable Status Negative Transition	0x0000
Operation Status Enable	0x0000
Operation Status Positive Transition	0x7FFF
Operation Status Negative Transition	0x0000

Summary: The Questionable Status Enable registers and the Operation Status Enable registers are both reset to 0.

The Questionable Status and Operation Status Positive Transition filters are all set high (0x7FFF) and the Negative Transition filters are all set low (0x0000). I.e., only positive transitions will be recognized for the Questionable Status and Operation Status registers.

Syntax

STATus:PRESet

Source Commands

[SOURce:]CURRent[:LEVel][:IMMediate][:AMPLitude]

Set → / → Query

Description	Sets or queries the current level in amps. For externally set current levels (from the analog control connector) the set current level is returned.
Syntax	[SOURce:]CURRent[:LEVel][:IMMediate][:AMPLitude] {<NRf>|MIN|MAX|DEF1|DEF2|DEF3}
Query Syntax	[SOURce:]CURRent[:LEVel][:IMMediate][:AMPLitude]? [MIN|MAX|DEF1|DEF2|DEF3]

Parameter/Return	<NRf>	0-105% of the rated current output level.
	MIN	Minimum current level.
	MAX	Maximum current level.
	DEF1	User defined setting 1.
	DEF2	User defined setting 2.
	DEF3	User defined setting 3.
Example	SOUR:CURR:LEV:IMM:AMPL? MAX 37.800 Returns the maximum possible current level in amps.	

[SOURce:]CURRent:DEF<1|2|3>

Set → Query

Description	Sets or returns the current of the user defined settings.
Syntax	[SOURce:]CURRent:DEF<1|2|3> {<NRf>|MIN|MAX}
Query Syntax	[SOURce:]CURRent:DEF<1|2|3>? [MIN|MAX]

Parameter/Return	1	DEF1
	2	DEF2
	3	DEF3
	<NRf>	0~105% of the rated current output level.
	MIN	Minimum current level.
	MAX	Maximum current level.
Example	SOUR:CURR:DEF1 MAX Sets the DEF1 to the maximum current level.	

[SOURce:]CURRent:STEP

Set → Query

Description	Sets or returns the current Step↗& Step↘preset settings.
Syntax	[SOURce:]CURRent:STEP {<rise>| MIN | MAX},{<fall>| MIN | MAX}
Query Syntax	[SOURce:]CURRent:STEP? [MIN|MAX]

Parameter/Return	<rise>	<NRf> Step↗, 0 ~ 105% of the rated current output level.
	<fall>	<NRf> Step↘, 0 ~ 105% of the rated current output level.
	MIN	Minimum current level.
	MAX	Maximum current level.
Example	SOUR:CURR:STEP MAX,MAX Sets the Step↗& Step↘preset settings to the maximum.	

[SOURce:]CURRent:STEP:RISing

Set → / → Query

Description	Sets or returns the preset current Step↗ settings.
Syntax	[SOURce:]CURRent:STEP:RISing {<NRf>| MIN | MAX}
Query Syntax	[SOURce:]CURRent:STEP:RISing? [MIN|MAX]
Parameter/Return	<NRf> 0~105% of the rated current output level. MIN Minimum current level. MAX Maximum current level.
Example	SOUR:CURR:STEP:RIS MAX Sets the current Step↗ to the maximum.

[SOURce:]CURRent:STEP:FALLing

Set → / → Query

Description	Sets or returns the preset current Step↘ settings.
Syntax	[SOURce:]CURRent:STEP:FALLing {<NRf>| MIN | MAX}
Query Syntax	[SOURce:]CURRent:STEP:FALLing? [MIN|MAX]
Parameter/Return	<NRf> 0~105% of the rated current output level. MIN Minimum current level. MAX Maximum current level.
Example	SOUR:CURR:STEP:FALL MAX Sets the current Step↘ to the maximum.

[SOURce:]CURRent[:LEVel]:TRIGgered[:AMPLitude]

Set → Query

Description	Sets or queries the current level in amps when a software trigger has been generated.	
Syntax	[SOURce:]CURRent[:LEVel]:TRIGgered[:AMPLitude] {<NRf>|MIN|MAX}	
Query Syntax	[SOURce:]CURRent[:LEVel]:TRIGgered[:AMPLitude]? [MIN|MAX]	
Parameter/Return	<NRf>	0%-105% of the rated current output in amps.
	MIN	Minimum current level.
	MAX	Maximum current level.
Example	SOUR:CURR:LEV:TRIG:AMPL? MAX 37.800 Returns the maximum possible current level in amps.	

[SOURce:]CURRent:PROTection[:LEVel]

Set → Query

Description	Sets or queries the OCP (over-current protection) level in amps.	
Syntax	[SOURce:]CURRent:PROTection[:LEVel] {<NRf>|MIN|MAX|DEF1|DEF2|DEF3}	
Query Syntax	[SOURce:]CURRent:PROTection[:LEVel]? [MIN|MAX|DEF1|DEF2|DEF3]	
Parameter/Return	<NRf>	4 - 44A (1400L) 1 - 11A (1400M) 5 - 88A (1800L) 2 - 22A (1800M)
	MIN	Minimum OCP level.
	MAX	Maximum OCP level.
	DEF1	User defined setting 1.
	DEF2	User defined setting 2.
	DEF3	User defined setting 3.

Example	SOUR:CURR:PROT:LEV? MIN +3.600 Returns the minimum possible current level in amps.

[SOURce:]CURRent:PROTection :DEF<1|2|3>

Set → Query

Description	Sets or returns the user defined over-current protection settings.
Syntax	[SOURce:]CURRent:PROTection:DEF<1|2|3> {<NRf>|MIN|MAX}
Query Syntax	[SOURce:]CURRent:PROTection:DEF<1|2|3>? [MIN|MAX]

Parameter/Return		
	1	DEF1
	2	DEF2
	3	DEF3
	<NRf>	4 - 44A (1400L) 1 - 11A (1400M) 5 - 88A (1800L) 2 - 22A (1800M)
	MIN	Minimum OCP level.
	MAX	Maximum OCP level.

Example	SOUR:CURR:PROT:DEF1 MIN Sets DEF1 to the minimum OCP level.

[SOURce:]CURRent:PROTection:DELay [:TIME]

Set → Query

Description	Sets or returns the OCP delay time.
Syntax	[SOURce:]CURRent:PROTection:DELay[:TIME] {<NRf>|MIN|MAX|DEF}
Query Syntax	[SOURce:]CURRent:PROTection:DELay[:TIME]? [MIN|MAX]

Parameter/Return	<NRf>	0.1~2.0 sec
	MIN	0.1 sec
	MAX	2.0 sec
	DEF	System defined setting

[SOURce:]CURRent:PROTection:STATe

Set → Query

Description	Turns OCP (over-current protection) on or off.	
Syntax	[SOURce:]CURRent:PROTection:STATe {0|1|OFF|ON}	
Query Syntax	[SOURce:]CURRent:PROTection:STATe?	
Parameter/Return	0	<NR1> Turns the buzzer off.
	OFF	Turns the OCP off.
	1	<NR1> Turns the OCP on.
	ON	Turns the OCP on.
Return parameter	<Bool>	Returns the protection status (0 or 1).
Example	SOUR:CURR:PROT:STAT OFF Turns OCP off.	

[SOURce:]CURRent:SLEW:RISing

Set → Query

Description	Sets or queries the rising current slew rate. This is only applicable for CC slew rate priority mode.	
Syntax	[SOURce:]CURRent:SLEW:RISing {<NRf>|MIN|MAX}	
Query Syntax	[SOURce:]CURRent:SLEW:RISing? [MIN|MAX]	
Parameter/Return	<NRf>	0.01 - (rating current x 2)
	MIN	Minimum rising current slew rate.
	MAX	Maximum rising current slew rate.
Example	SOUR:CURR:SLEW:RIS 72 Sets the rising current slew rate to 72A/s.	

[SOURce:]CURRent:SLEW:FALLing

Set → Query

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

Syntax	[SOURce:]CURRent:SLEW:FALLing {<NRf>|MIN|MAX}	
Query Syntax	[SOURce:]CURRent:SLEW:FALLing? [MIN|MAX]	
Parameter/Return	NRf	0.01 - (rating current x 2)
	MIN	Minimum falling current slew rate
	MAX	Maximum falling current slew rate
Example	SOUR:CURR:SLEW:FALL 1 Sets the falling current slew rate to 1A/s.	

[SOURce:]RESistance[:LEVel][:IMMediate][:AMPLitude]

Set / Query

Description	Sets or queries the internal resistance in ohms.	
Syntax	[SOURce:]RESistance[:LEVel][:IMMediate][:AMPLitude] {<NRf>|MIN|DEF|MAX|?}	
Query Syntax	[SOURce:]RESistance[:LEVel][:IMMediate][:AMPLitude] ? [MIN|MAX]	
Parameter/Return	<NRf>	Resistance in ohms: 0.000Ω - 1.000Ω (PSB-1400L) 0.000Ω - 16.00Ω (PSB-1400M) 0.000Ω - 0.500Ω (PSB-1800L) 0.000Ω - 8.000Ω (PSB-1800M)
	MIN	Minimum internal resistance in ohms
	MAX	Maximum internal resistance in ohms
Example	SOUR:RES:LEV:IMM:AMPL 0.1 Sets the internal resistance to 100mΩ.	

[SOURce:]VOLTage[:LEVel][:IMMediate][:AMPLitude]

Set / Query

Description	Sets or queries the voltage level in volts.
Syntax	[SOURce:]VOLTage[:LEVel][:IMMediate][:AMPLitude] {<NRf>|MIN|MAX|DEF1|DEF2|DEF3}
Query Syntax	[SOURce:]VOLTage[:LEVel][:IMMediate][:AMPLitude]? [MIN|MAX|DEF1|DEF2|DEF3]

Parameter/Return	<NRf>	0-105% of the rated output voltage in volts.
	MIN	Minimum voltage level
	MAX	Maximum voltage level
	DEF1	User defined setting 1.
	DEF2	User defined setting 2.
	DEF3	User defined setting 3.
Example	SOUR:VOLT:LEV:IMM:AMPL 10 Sets the voltage level to 10 volts.	

[SOURce:]VOLTage:DEF<1|2|3>

Set → Query

Description	Sets or returns the user defined voltage settings.
Syntax	[SOURce:]VOLTage:DEF<1|2|3> {<NRf>|MIN|MAX}
Query Syntax	[SOURce:]VOLTage:DEF<1|2|3>? [MIN|MAX]

Parameter/Return	1	DEF1
	2	DEF2
	3	DEF3
	<NRf>	0~105% of the rated output voltage in volts.
	MIN	Minimum voltage level.
	MAX	Maximum voltage level.
Example	SOUR:VOLT:DEF1 MIN Sets DEF1 to the minimum voltage level.	

[SOURce:]VOLTage:STEP

Set → Query

Description	Sets or returns the preset voltage Step↗& Step↘ settings.
Syntax	[SOURce:]VOLTage:STEP {<rise>| MIN | MAX},{<fall>| MIN | MAX}
Query Syntax	[SOURce:]VOLTage:STEP? [MIN|MAX]

Parameter/Return	<rise>	<NRf> Step↗, 0 ~ 105% of the rated voltage output level.
	<fall>	<NRf> Step↘, 0 ~ 105% of the rated voltage output level.
	MIN	Minimum voltage level.
	MAX	Maximum voltage level.
Example	SOUR:VOLT:STEP MAX,MAX Sets the preset Step↗& Step↘ settings to the maximum.	

[SOURce:]VOLTage:STEP:RISing

Set → / → Query

Description	Sets or returns the preset voltage Step ↗ settings.
Syntax	[SOURce:]VOLTage:STEP:RISing {<NRf>| MIN | MAX}
Query Syntax	[SOURce:]VOLTage:STEP:RISing? [MIN|MAX]
Parameter/Return	<NRf> 0~105% of the rated voltage output level. MIN Minimum voltage level. MAX Maximum voltage level.
Example	SOUR:VOLT:STEP:RIS MAX Sets the voltage Step↗ to the maximum.

[SOURce:]VOLTage:STEP:FALLing

Set → / → Query

Description	Sets or returns the preset voltage Step↘ settings.
Syntax	[SOURce:]VOLTage:STEP:FALLing {<NRf>| MIN | MAX}
Query Syntax	[SOURce:]VOLTage:STEP:FALLing? [MIN|MAX]
Parameter/Return	<NRf> 0~105% of the rated voltage output level. MIN Minimum voltage level. MAX Maximum voltage level.
Example	SOUR:VOLT:STEP:FALL MAX Sets the voltage Step↘ to the maximum.

[SOURce:]VOLTage[:LEVel]:TRIGgered[:AMPLitude]

Set → Query

Description	Sets or queries the voltage level in volts when a software trigger has been generated.	
Syntax	[SOURce:]VOLTage[:LEVel]:TRIGgered[:AMPLitude] {<NRf>|MIN|MAX}	
Query Syntax	[SOURce:]VOLTage[:LEVel]:TRIGgered[:AMPLitude]? [MIN|MAX]	
Parameter/Return	<NRf>	0%-105% of the rated voltage output in volts.
	MIN	Minimum current level.
	MAX	Maximum current level.
Example	SOUR:VOLT:LEV:TRIG:AMPL 10 Sets the voltage level to 10 volts when a software trigger is generated.	

[SOURce:]VOLTage:PROTection[:LEVel]

Set → Query

Description	Sets or queries the overvoltage protection level.	
Syntax	[SOURce:]VOLTage:PROTection[:LEVel] {<NRf>|MIN|MAX|DEF1|DEF2|DEF3}	
Query Syntax	[SOURce:]VOLTage:PROTection[:LEVel]? [MIN|MAX|DEF1|DEF2|DEF3]	
Parameter/Return	<NRf>	4 - 44V (1400L) 5 - 176V (1400M) 4 - 44V (1800L) 5 - 176V (1800M)
	MIN	Minimum OVP level
	MAX	Maximum OVP level
	DEF1	User defined setting 1
	DEF2	User defined setting 2
	DEF3	User defined setting 2
Example	SOUR:VOLT:PROT:LEV MAX Sets the OVP level to its maximum.	

[SOURce:]VOLTage:PROTection :DEF<1|2|3>

Set → / → Query

Description	Sets or returns the user defined OVP settings.	
Syntax	[SOURce:]VOLTage:PROTection:DEF<1|2|3> {<NRf>|MIN|MAX}	
Query Syntax	[SOURce:]VOLTage:PROTection:DEF<1|2|3>? [MIN|MAX]	
Parameter/Return	<NRf>	4 ~ 44V (1400L) 5 ~ 176V (1400M) 4 ~ 44V (1800L) 5 ~ 176V (1800M)
	MIN	Minimum OVP level.
	MAX	Maximum OVP level.
Example	SOUR:VOLT:PROT:DEF1 MIN Sets DEF1 to the minimum OVP level.	

[SOURce:]VOLTage:SLEW:RISing

Set → / → Query

Description	Sets or queries the rising voltage slew rate. This is only applicable for CV slew rate priority mode.	
Syntax	[SOURce:]VOLTage:SLEW:RISing {<NRf>|MIN|MAX}	
Query Syntax	[SOURce:]VOLTage:SLEW:RISing? [MIN|MAX]	
Parameter/Return	<NRf>	0.01 - (rating voltage x 2)
	MIN	Minimum rising voltage slew rate.
	MAX	Maximum rising voltage slew rate.
Example	SOUR:VOLT:SLEW:RIS MAX Sets the rising voltage slew rate to its maximum.	

[SOURce:]VOLTage:SLEW:FALLing

Set → / → Query

Description	Sets or queries the falling voltage slew rate. This is only applicable for CV slew rate priority mode.

Syntax	[SOURce:]VOLTage:SLEW:FALLing {<NRf>|MIN|MAX}	
Query Syntax	[SOURce:]VOLTage:SLEW:FALLing? [MIN|MAX]	
Parameter/Return	<NRf>	0.01 - (rating voltage x 2)
	MIN	Minimum voltage falling slew rate.
	MAX	Maximum voltage falling slew rate.
Example	SOUR:VOLT:SLEW:FALL MIN Sets the falling voltage slew rate to its minimum.	

Trigger Commands

The trigger commands generate and configure software triggers.

TRIGger:TRANsient[:IMMediate]

Set →

Description	Generates a software trigger for the transient trigger system. On a trigger, sets the voltage & current. Refer to the :CURR:TRIG and VOLT:TRIG commands on page 77 and 83, respectively.
Syntax	TRIGger:TRANsient[:IMMediate]
Related Commands	[SOURce:]CURRent[:LEVel]:TRIGgered[:AMPLitude] [SOURce:]VOLTage[:LEVel]:TRIGgered[:AMPLitude]

TRIGger:TRANsient:SOURce

Set →
→ Query

Description	Sets or queries the trigger source for the transient system.	
Syntax	TRIGger:TRANsient:SOURce {BUS | IMMediate}	
Query Syntax	TRIGger:TRANsient:SOURce?	
Parameter/Return	BUS	Internal software trigger. Waits for the *TRG (or IEEE 488.1 "get" group execute trigger) command to start the trigger.
	IMMediate	Starts the trigger immediately. (default)
Example	TRIG:TRAN:SOUR BUS Sets the trigger source as BUS.	

TRIGger:OUTPut[:IMMediate] Set

Description	Generates a software trigger for the output trigger system. On a trigger, sets the output state. Refer to the :OUTP:TRIG command on page 64.
Syntax	TRIGger:OUTPut[:IMMediate]
Related commands	OUTPut[:STATe]:TRIGgered

TRIGger:OUTPut:SOURce Set Query

Description	Sets or queries the trigger source for the output system.	
Syntax	TRIGger:OUTPut:SOURce [BUS | IMMediate]	
Query Syntax	TRIGger:OUTPut:SOURce?	
Parameter/Return	BUS	Internal software trigger. Waits for the *TRG (or IEEE 488.1 "get" group execute trigger) command to start the trigger.
	IMMediate	Starts the trigger immediately. (default)
Example	TRIG:OUTP:SOUR BUS Sets the trigger source of the output system as BUS.	

Trigger Command Examples

1. The transient system for the trigger in immediate mode.

Example 1	TRIG:TRAN:SOUR IMM	
	CURR:TRIG MAX	
	VOLT:TRIG 5	
	INIT:NAME TRAN	<==The current changes to the maximum, and the voltage changes to 5V.

2. The transient system for the trigger in BUS mode.

Example 2	TRIG:TRAN:SOUR BUS	
	CURR:TRIG MAX	
	VOLT:TRIG 5	
	INIT:NAME TRAN	
	TRIG:TRAN (or *TRG)	<==The current changes to the maximum, and the voltage changes to 5V.

3. The output system for the trigger in immediate mode.

Example 3	TRIG:OUTP:SOUR IMM	
	OUTP:TRIG 1	
	INIT:NAME OUTP	<==The output changes to ON.

4. The output system for the trigger in BUS mode.

Example 4	TRIG:OUTP:SOUR BUS	
	OUTP:TRIG 1	
	INIT:NAME OUTP	
	TRIG:OUTP (or *TRG)	<==The output changes to ON.

System Function Command

SYSTem:BEEPer[:IMMediate]

Set → / → Query

Description	This command causes an audible tone to be generated by the instrument. The duration time is specified in seconds.	
Syntax	SYSTem:BEEPer[:IMMediate] {<NR1>|MINimum|MAXimum}	
Query Syntax	SYSTem:BEEPer[:IMMediate]? [MINimum|MAXimum]	
Parameter	<NR1>	0 - 3600 seconds.
	MINimum	Sets the beeper time to the minimum (0 seconds)
	MAXimum	Sets the beeper time to the maximum (3600 seconds)
Return parameter	<NR1>	Returns the remaining beeper duration time in seconds or returns the maximum or minimum beeper time in seconds (for the [MINimum | MAXimum] query parameters).
Example 1	SYST:BEEP 10 **after a 2 second wait** SYST:BEEP? >8 The first command turns the beeper on for 10 seconds. After 2 seconds the SYST:BEEP? query returns the remaining beeper time (8 seconds).	
Example 2	SYST:BEEP? MAX >3600 Returns the maximum settable beeper time in seconds.	

SYSTem:CONFigure:BEEPer[:STATe]

Set → / → Query

Description	Sets or queries the buzzer state on/off.
Syntax	SYSTem:CONFigure:BEEPer[:STATe] {OFF|ON|0|1}
Query Syntax	SYSTem:CONFigure:BEEPer[:STATe]?

Parameter	0	<NR1> Turns the buzzer off.
	OFF	Turns the buzzer off.
	1	<NR1> Turns the buzzer on.
	ON	Turns the buzzer on.
Return parameter	<Boolean>	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] {OFF|ON|AUTO|0|1|2}
Query Syntax	SYSTem:CONFigure:BLEeder[:STATe]?

Parameter	0	<NR1> Turns the bleeder resistor off.
	OFF	Turns the bleeder resistor off.
	1	<NR1> Turns the bleeder resistor on.
	ON	Turns the bleeder resistor on.
	2	<NR1> Turns the AUTO mode on.
	AUTO	Turns the AUTO mode on.
Return parameter	<NR1>	Returns bleeder resistor status.

SYSTem:CONFigure:BTRip[:IMMediate]

Set →

Description	Trips the power switch trip (circuit breaker) to turn the unit off (shut down the power).
Syntax	SYSTem:CONFigure:BTRip[:IMMediate]

SYSTem:CONFigure:BTRip:PROTection

Set → / → Query

Description	Enables/Disables the power switch trip (circuit breaker) when the OVP or OCP protection settings are tripped. This setting only applies after power has been reset.
Syntax	SYSTem:CONFigure:BTRip:PROTection {OFF|ON|0|1}
Query Syntax	SYSTem:CONFigure:BTRip:PROTection?

Parameter	0	<NR1> Disables the power switch trip for OVP or OCP.
	OFF	Disables the power switch trip for OVP or OCP.
	1	<NR1> Enables the power switch trip for OVP or OCP.
	ON	Enables the power switch trip for OVP or OCP.
Return parameter	<Boolean>	Returns power switch trip setting.

SYSTem:CONFigure:CURRent:CONTrol

Set → / → Query

Description	Sets or queries the CC control mode (local control (panel), external voltage control, external resistance control). This setting is applied only after the unit is reset.
Syntax	SYSTem:CONFigure:CURRent:CONTrol { 0 | 1 | 2 | 3 }
Query Syntax	SYSTem:CONFigure:CURRent:CONTrol?

Parameter/Return	<NR1>	Description
	0	Local (Panel) control
	1	External voltage control
	2	External resistance control; 10kΩ = Io max, 0kΩ = Io min.
	3	External resistance control; 10kΩ = Io min, 0kΩ = Io max.

SYSTem:CONFigure:VOLTage:CONTrol

Set → / → Query

Description	Sets or queries the CV control mode (local control, external voltage control, external resistance control). This setting is applied only after the unit is reset.
Syntax	SYSTem:CONFigure:VOLTage:CONTrol { 0 | 1 | 2 | 3 }
Query Syntax	SYSTem:CONFigure:VOLTage:CONTrol?

Parameter/Return	<NR1>	Description
	0	Local (Panel) control
	1	External voltage control
	2	External resistance control; 10kΩ = Vo max, 0kΩ = Vo min.
	3	External resistance control; 10kΩ = Vo min, 0kΩ = Vo max.

SYSTem:CONFigure:MSLave

Set → / → Query

Description	Sets or queries the unit operation mode. This setting is only applied after the unit has been reset.
Syntax	SYSTem:CONFigure:MSLave { 0 | 1 | 2 | 3 | 4 | 5 }
Query Syntax	SYSTem:CONFigure:MSLave?

Parameter/Return	<NR1>	Description
	0	Master/Local
	1	Slave/Parallel
	2	Slave/Series
	3	Master/Parallel 1 (2 units total)
	4	Master/Parallel 2 (3 units total)
	5	Master/Parallel 3 (4 units total)

SYSTem:CONFigure:OUTPut:EXTernal [:MODE]

Set → / → Query

Description	Sets the external logic as active high or active low. This setting is only applied after the unit has been reset.
Syntax	SYSTem:CONFigure:OUTPut:EXTernal[:MODE]
Query Syntax	SYSTem:CONFigure:OUTPut:EXTernal[:MODE]?

Parameter	0	Active high
	HIGH	Active high
	1	Active low
	LOW	Active low
Return Parameter	0	<boolean>Active high
	1	<boolean>Active low

SYSTem:CONFigure:OUTPut:PON[:STATe]

Set → Query

Description	Sets the unit to turn the output ON/OFF at power-up. This setting is only applied after the unit has been reset.	
Syntax	SYSTem:CONFigure:OUTPut:PON[:STATe] {OFF|ON|0|1}	
Query Syntax	SYSTem:CONFigure:OUTPut:PON[:STATe]?	
Parameter	0	Output off at power up
	OFF	Output off at power up
	1	Output on at power up
	ON	Output on at power up
Return Parameter	0	Output off at power up
	1	Output on at power up

SYSTem:CONFigure:SENSe[:STATe]

Set → Query

Description	Sets or returns the sense mode used.	
Syntax	SYSTem:CONFigure:SENSe[:STATe] {0 | 1 | 2 | DISable | REAR | FRONt}	
Query Syntax	SYSTem:CONFigure:SENSe[:STATe]?	
Parameter	0 | DISable	Disables remote sense.
	1 | REAR	Sets remote sense to the rear panel terminals.
	2 | FRONt	Sets remote sense to the front panel terminals.
Return parameter	<NR1>	Returns the sense mode.
Example	SYST:CONF:SENS 0 Disables remote sense.	

SYSTem:COMMunicate:ENABle

Set / Query

Description	Enables/Disables LAN, GPIB or USB remote interfaces as well as remote services (Sockets, Web Server). This setting is applied only after the unit is reset.
Syntax	SYSTem:COMMunicate:ENABle <mode>,<interface>
Query Syntax	SYSTem:COMMunicate:ENABle? <interface>
Parameter	<mode> OFF Turns the selected mode off. 0 Turns the selected mode off. ON Turns the selected mode on. 1 Turns the selected mode on.
	<interface> GPIB Select GPIB USB Select USB LAN Select LAN SOCKets Select Sockets WEB Select the web server
Return Parameter	0 The selected mode is off. 1 The selected mode is on.
Example	SYST:COMM:ENAB 1,USB Turns the USB interface on.
Query Example	SYST:COMM:ENAB? USB 1 Queries the USB state, returns 1 (USB is on).

SYSTem:COMMunicate:GPIB[:SELF]:ADDRess

Set / Query

Description	Sets or queries the GPIB address. This setting is applied only after the unit is reset.
Syntax	SYSTem:COMMunicate:GPIB[:SELF]:ADDRess <NR1>
Query Syntax	SYSTem:COMMunicate:GPIB[:SELF]:ADDRess?

Parameter/Return	<NR1>	0-30
Example	SYST:COMM:GPIB:SELF:ADDR 15 Sets the GPIB address to 15.	

SYSTem:COMMunicate:LAN:IPADdress

Set / Query

Description	Sets or queries LAN IP address. This setting is applied only after the unit is reset.	
Syntax	SYSTem:COMMunicate:LAN:IPADdress <string>	
Query Syntax	SYSTem:COMMunicate:LAN:IPADdress?	
Parameter/Return	<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. This setting is applied only after the unit is reset.	
Syntax	SYSTem:COMMunicate:LAN:GATEway <string>	
Query Syntax	SYSTem:COMMunicate:LAN:GATEway?	
Parameter/Return	<string>	Gateway address in string format ("address") Applicable ASCII characters: 20H to 7EH
Example	SYST:COMM:LAN:GATE "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. This setting is applied only after the unit is reset.	
Syntax	SYSTem:COMMunicate:LAN:SMASk <string>	
Query Syntax	SYSTem:COMMunicate:LAN:SMASk?	
Parameter/Return	<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. This setting is applied only after the unit is reset.	
Syntax	SYSTem:COMMunicate:LAN:DHCP {OFF | ON | 0 | 1}	
Query Syntax	SYSTem:COMMunicate:LAN:DHCP?	
Parameter	0	DHCP off
	OFF	DHCP off
	1	DHCP on
	ON	DHCP on
Return parameter	0	<boolean>DHCP off
	1	<boolean>DHCP on

SYSTem:COMMunicate:LAN:DNS

Set → / → Query

Description	Sets or queries the DNS address. This setting is applied only after the unit is reset.	
Syntax	SYSTem:COMMunicate:LAN:DNS <string>	
Query Syntax	SYSTem:COMMunicate:LAN:DNS?	
Parameter/Return	<string>	DNS in string format ("mask") Applicable ASCII characters: 20H to 7EH
Example	SYST:COMM:LAN:DNS "172.16.1.252" Sets the DNS to 172.16.1.252.	

SYSTem:COMMunicate:LAN:HOSTname

→ Query

Description	Queries the host name.	
Query Syntax	SYSTem:COMMunicate:LAN:HOSTname?	
Return Parameter	<string>	Host name in string format
Query Example	SYST:COMM:LAN:HOST? P-160054 Returns the host name (P-160054).	

SYSTem:COMMunicate:LAN:WEB:PACTive

Set → / → Query

Description	Sets or queries whether the web password is on or off. This setting is applied only after the unit is reset.	
Syntax	SYSTem:COMMunicate:LAN:WEB:PACTive {OFF | ON | 0 | 1}	
Query Syntax	SYSTem:COMMunicate:LAN:WEB:PACTive?	
Parameter	0	Web password off
	OFF	Web password off
	1	Web password on
	ON	Web password on
Return parameter	0	<boolean> Web password off
	1	<boolean> Web password on

SYSTem:COMMunicate:LAN:WEB:PASSword

Set / Query

Description	Sets or queries the web password. This setting is applied only after the unit is reset.	
Syntax	SYSTem:COMMunicate:LAN:WEB:PASSword <NR1>	
Query Syntax	SYSTem:COMMunicate:LAN:WEB:PASSword?	
Parameter/Return	<NR1>	0 - 9999
Example	SYST:COMM:LAN:WEB:PASS 1234 Set the web password as 1234.	

SYSTem:COMMunicate:RLSTate

Set / Query

Description	Sets or queries the control state of the instrument.	
Note	Only applicable for software version 1.60 or above.	
Syntax Query Syntax	SYSTem:COMMunicate:RLSTate {LOCal | REMote | RWLock} SYSTem:COMMunicate:RLSTate ?	
Parameter	LOCal	Sets the instrument to front panel control.
	REMote	Sets the instrument to remote interface control.
	RWLock	Disables the front panel keys and only allows the instrument to be controlled via the remote interface.
Return parameter	LOC	The instrument is set to front panel control.
	REM	The instrument is set to remote interface control.
	RWL	The front panel keys are disabled. The instrument can only be controlled via the remote interface.
Example	SYST:COMM:RLST: LOC Sets the instrument to front panel control.	

SYSTem:COMMunicate:USB:FRONt:STATe

Query

Description	Queries the front panel USB-A port state.

Query Syntax	SYSTem:COMMunicate:USB:FRONt:STATe?	
Return parameter	0	<NR1>Absent
	1	<NR1>Mass Storage

SYSTem:COMMunicate:USB:REAR:STATe → Query

Description	Queries the rear panel USB-B port state.	
Query Syntax	SYSTem:COMMunicate:USB:REAR:STATe?	
Return parameter	0	Absent
	1	Connected to the PC

SYSTem:COMMunicate:USB:REAR:MODE → Set / → Query

Description	Sets or queries the rear panel USB-B port mode. Any changes to this setting are only applied after the unit is reset.	
Syntax	SYSTem:COMMunicate:USB:REAR:MODE {0|1|2}	
Query Syntax	SYSTem:COMMunicate:USB:REAR:MODE?	
Parameter/ Return parameter	0	Disable
	1	Auto detect speed (USB-CDC)
	2	Full speed only (USB-CDC)

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?	
Paramter/Return	<NR1>,<string>	Returns an error code followed by an error message as a string. The string is returned as "string".
Example	SYSTem:ERRor? -100, "Command error"	

SYSTem:KEYLock:MODE

Set → / → Query

Description	Sets or queries the key lock mode.	
Syntax	SYSTem:KEYLock:MODE {0|1}	
Query Syntax	SYSTem:KEYLock:MODE?	
Parameter / Return parameter	0	Panel lock: allow output off.
	1	Panel lock: allow output on/off.

SYSTem:KLOCk

Set → / → Query

Description	Enables or disables the front panel key lock.	
Syntax	SYSTem:KLOCk { OFF | ON | 0 | 1}	
Query Syntax	SYSTem:KLOCk?	
Parameter	0	Panel keys unlocked
	OFF	Panel keys unlocked
	1	Panel keys locked
	ON	Panel keys locked
Return parameter	0	<boolean>Panel keys unlocked
	1	<Boolean>Panel keys locked

SYSTem:PRESet

Set →

Description	Resets all the settings to the factory default settings. See page 126 for details.
Syntax	SYSTem:PRESet

SYSTem:VERSion

→ Query

Description	Returns the version of the SCPI specifications that the unit complies with.	
Query Syntax	SYSTem:VERSion?	
Return	<1999.0>	Always returns the SCPI version: 1999.0.

IEEE 488.2 Common Commands

*CLS

Set →

Description	The *CLS command clears the Standard Event Status, Operation Status and Questionable Status registers. The corresponding Enable registers in each of the above registers are not cleared. If a <NL> newline code immediately precedes a *CLS command, the Error Que and the MAV bit in the Status Byte Register is also cleared.
Syntax	*CLS

*ESE

Set →
→ Query

Description	Sets or queries the Standard Event Status Enable register.	
Syntax	*ESE <NR1>	
Query Syntax	*ESE?	
Parameter	<NR1>	0-255
Return parameter	<NR1>	Returns the bit sum of the Standard Event Status Enable register.

*ESR

→ Query

Description	Queries the Standard Event Status (Event) register. The Event Status register is cleared after it is read.	
Query Syntax	*ESR?	
Return parameter	<NR1>	Returns the bit sum of the Standard Event Status (Event) register and clears the register.

*IDN

→ Query

Description	Queries the manufacturer, model name, serial number, and software version of the unit.	
Query Syntax	*IDN?	
Return parameter	<string>	Returns the instrument identification as a string in the following format: GW-INSTEK,PSB-1400L,TWXXXXXXXXXX, X.XX.XXXXXXXX Manufacturer: GW-INSTEK Model number : PSB-1400L Serial number : TWXXXXXXXXXX Software version : X.XX.XXXXXXXX

*OPC

→ Set
→ Query

Description	The *OPC command sets the OPC bit (bit0) of the Standard Event Status Register when all current commands have been processed. The *OPC? Query returns 1 when all the outstanding commands have completed.	
Syntax	*OPC	
Query Syntax	*OPC?	
Return parameter	1	Returns 1 when all the outstanding commands have completed.

*RST

Set →

Description	Performs a device reset. Configures the unit to a known configuration (default settings). This known configuration is independent of the usage history.
Syntax	*RST

*SRE

Set →
→ Query

Description	Sets or queries the Service Request Enable register. The Service Request Enable register determines which registers of the Status Byte register are able to generate service requests.	
Syntax	*SRE <NR1>	
Query Syntax	*SRE?	
Parameter	<NR1>	0-255
Return parameter	<NR1>	Returns the bit sum of the Service Request Enable register.

*STB

→ Query

Description	Queries the bit sum of the Status Byte register with MSS (Master summary Status).	
Query Syntax	*STB?	
Return parameter	<NR1>	Returns the bit sum of the Status Byte register with the MSS bit (bit 6).

*TRG

Set →

Description	The *TRG command is able to generate a "get" (Group Execute Trigger). If the unit cannot accept a trigger at the time of the command, an error message is generated (-211, "Trigger ignored").
Syntax	*TRG

*TST

→ Query

Description	Executes a self test.	
Query Syntax	*TST?	
Return parameter	0	Returns "0" if there are no errors.
	<NR1>	Returns an error code <NR1> if there is an error.

*WAI

Set →

Description	Prevents any other commands or queries from being executed until all outstanding commands have completed.
Syntax	*WAI

Status Register Overview

To program the PSB-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

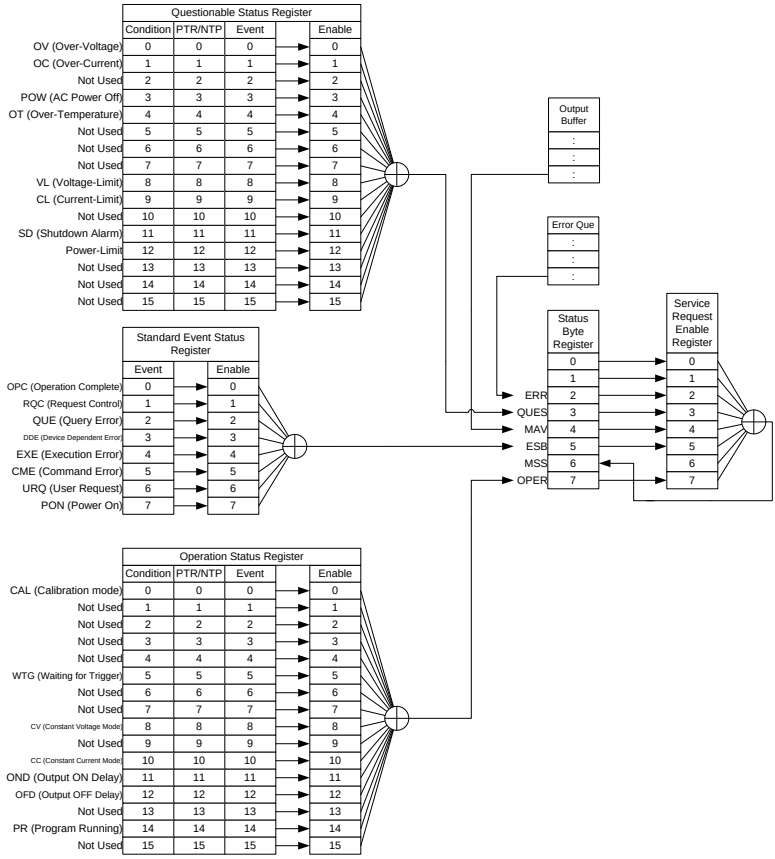
The status registers are used to determine the status of the power supply. The status registers maintain the status of the protection conditions, operation conditions and instrument errors.

The PSB-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.

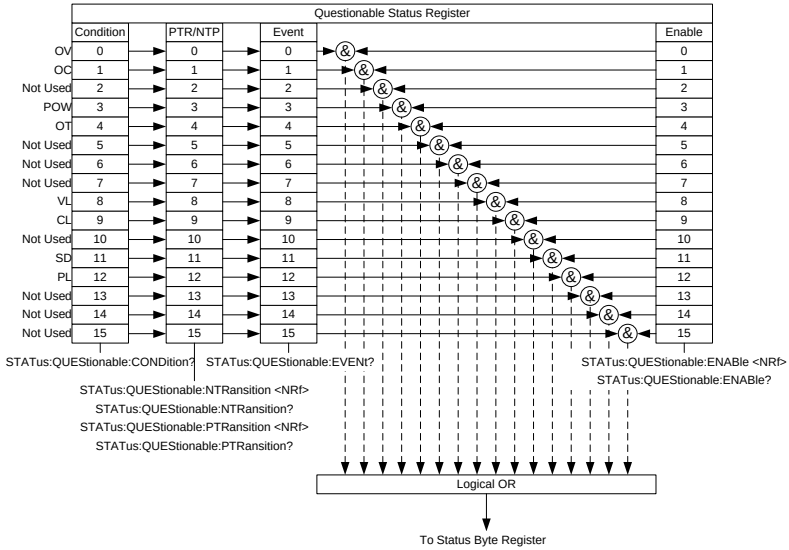
The Status Registers



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
POW (AC Power Off) AC power switch is off	3	8

	OT (Over Temperature) Over temperature protection has been tripped	4	16
	VL (Voltage Limit) Voltage limit has been reached	8	256
	CL (Current Limit) Current limit has been reached	9	512
	SD (Shutdown Alarm)	11	2048
	PL (Power-Limit)	12	4096

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.

PTR/NTR Filters

The PTR/NTR (Positive/Negative transition) register determines the type of transition conditions that will set the corresponding bit in the Event Registers. Use the Positive transition filter to view events that change from false to positive, and use the negative transition filter to view events that change from positive to negative.

Positive Transition	0→1
Negative Transition	1→0

Event Register

The PTR/NTR Register will dictate 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.

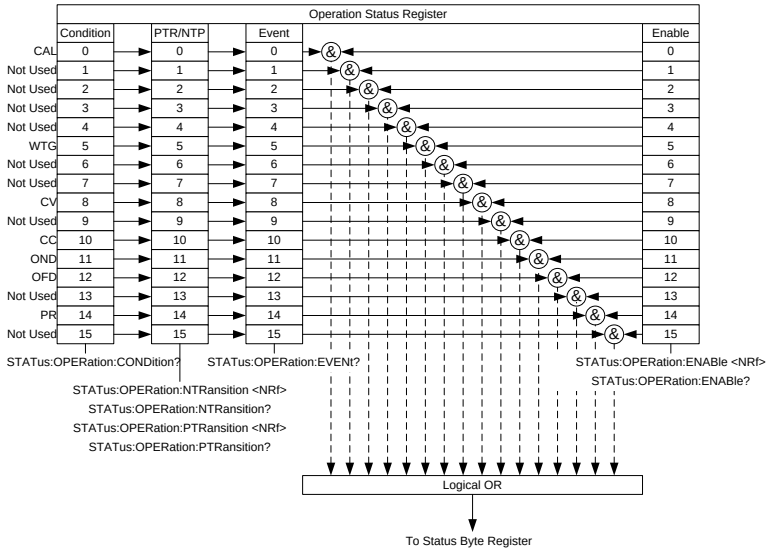
Enable Register

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.



Bit Summary

Event	Bit #	Bit Weight
CAL (Calibration mode) Indicates if the unit is in calibration mode.	0	1
WTG (Waiting for trigger) Indicates if the unit is waiting for a trigger.	5	32
CV (Constant voltage mode) Indicates if the UNIT is in CV mode.	8	256

	CC (Constant current mode) Indicates if the UNIT 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
	PR (Program Running) Indicates if a Test is running	13	8192

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.

PTR/NTR Filters	The PTR/NTR (Positive/Negative transition) register determines the type of transition conditions that will set the corresponding bit in the Event Registers. Use the Positive transition filter to view events that change from false to positive, and use the negative transition filter to view events that change from positive to negative.	
	Positive Transition	0→1
	Negative Transition	1→0

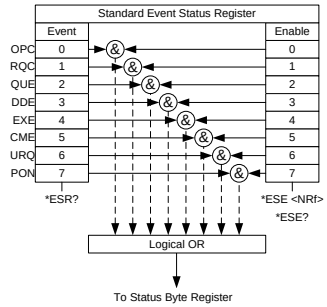
Event Register	The PTR/NTR Register will dictate the type of transition conditions will set the corresponding bits in the Event Register. If the Event Register is read, it will be cleared to 0.

Enable Register	The Enable register determines which registered Events in the Event Register will be used to set the OPER bit in the Status Byte Register.

Standard Event Status Register Group

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 OCP bit is set when all selected pending operations are complete. This bit is set in response to the *OPC command.	0	1
RQC (Request control)	1	2
QUE (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

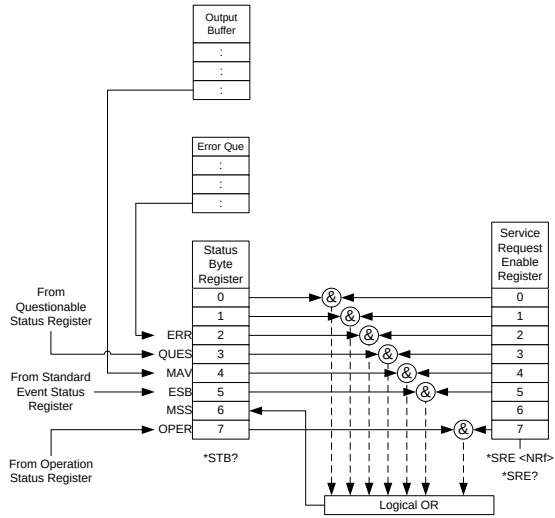
	EXE (Execution Error) The EXE bit indicates an execution error due to one of the following: illegal command parameter, parameter out of range, invalid parameter, the command didn't execute due to an overriding operation condition.	4	16
	CME (Command Error) The CME bit is set when a syntax error has occurred. The CME bit can also be set when a <GET> command is received within a program message.	5	32
	URQ (User Request)	6	64
	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 1-5, 7). This will be set to 1.	6	64
	OPER (Operation Status Register) OPER bit is the summary bit for the Operation Status Register Group.	7	128

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 Errors

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.

Error Code	Description
-100 Command Error	This is the generic syntax error for devices that cannot detect more specific errors. This code indicates only that a Command Error as defined in IEEE 488.2,11.5.1.1.4 has occurred.
-102 Syntax error	An unrecognized command or data type was encountered; for example, a string was received when the device does not accept strings.
-103 Invalid separator	The parser was expecting a separator and encountered an illegal character; for example, the semicolon was omitted after a program message unit, MEAS:VOLT:DC?:MEASCURR:DC?
-104 Data type error	The parser recognized a data element different than one allowed; for example, numeric or string data was expected but block data was encountered.
-108 Parameter not allowed	More parameters were received than expected for the header; for example, the KLOCk command only accepts one parameter, so receiving SYSTem:KLOCk 1,0 is not allowed.
-109 Missing parameter	Fewer parameters were recieved than required for the header; for example, the KLOCk command requires one parameter, so receiving KLOCk is not allowed.
-111 Header separator error	A character which is not a legal header separator was encountered while parsing the header; for example, no white space followed the header, thus APPL5,1 is an error.

-112 Program mnemonic too long	The header contains more that twelve characters (see IEEE 488.2, 7.6.1.4.1).
-113 Undefined header	The header is syntactically correct, but it is undefined for this specific device; for example, *XYZ is not defined for any device.
-114 Header suffix out of range	The value of a numeric suffix attached to a program mnemonic, see Syntax and Style section 6.2.5.2, makes the header invalid.
-115 Unexpected number of parameters	The number of parameters received does not correspond to the number of parameters expected. This is typically due an inconsistency with the number of instruments in the selected group.
-120 Numeric data error	This error, as well as errors -121 through -129, are generated when parsing a data element which apprears to be numeric, including the nondecimal numeric types. This particular error message should be used if the device cannot detect a more specific error.
-121 Invalid character in number	An invalid character for the data type being parsed was encountered; for example, an alpha in a decimal numeric or a “9" in octal data.
-128 Numeric data not allowed	A legal numeric data element was received, but the device does not accept one in this position for the header.
-131 Invalid suffix	The suffix does not follow the syntax described in IEEE 488.2, 7.7.3.2, or the suffix is inappropriate for this device.

-141 Invalid character data	Either the character data element contains an invalid character or the particular element received is not valid for the header.
-148 Character data not allowed	A legal character data element was encountered where prohibited by the device.
-151 Invalid string data	A string data element was expected, but was invalid for some reason (see IEEE 488.2, 7.7.5.2); for example, an END message was received before the terminal quote character.
-158 String data not allowed	A string data element was encountered but was not allowed by the device at this point in parsing.
-160 Block data error	This error, as well as errors -161 through -169, are generated when parsing a block data element. This particular error message should be used if the device cannot detect a more specific error.
-161 Invalid block data	A block data element was expected, but was invalid for some reason (see IEEE 488.2, 7.7.6.2); for example, an END message was received before the length was satisfied.
-168 Block data not allowed	A legal block data element was encountered but was not allowed by the device at this point in parsing.
-178 Expression data not allowed	A legal expression data was encountered but was not allowed by the device at this point in parsing.

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.

Error Code	Description
-200 Execution error	This is the generic syntax error for devices that cannot detect more specific errors. This code indicates only that an Execution Error as defined in IEEE 488.2, 11.5.1.1.5 has occurred.

-201 Invalid while in local	Indicates that a command is not executable while the device is in local due to a hard local control (see IEEE 488.2, 5.6.1.5); for example, a device with a rotary switch receives a message which would change the switches state, but the device is in local so the message can not be executed.
-203 Command protected	Indicates that a legal password-protected program command or query could not be executed because the command was disabled.
-211 Trigger ignored	Indicates that a GET, *TRG, or triggering signal was received and recognized by the device but was ignored because of device timing considerations; for example, the device was not ready to respond. Note: a DT0 device always ignores GET and treats *TRG as a Command Error.
-213 Init ignored	Indicates that a request for a measurement initiation was ignored as another measurement was already in progress.
-220 Parameter error	Indicates that a program data element related error occurred. This error message should be used when the device cannot detect the more specific errors described for errors -221 through -229.
-221 Settings conflict	Indicates that a legal program data element was parsed but could not be executed due to the current device state (see IEEE 488.2, 6.4.5.3 and 11.5.1.1.5.).

-222 Data out of range	Indicates that a legal program data element was parsed but could not be executed because the interpreted value was outside the legal range as defined by the device (see IEEE 488.2, 11.5.1.1.5.).
-224 Illegal parameter value	Used where exact value, from a list of possibles, was expected.

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.
Error Code	Description
-310 System error	Indicates that some error, termed "system error" by the device, has occurred. This code is device-dependent.
-320 Storage fault	Indicates that the firmware detected a fault when using data storage. This error is not an indication of physical damage or failure of any mass storage element.

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.

Error Code	Description
-400 Query error	This is the generic query error for devices that cannot detect more specific errors. This code indicates only that a Query Error as defined in IEEE 488.2, 11.5.1.1.7 and 6.3 has occurred.

APPENDIX

PSB-1000 Default Settings

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

For details on how to return to the factory default settings, see the SYSTem:PRESet command on page 101.

Function	
CV Control	Local
CC Control	Local
Breaker	Enable
Ext-Out	High
PON Run	None
Track	Local
Sense	Disable
Speaker	Enable
Lock Ctrl	OFF
Output	OFF
Voltage	0.00V
Current	0.00A
OVP	105% Rating
OCP	105% Rating
Bleeder	Enable
INT-R	0.000Ω
Average	Low
Lock	Mode 0
On Delays	0.00s
Off Delays	0.00s
OCP Control	Enable
OCP Delays	Auto
I/V Mode	CVHS

VSR ↗	Maximum
VSR ↘	Maximum
ISR ↗	Maximum
ISR ↘	Maximum
Vdef1	0.00V
Vdef2	0.00V
Vdef3	0.00V
Vsetp ↗	0.00V
Vsetp ↘	0.00V
OVPdef1	105% Rating
OVPdef2	105% Rating
OVPdef3	105% Rating

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