Solar Array Simulator

IT-N2100 Series Programming Guide

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Version: V1.1

Notices

Manual Part Number

IT-N2100

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A CAUTION sign denotes a hazard. It calls attention to an operating procedure or practice that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

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We certify that IT-N2100 series instruments meet all the published specifications at time of shipment from the factory.

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ITECH warrants that the product will be free from defects in material and workmanship under normal use for a period of one (1) year from the date of delivery (except those described in the Limitation of Warranty below).

For warranty service or repair, the product must be returned to a service center designated by ITECH.

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This Warranty will be rendered invalid in case of the following:

- Damage caused by circuit installed by customer or using customer own products or accessories;
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- The product model or serial number is altered, deleted, removed or made illegible by customer;
- Damaged as a result of accidents, including but not limited to lightning, moisture, fire, improper use or negligence.

Safety Symbols

	Direct current		ON (power on)
	Alternating current		OFF (power off)
	Both direct and alternating current		Power-on state
	Protective conductor terminal		Power-off state
	Earth (ground) terminal		Reference terminal
	Caution, risk of electric shock		Positive terminal
	Warning, risk of danger (refer to this manual for specific Warning or Caution information)		Negative terminal

	Frame or chassis terminal	-	-

Safety Precautions

The following safety precautions must be observed during all phases of operation of this instrument. Failure to comply with these precautions or specific warnings elsewhere in this manual will constitute a default under safety standards of design, manufacture and intended use of the instrument. ITECH assumes no liability for the customer's failure to comply with these precautions.

WARNING

- Do not use the instrument if it is damaged. Before operation, check the casing to see whether it cracks. Do not operate the instrument in the presence of inflammable gasses, vapors or dusts.
- The electronic load is provided with a power line during delivery and should be connected to a socket with a protective earth terminal. Before operation, be sure that the instrument is well grounded.
- Make sure to use the power cord supplied by ITECH.
- Check all marks on the instrument before connecting the instrument to power supply.
- Use electric wires of appropriate load. All loading wires should be capable of bearing maximum short-circuit current of electronic load without overheating. If there are multiple electronic loads, each pair of the power cord must be capable of bearing the full-loaded rated short-circuit output current
- Ensure the voltage fluctuation of mains supply is less than 10% of the working voltage range in order to reduce risks of fire and electric shock.
- If you use the power supply to charge the battery, pay attention to the positive and negative polarity of the battery when wiring, otherwise the power supply will be damaged!
- Do not install alternative parts on the instrument or perform any unauthorized modification.
- Do not use the instrument if the detachable cover is removed or loosen.
- To prevent the possibility of accidental injuries, be sure to use the power adapter supplied by the manufacturer only.
- We do not accept responsibility for any direct or indirect financial damage or loss of profit that might occur when using the instrument.
- This instrument is used for industrial purposes, do not apply this product to IT power supply system.
- Never use the instrument with a life-support system or any other equipment subject to safety requirements.

CAUTION

- Failure to use the instrument as directed by the manufacturer may render its protective features void.
- Always clean the casing with a dry cloth. Do not clean the internals.

- Make sure the vent hole is always unblocked.

Environmental Conditions

The instrument is designed for indoor use and an area with low condensation. The table below shows the general environmental requirements for the instrument.

Environmental Conditions	Requirements
Operating temperature	0°C to 40°C
Operating humidity	20%-80% (non-condensation)
Storage temperature	-10°C to 70 °C
Altitude	Operating up to 2,000 meters
Pollution degree	Pollution degree 2
Installation category	II

Note

To make accurate measurements, allow the instrument to warm up for 30 min before operation.

Regulatory Markings

CE	The CE mark indicates that the product complies with all the relevant European legal directives. The specific year (if any) affixed refers to the year when the design was approved.
UKCA	The UKCA mark indicates that the product complies with all relevant UK legal regulations (if accompanied by a year, it indicates the year the design was approved).
	The instrument complies with the WEEE Directive (2002/96/EC) marking requirement. This affixed product label indicates that you must not discard the electrical/electronic product in domestic household waste.
	This symbol indicates the time period during which no hazardous or toxic substances are expected to leak or deteriorate during normal use. The expected service life of the product is 10 years. The product can be used safely during the 10-year Environment Friendly Use Period (EFUP). Upon expiration of the EFUP, the product must be immediately recycled.

Waste Electrical and Electronic Equipment (WEEE) Directive

This product complies with the WEEE Directive (2002/96/EC) marking requirement. This affix product label indicates that you must not discard the electrical/electronic product in domestic household waste.

Product Category

With reference to the equipment classifications described in the Annex I of the WEEE Directive, this instrument is classified as a “Monitoring and Control Instrument”.

To return this unwanted instrument, contact your nearest ITECH office.

Compliance Information

Complies with the essential requirements of the following applicable European Directives, and carries the CE marking accordingly:

- Electromagnetic Compatibility (EMC) Directive 2014/30/EU
- Low-Voltage Directive (Safety) 2014/35/EU

Conforms with the following product standards:

EMC Standard

IEC 61326-1:2012/ EN 61326-1:2013 [1][2][3]

Reference Standards

CISPR 11:2015+A1:2016 Ed 6.1
IEC 61000-3-2: 2018 RLV
IEC 61000-3-3: 2013+A1:2017
IEC 61000-4-2:2008
IEC 61000-4-3 2006+A1:2007+A2:2010/ EN 61000-4-3 A1:2008+A2:2010
IEC 61000-4-4:2012
IEC 61000-4-5:2014+A1:2017
IEC 61000-4-6:2013+cor1:2015
IEC 61000-4-11:2004+A1:2017

1. The product is intended for use in non-residential/non-domestic environments. Use of the product in residential/domestic environments may cause electromagnetic interference.
2. Connection of the instrument to a test object may produce radiations beyond the specified limit.
3. Use high-performance shielded interface cable to ensure conformity with the EMC standards listed above.

Safety Standard

IEC 61010-1:2010+A1:2016

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Chapter1 Remote Control

1.1 Overview

This chapter will provide following remote configuration introductions:

- SCPI Command Introduction
- Command type
- Command format
- Data format
- Remote Operation

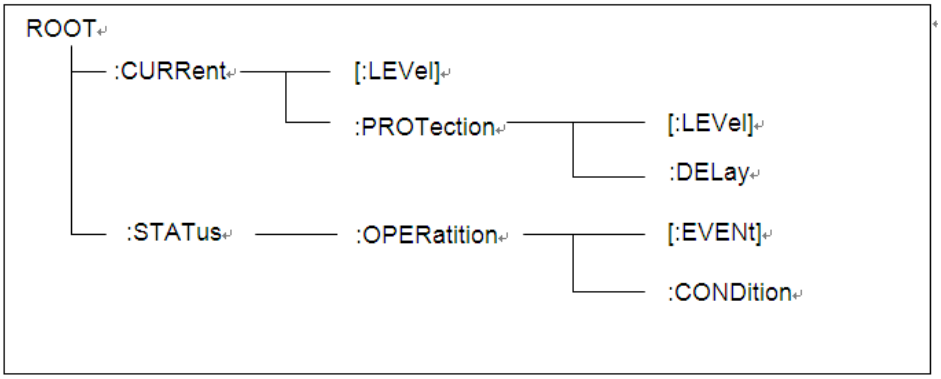
1.2 SCPI Command Introduction

SCPI is short for Standard Commands for Programmable Instruments which defines a communication method of bus controller and instrument. It is based on ASCII and supply for testing and measuring instruments. SCPI command is based on hierarchical architecture which also known as tree system. In this system, Relevant Command is returned to a common node or root, so that a subsystem is formed.

1.3 Command Type of SCPI

SCPI has two types of commands, common and subsystem.

- Common commands generally are not related to specific operation but to controlling overallelectronic load functions, such as reset, status, and synchronization. All commoncommands consist of a three-letter mnemonic preceded by an asterisk: *RST *IDN? *SRE 8.
- Subsystem commands perform specific electronic load functions. They are organized into an inverted tree structure with the "root" at the top. The following figure shows a portion of a subsyste command tree, from which you access the commands located along the various paths.



Multiple commands in a message

Multiple SCPI commands can be combined and sent as a single message with one message terminator. There are two important considerations when sending several commands within a single message:

- Use a semicolon to separate commands within a message.
- Head paths influence how the instrument interprets commands.

We consider the head path as a string which will be inserted in front of every command of a message. As for the first command of a message, the head path is a null string; for each subsequent command, the head path is a string which is defined to form the current command until and including the head of the last colon separator. A message with two combined commands: CURR:LEV 3;PROT:STAT OFF

The example indicates the effect of semicolon and explains the concept of head path. Since the head path is defined to be "CURR" after "curr: lev 3", the head of the second command, "curr", is deleted and the instrument explains the second command as: CURR:PROT:STAT OFF

If "curr" is explicitly included in the second command, it is semantically wrong. Since combining it with the head path will become "CURR:CURR:PROT:STAT OFF", resulting in wrong command.

Movement in the subsystem

In order to combine commands from different subsystems, you need to be able to reset the header path to a null string within a message. You do this by beginning the command with a colon (:), which discards any previous header path. For example, you could clear the output protection and check the status of the Operation Condition register in one message by using a root specifier as follows:

PROTection:CLEAr;:STATus:OPERation:CONDition?

The following message shows how to combine commands from different subsystems as well as within the same subsystem:

POWer:LEVel 200;PROTection 28; :CURRent:LEVel 3;PROTection:STATe ON

Note the use of the optional header LEVel to maintain the correct path within the voltage and current subsystems, and the use of the root specifier to move between subsystems.

Including Common Commands

You can combine common commands with subsystem commands in the same message. Treat the common command as a message unit by separating it with a semicolon (the message unit separator). Common commands do not affect the header path; you may insert them anywhere in the message.

VOLTage:TRIGgered 17.5;:INITialize;*TRG

OUTPut OFF;*RCL 2;OUTPut ONIT872X-3X SCPI Communication protocol 17

Case sensitivity

Common commands and SCPI commands are not case sensitive. You can use upper or lowerfor example:

*RST = *rst
:DATA? = :data?
:SYSTem:PRESet = :system:preset

Long-form and short-form versions

A SCPI command word can be sent in its long-form or short-form version.

The command subsystem tables in Section 5 provide the in the long-form version. However, the short-form version is indicated by upper case characters. Examples:

:SYSTem:PRESet long-form

:SYST:PRES short form

:SYSTem:PRES long-form and short-form combination

Note that each command word must be in long-form or short-form, and not something in between.

For example, :SYSTe:PRESe is illegal and will generate an error. The command will not be executed.

Query

Observe the following precautions with queries:

- Set up the proper number of variables for the returned data. For example, if you are reading back a measurement array, you must dimension the array according to the number of measurements that you have placed in the measurement buffer.
- Read back all the results of a query before sending another command to the electronic load. Otherwise a Query Interrupted error will occur and the unreturned data will be lost.

1.4 Command Format

Formats for command display are as follows:

[SOURce[1|2]:]VOLTage:UNIT {VPP|VRMS|DBM}

[SOURce[1|2]:]FREQuency:CENTer
{<frequency>|MINimum|MAXimum|DEFault}

Based on the command syntax, most commands (and certain Parameter) are expressed in both upper and lower cases. Upper case refers to abbreviation of commands. Shorter program line may send commands in abbreviated format. Long-format commands may be sent to ensure better program readability.

For example, both formats of VOLT and VOLTAGE are acceptable in the above syntax statements. Upper or lower case may be used. Therefore, formats of VOLTAGE, volt and Volt are all acceptable. Other formats (such as VOL and VOLTAG) are invalid and will cause errors.

- Parameter options with given command strings are included in the brace ({ }). The brace is not sent along with command strings.
- Vertical stripes (|) separate several parameter options with given command strings. For example, {VPP|VRMS|DBM} indicates that you may assign "APP", "VRMS" or "DBM" in the above commands. Vertical stripes are not sent along with command strings.
- Angle brackets (< >) in the second example indicates that a value must be assigned to the parameter in the brace. For example, the parameter in the angle bracket is <frequency> in the above syntax statements. Angle brackets are not sent along with command strings. You must assign a value (such as "FREQ:CENT 1000") to the parameter, unless you select other options displayed in the syntax (such as "FREQ:CENT MIN").
- Some syntax elements (such as nodes and Parameter) are included in

square brackets ([ ]). It indicates that these elements can be selected and omitted. Angle brackets are not sent along with command strings. If no value is assigned to the optional Parameter, the instrument will select a default value. In the above examples, "SOURce[1|2]" indicates that you may refer to source channel 1 by "SOURce" or "SOURce1" or "SOUR1" or "SOUR". In addition, since the whole SOURce node is optional (in the square bracket), you can refer to the channel 1 by omitting the whole SOURce node. It is because the channel 1 is the default channel for SOURce language node. On the other hand, if you want to refer to channel 2, "SOURce2" or "SOUR2" must be used in the program line.

Colon (:)

It is used to separate key words of a command with the key words in next level. As shown below:

APPL:SIN 455E3,1.15,0.0

In this example, APPLy command assigns a sine wave with frequency of 455 KHz, amplitude of 1.15 V and DC offset of 0.0 V.

Semicolon (;)

It is used to separate several commands in the same subsystem and can also minimize typing. For example, to send the following command string:

TRIG:SOUR EXT; COUNT 10

has the same effect as sending the following two commands:

TRIG:SOUR EXT
TRIG:COUNT 10

Question mark (?)

You can insert question marks into a command to query current values of most Parameter. For example, the following commands will trigger to set the count as 10:

TRIG:COUN 10

Then, you may query count value by sending the following command:

TRIG:COUN?

You may also query the allowable minimum or maximum count as follows:

TRIG:COUN?MIN
TRIG:COUN?MAX

Comma (,)

If a command requires several Parameter, then a comma must be used to separate adjacent Parameter.

Space

You must use blank characters, [TAB] or [Space] to separate Parameter with key words of commands.

Generic commands (*)

Execute functions like reset, self-inspection and status operation. Generic commands always start with an asterisk (*) and occupy 3 character sizes,

including one or more Parameter. Key words of a command and the first parameter are separated by a space. Semicolon (;) can separate several commands as follows:

*RST; *CLS; *ESE 32; *OPC?

Command terminator

Command strings sent to the instrument must end with a <Newline> (<NL>) character. IEEE-488 EOI (End or Identify) information can be used as <NL> character to replace termination command string of <NL> character. It is acceptable to place one <NL> after a <Enter>. Termination of command string always resets current SCPI command path to root level.

NOTE

As for every SCPI message with one query sent to the instrument, the instrument will use a <NL> or newline sign (EOI) to terminate response of return. For example, if "DISP:TEXT?" is sent, <NL> will be placed after the returned data string to terminate response. If an SCPI message includes several queries separated by semicolon (such as "DISP?;DISP:TEXT?"), <NL> will terminate response returned after response to the last query. In all cases, the program must read <NL> in response before another command is sent to the instrument, otherwise errors will be caused.

1.5 Data Type

SCPI language defines several data types used for program message and response messages.

- Numerical parameter

Commands requiring numerical Parameter support the notations of all common decimal notations, including optional signs, decimal points, scientific notation, etc. Special values of numerical Parameter are also acceptable, such as MIN, MAX and DEF. In addition, suffixes for engineering units can also be sent together with numerical Parameter (including M, k, m or u). If the command accepts only some specific values, the instrument will automatically round the input Parameter to acceptable values. The following commands require numerical Parameter of frequency value:

[SOURce[1|2]:]FREQuency:CENTer {<Frequency>|MINimum|MAXimum}

- Discrete parameter

Discrete Parameter are used for settings with limited number of programming values (such as IMMediate, EXTernal or BUS). They can use short and long format like key words of commands. They may be expressed in both upper and lower case. The query response always returns uppercase Parameter in short format. The following commands require discrete Parameter in voltage unit:

[SOURce[1|2]:]VOLTage:UNIT {VPP|VRMS|DBM}

- Boolean parameter

Boolean Parameter refer to true or false binary conditions. In case of false conditions, the instrument will accept "OFF" or "0". In case of true conditions, the instrument will accept "ON" or "1". In query of Boolean settings, the instrument will always return "0" or "1". Boolean Parameter are required by the following commands:

DISPlay {OFF|0|ON|1}

- ASCII string Parameter

String Parameter may actually include all ASCII character sets. Character strings must start and end with paired quotation marks; and single quotation marks or double quotation marks are both allowed. Quotation mark separators may also act as one part of a string, they can be typed twice without any character added between them. String parameter is used in the following command:

DISPlay:TEXT <quoted string>

For example, the following commands display message of "WAITING..." (without quotation marks) on the front panel of the instrument.

DISP:TEXT "WAITING..."

Single quotation marks may also be used to display the same message.

DISP:TEXT 'WAITING...'

1.6 Remote Operation

Please refer to user manual for detailed introductions of the remote interface connections. If the user want to change the settings of the instrument, for instance, the output setting value, the command SYST:REM must be sent to the instrument after finishing the connection between the instrument and PC.

Chapter2 FETCh & MEASure Subsystem

MEASure[:SCALar]:CURRent[:DC]?

This command is used to return the actual current value of power output.

Command Syntax:

MEASure[:SCALar]:CURRent[:DC]?

Return Parameters:

<NRf>

FETCh[:SCALar]:CURRent[:DC]?

This order is used to read the latest current to be processed from sampling buffer. When you send this order, then our unit will communicate with PC, and sending the current data to PC. This order will not affect our unit's setting or trigger the measurement operation. It only need the nearest reading it can get. The returned readings will keep the old before it get a new data.

Command Syntax:

FETCh[:SCALar]:CURRent[:DC]?

Return Parameters:

<NRf>

MEASure[:SCALar]:VOLTage[:DC]?

The command returns the actual voltage value of the power supply output.

Command Syntax:

MEASure[:SCALar]:VOLTage[:DC]?

Return Parameters:

<NRf>

FETCh[:SCALar]:VOLTage[:DC]?

The command reads the most recent pre-processed voltage reading in the sample buffer.

Command Syntax:

FETCh[:SCALar]:VOLTage[:DC]?

Return Parameters:

<NRf>

MEASure[:SCALar]:POWer[:DC]?

This command is used to return the actual power value of the power output.

Command Syntax:

MEASure[:SCALar]:POWer[:DC]?

Return Parameters:

<NRf>

FETCh[:SCALar]:POWer[:DC]?

This command is used to read the most recent pre-processed power reading in the sample buffer.

Command Syntax:

FETCh[:SCALar]:POWer[:DC]?

Return Parameters:

<NRf>

MEASure:ALL?

This command is used to return the actual voltage, current, and power values of the power supply output.

Command Syntax

MEASure:ALL?

Parameters

None

RST Value

Not applicable

Example

MEAS:ALL?

Return Parameters

NRf,NRf,NRf

FETCh:ALL?

This command is used to read the most recent pre-processed voltage, current, and power readings from the sample buffer.

Command Syntax

FETCh:ALL?

Parameters

None

RST Value

Not applicable

Example

FETC:ALL?

Return Parameters

NRf,NRf,NRf

FETCh:TIME?

This command queries the time of the source output.

Command Syntax

FETCh:TIME?

Parameters

None

RST Value

Not applicable

Example

FETC:TIME?

Return Parameters

NRf

Chapter3 SOLar Subsystem

SOLar:Vmax <NRf+>

The command sets the maximum output voltage value in PV mode, i.e. the maximum output voltage value of the instrument.

Subsystem

SOLar

Command Syntax

SOLar:Vmax <NRf+>

Parameters

<NRf+>

MIN|MAX|DEF|<Value>

Value range: MIN~MAX

Default value

MIN

Example

SOLar:Vmax 50

Query Syntax

SOLar:Vmax?

Return Parameters

<NRf+>

SOLar:USER:VOC <NRf+>

The command sets the open-circuit voltage value, which is the VOC voltage in User mode.

Subsystem

SOLar

Command Syntax

SOLar:USER:VOC <NRf+>

Parameters

<NRf+>

MIN|MAX|DEF|<Value>

Value range: MIN~MAX

Default value

MIN

Example

SOLar:USER:VOC 20

Query Syntax

SOLar:USER:VOC?

Return Parameters

<NRf+>

SOLar:EDIT:USER:IMP <NRf+>

The command sets the maximum power current value in User four-point mode.

<NRf+>

MIN|MAX|DEF|<Value>

Value range: MIN~MAX

Example: SOL:EDIT:USER:IMP 5

Query Syntax

SOLar:EDIT:USER:IMP?

Return Parameters

<NRf+>

SOLar:USER:VMP <NRf+>

The command sets the maximum power voltage value in User mode.

Command Syntax

SOLar:USER:VMP <NRf+>

Parameters

<NRf+>

MIN|MAX|DEF|<Value>

Value range: MIN~MAX

Example

SOLar:USER:VMP 40

Query Syntax

SOLar:USER:VMP?

Return Parameters

<NRf+>

SOLar:USER:ISC <NRf+>

The command sets the short-circuit current value in User mode.

Subsystem

SOLar

Command Syntax

SOLar:USER:ISC <NRf+>

Parameters

<NRf+>

MIN|MAX|DEF|<Value>

Value range: MIN~MAX

Default value

MIN

Example

SOLar:USER:ISC 5

Query Syntax

SOLar:USER:ISC?

Return Parameters

<NRf+>

SOLar:EDIT:SAS:VMP <NRf+>

The command sets the maximum power voltage value in Curve mode.

Subsystem

SOLar

Command Syntax

SOLar:EDIT:SAS:VMP <NRf+>

Parameters

<NRf+>

MIN|MAX|DEF|<Value>

Value range: MIN~MAX

Default value

MIN

Example

SOLar:EDIT:SAS:VMP 50

Query Syntax

SOLar:EDIT:SAS:VMP?

Return Parameters

<NRf+>

SOLar:EDIT:CURVe:PMP <NRf+>

The command sets the maximum power value in Curve mode.

<NRf+>

MIN|MAX|DEF|<Value>

Value range: MIN~MAX

Example: SOLar:EDIT:CURVe:PMP 100

Command Syntax

SOLar:EDIT:CURVe:PMP <NRf+>

Query Syntax

SOLar:EDIT:CURVe:PMP?

Parameters

<NRf+>

SOLar:EDIT:SAS:FORMula <CPD>

This command is used to set the regulation selection in regulation mode (SANDIA|EN50530).

Command Syntax

SOLar:EDIT:SAS:FORMula <CPD>

Parameters

<CPD>

SANDIA|EN50530

RST Value

SANDIA

Example

SOLar:EDIT:SAS:FORMula EN50530

Query Syntax

SOLar:EDIT:SAS:FORMula?

Return Parameters

<CRD>

SANDIA|EN50530

SOLar:EDIT:SAS:MATERial <NR1>

This command is used to select the material. The values 0,1,2 can be set.

- When the regulation is selected as SANDIA, set 0 for TF, set 1 for SCMC, and set 2 for HEC.
- When the regulation is selected as EN50530, setting 0 means TF and setting 1 means cSi.

Command Syntax

SOLar:EDIT:SAS:MATERial <NR1>

Parameters

<NR1>

0|1|2

RST Value

0

Example

SOLar:EDIT:SAS:MATERial 1

Query Syntax

SOLar:EDIT:SAS:MATERial?

Return Parameters

<SRD>

Thin-film|SANDIA:SCMC|EN50530:cSi|HEC

SOLar:FILTer:LEVel <CPD>

This command is used to select the filtering speed. The input voltage is filtered to reduce disturbing factors.

- LOW: Low speed
- MEDium: Medium speed
- FAST: High Speed

Command Syntax

SOLar:FILTer:LEVel <CPD>

Parameters

<CPD>

LOW|MEDium|FAST

RST Value

MEDium

Example

SOLar:FILTer:LEVel FAST

Query Syntax

SOLar:FILTer:LEVel?

Return Parameters

<CRD>

LOW|MEDium|FAST

SOLar:EDIT:TABLe:VOC <NRf+>

The command sets the open-circuit voltage value in Table mode, that is, the VOC in Table mode.

Subsystem

SOLar

Command Syntax

SOLar:EDIT:TABLe:VOC <NRf+>

Parameters

<NRf+>

MIN|MAX|DEF|<Value>

Value range: MIN~MAX

Default value

MIN

Example

SOLar:EDIT:TABLe:VOC 20

Query Syntax

SOLar:EDIT:TABLe:VOC?

Return Parameters

<NRf+>

SOLar:EDIT:TABLe:ISC <NRf+>

The command sets the short-circuit current value in Table mode.

<NRf+>

MIN|MAX|DEF|<Value>

Value range: MIN~MAX

Example: SOLar:EDIT:TABLe:ISC 5

Query Syntax

SOLar:EDIT:TABLe:ISC?

Return Parameters

<NRf+>

SOLar:EDIT:TABLe:POINts <NR1>

The command sets the voltage and current points in Table mode.

Command Syntax

SOLar:EDIT:TABLe:POINts <NR1>

Parameters

<NR1>

Value range: 1-4096

Example

SOLar:EDIT:TABLe:POINts 256

Query Syntax

SOLar:EDIT:TABLe:POINts? [MINimum|MAXimum]

Return Parameters

<NR1>

SOLar:EDIT:TABLe:VOLTage <NR1>,<NRf+>

The command sets the voltage value of the Nth point in Table mode.

Subsystem

SOLar

Command Syntax

SOLar:EDIT:TABLe:VOLTage <NR1>,<NRf+>

Parameters

<NR1>,<NRf+>

<NR1>: 1-4096

<NRf+>: MIN|MAX|DEF|<Value> Value range: MIN~MAX

Example

SOLar:EDIT:TABLe:VOLTage 1,10

Query Syntax

SOLar:EDIT:TABLe:VOLTage? <NR1>

Return Parameters

<NRf+>

SOLar:EDIT:TABLe:CURRent <NR1>,<NRf+>

The command sets the current value of the Nth point in Table mode.

Subsystem

SOLar

Command Syntax

SOLar:EDIT:TABLe:CURRent <NR1>,<NRf+>

Parameters

<NR1>,<NRf+>

<NR1>: 1-4096

<NRf+>: MIN|MAX|DEF|<Value> Value range: MIN~MAX

Example

SOLar:EDIT:TABLe:CURRent 1,5

Query Syntax

SOLar:EDIT:TABLe:CURRent? <NR1>

Return Parameters

<NRf+>

SOLar:EDIT:FIXed:VOLTage <NRf+>

The command sets the fixed mode output voltage.

Command Syntax

SOLar:EDIT:FIXed:VOLTage <NRf+>

Parameters

<NRf+>

MIN|MAX|DEF|<Value>

Value range: MIN~MAX <0.000-151.50>

Example

SOL:EDIT:FIX:VOLT 10

Query Syntax

SOLar:EDIT:FIXed:VOLTage? [MINimum|MAXimum]

Return Parameters

<NRf+>

SOLar:EDIT:FIXed:CURRent <NRf+>

The command sets the fixed mode output current.

Subsystem

SOLar

Command Syntax

SOLar:EDIT:FIXed:CURRent <NRf+>

Parameters

<NRf+>

MIN|MAX|DEF|<Value>

Value range: MIN~MAX

Default value

0

Example

SOL:EDIT:FIX:CURR 5

Query Syntax

SOLar:EDIT:FIXed:CURRent? [MINimum|MAXimum]

Return Parameters

<NRf+>

SOLar:EDIT:FIXed:RESistance <NRf+>

The command sets the output resistance of fixed mode.

Subsystem

SOLar

Command Syntax

SOLar:EDIT:FIXed:RESistance <NRf+>

Parameters

<NRf+>

MIN|MAX|DEF|<Value>

Value range: MIN~MAX <0.000-10.000>

Default value

0

Example

SOL:EDIT:FIX:RES 1

Query Syntax

SOLar:EDIT:FIXed:RESistance? [MINimum|MAXimum]

Return Parameters

<NRf+>

SOLar:DOWNload

Send the edited point data down to the instrument.

Command Syntax

SOLar:DOWNload

Parameters

None

Example

SOL:DOWN

Query Syntax

None

SOLar:OUT:MODE <CPD>

This command is used to set the SAS output mode.

Command Syntax

SOLar:OUT:MODE <CPD>

Parameters

<CPD>

<FIXed|CURVe|TABLe|USER>

RST Value

FIXed

Example

SOL:OUT:MODE USER

Query Syntax

SOLar:OUT:MODE?

Return Parameters

<CRD>

FIXed|CURVe|TABLe|USER

FETCh[:SCALar]:MPPT?

This command queries the present MPPT efficiency. The calculation formula is: Output Power divided by the Maximum Power from the PV Curve.

Supported in firmware version **1.1602** and above.

Command Syntax

FETCh[:SCALar]:MPPT?

Parameters

None

RST Value

Not Applicable

Example

FETCh[:SCALar]:MPPT?

Return Parameters

<NRf>

Chapter4 OUTPut Subsystem

OUTPut[:STATe][:ALL] <bool>

This command is used to set the output state of the power supply.

Command Syntax

OUTPut[:STATe][:ALL] <bool>

Parameters

0|OFF|1|ON

RST Value

0

Example

OUTP ON

Query Syntax

OUTPut[:STATe][:ALL]?

Return Parameters

0|1

OUTPut:PROTection:CLEar

This command is used to clear the protection.

Command Syntax

OUTPut:PROTection:CLEar

Parameters

None

Example

OUTP:PROT:CLE

Query Syntax

None

OUTPut:DELay[:ON] <NRf+>

This command is used to set the delay time for the power output to turn on.

Command Syntax

OUTPut:DELay[:ON] <NRf+>

Parameters

<0.000-10.000>

RST Value

0.000S

Example

OUTP:DEL 1.0

Query Syntax

OUTPut:DELay[:ON]? [MINimum|MAXimum]

Return Parameters

NR3

OUTPut:DELay:OFF <NRf+>

This command is used to set the delay time for the power output to be turned off.

Command Syntax

OUTPut:DELay:OFF <NRf+>

Parameters

<0.000-10.000>

RST Value

0.000S

Example

OUTP:DEL:OFF 1.0

Query Syntax

OUTPut:DELay:OFF? [MINimum|MAXimum]

Return Parameters

NR3

OUTPut:TIMer[:STATe]

This command sets the timer function to turn on or off.

Command Syntax

OUTPut:TIMer[:STATe] <bool>

Parameters

0|OFF|1|ON

RST Value

0

Example

OUTP:TIM ON

Query Syntax

OUTPut:TIMer[:STATe]?

Return Parameters

0|1

OUTPut:TIMer:DELay

This command sets the time of the timer.

Command Syntax

OUTPut:TIMer:DELay <NRf+>

Parameters

<1.0-9999.0>

RST Value

1.0s

Example

OUTP:TIM:DEL 3600

Query Syntax

OUTPut:TIMer:DELay?

Return Parameters

NR3

OUTPut:PROTection:FOLDback[:MODE] <OFF|CC|CV>

This command is used to set the FOLDBACK protection mode.

Command Syntax

OUTPut:PROTection:FOLDback[:MODE] <OFF|CC|CV>

Parameters

<OFF|CC|CV>

RST Value

OFF

Example

OUTP:PROT:FOLD CC

Query Syntax

OUTPut:PROTection:FOLDback[:MODE]?

Return Parameters

OFF|CC|CV

OUTPut:PROTection:FOLDback:DELay <NRf+>

This command is used to set the FOLDBACK protection delay time.

Command Syntax

OUTPut:PROTection:FOLDback:DELay <NRf+>

Parameters

<MINimum-MAXimum>|MINimum|MAXimum

<0.0000-9.9999>

RST Value

0.0000

Example

OUTP:PROT:FOLD:DEL 1

Query Syntax

OUTPut:PROTection:FOLDback:DELay? [MINimum|MAXimum]

Return Parameters

NR3

OUTPut:PONSetup[:STATe] <RST|LAST|LOFF>

This command is used to set the instrument power-up parameters or power-up output status.

RST: Restore to factory setting after power up.

LAST: The parameter setting and output status after power-on are the settings before power-off.

LOFF: The parameter setting after power-on is the setting before power-off, and the output status is OFF.

Command Syntax

OUTPut:PONSetup[:STATe] <RST|LAST|LOFF>

Parameters

<RST|LAST|LOFF>

RST Value

RST

Example

OUTP:PONS LAST

Query Syntax

OUTPut:PONSetup[:STATe]?

Return Parameters

RST|LAST|LOFF

OUTPut:INHibit:MODE <OFF|LIVE|LATChing>

This command is used to set the disable output mode of the instrument. The default is Off.

OFF: The output state is not controlled by the rear panel Inhibit pins.

LIVE: When the rear panel Inhibit pins receive a low level signal, the output will be disabled, and when a high level signal is received, the output will be restored.

LATChing: When the rear panel Inhibit pins receive a low level signal, the output is disabled, and even if the pins receive a high level signal, the output is not restored and must be manually turned on **[On/Off]**.

Command Syntax

OUTPut:INHibit:MODE <OFF|LIVE|LATChing>

Parameters

<OFF|LIVE|LATChing>

RST Value

OFF

Example

OUTPut:INHibit:MODE LIVE

Query Syntax

OUTPut:INHibit:MODE?

Return Parameters

OFF|LIVE|LATChing

Chapter5 SENSe Subsystem

SENSe[:REMote][:STATe] <bool>

This command is used to set the Sense enable state.

Command Syntax

SENSe[:REMote][:STATe] <bool>

Parameters

0|OFF|1|ON

RST Value

0

Example

SENS ON

Query Syntax

SENSe[:REMote][:STATe]?

Return Parameters

0|1

SENSe:FILTer:LEVel <SLOW|MEDium|FAST>

This command is used to set the Sense filtering level.

Command Syntax

SENSe:FILTer:LEVel <SLOW|MEDium|FAST>

Parameters

<CPD>

SLOW|MEDium|FAST

RST Value

Not applicable

Example

SENS:FILT:LEV MED

Query Syntax

SENSe:FILTer:LEVel?

Return Parameters

SLOW|MEDium|FAST

Chapter6 SOURce Subsystem

[SOURce:]CURRent:OVER:PROTection[:LEVel] <NRf+>

This command is used to set the output overcurrent protection limit of the power supply.

Command Syntax

[SOURce:]CURRent:OVER:PROTection[:LEVel] <NRf+>

Parameters

<NRf+> MIN TO MAX

RST Value

MAX

Example

CURR:OVER:PROT 3.500

Query Syntax

[SOURce:]CURRent:OVER:PROTection[:LEVel]? [MINimum|MAXimum]

Return Parameters

NR3

[SOURce:]CURRent:OVER:PROTection:DELay <NRf+>

This command is used to set the power supply output overcurrent protection delay time.

Command Syntax

[SOURce:]CURRent:OVER:PROTection:DELay <NRf+>

Parameters

<NRf+>

<0.00-10.00>

RST Value

10.00S

Example

CURR:OVER:PROT:DEL 10.00

Query Syntax

[SOURce:]CURRent:OVER:PROTection:DELay? [MINimum|MAXimum]

Return Parameters

NR3

[SOURce:]CURRent:OVER:PROTection:STATe <bool>

This command is used to set the power supply output overcurrent protection status.

Command Syntax

[SOURce:]CURRent:OVER:PROTection:STATe <bool>

Parameters

0|OFF|1|ON

RST Value

0

Example

CURR:OVER:PROT:STAT ON

Query Syntax

[SOURce:]CURRent:OVER:PROTection:STATe?

Return Parameters

0|1

[SOURce:]CURRent:UNDer:PROTection[:LEVel] <NRf+>

This command is used to set the under-current protection limit of power supply output.

Command Syntax

[SOURce:]CURRent:UNDer:PROTection[:LEVel] <NRf+>

Parameters

<NRf+> MIN TO MAX

RST Value

0.000

Example

CURR:UND:PROT 0.500

Query Syntax

[SOURce:]CURRent:UNDer:PROTection[:LEVel]? [MINimum|MAXimum]

Return Parameters

<NR3>

[SOURce:]CURRent:UNDer:PROTection:DELay <NRf+>

This command is used to set the power supply output undercurrent protection delay time.

Command Syntax

[SOURce:]CURRent:UNDer:PROTection:DELay <NRf+>

Parameters

<NRf+>

0.00-10.00

RST Value

10.00S

Example

CURR:UND:PROT:DEL 10.000

Query Syntax

[SOURce:]CURRent:UNDer:PROTection:DELay? [MINimum|MAXimum]

Return Parameters

<NR3>

[SOURce:]CURRent:UNDer:PROTection:STATe <bool>

This command is used to set the under-current protection status of power supply output.

Command Syntax

[SOURce:]CURRent:UNDer:PROTection:STATe <bool>

Parameters

<0|OFF|1|ON>

RST Value

0

Example

CURR:UND:PROT:STAT ON

Query Syntax

[SOURce:]CURRent:UNDer:PROTection:STATe?

Return Parameters

0|1

[SOURce:]CURRent:UNDer:PROTection:WARM <NRf+>

This command is used to set the warm-up time of power supply output undercurrent protection.

Command Syntax

[SOURce:]CURRent:UNDer:PROTection:WARM <NRf+>

Parameters

<0.00-30.00>

RST Value

30.00s

Example

CURR:UND:PROT:WARM 10.000

Query Syntax

[SOURce:]CURRent:UNDer:PROTection:WARM? [MINimum|MAXimum]

Return Parameters

NR3

[SOURce:]CURRent:DECimal?

This command returns the number of digits after the decimal point of the current.

Command Syntax

[SOURce:]CURRent:DECimal?

Parameters

None

Example

CURR:DEC?

Return Parameters:

<NR1>

[SOURce:]CURRent[:LEVel]:MAXimum <NRf+>

This command is used to set the maximum current setting value of the power supply.

Command Syntax

[SOURce:]CURRent[:LEVel]:MAXimum <NRf+>

Parameters

<NRf+> MIN TO MAX

RST Value

MAX

Example

[SOURce:]CURRent[:LEVel]:MAXimum 3.500

Query Syntax

[SOURce:]CURRent[:LEVel]:MAXimum? [MINimum|MAXimum]

Return Parameters

NR3

[SOURce:]VOLTage:OVER:PROTection[:LEVel] <NRf+>

This command is used to set the power supply overvoltage protection limit.

Command Syntax

[SOURce:]VOLTage:OVER:PROTection[:LEVel] <NRf+>

Parameters

<NRf+> MIN TO MAX

RST Value

MAX

Example

VOLT:OVER:PROT 50.00

Query Syntax

[SOURce:]VOLTage:OVER:PROTection[:LEVel]? [MINimum|MAXimum]

Return Parameters

NR3

[SOURce:]VOLTage:OVER:PROTection:DELay <NRf+>

This command is used to set the delay time of power supply overvoltage protection.

Command Syntax

[SOURce:]VOLTage:OVER:PROTection:DELay <NRf+>

Parameters

<0.00-10.00>

RST Value

10.00

Example

VOLT:OVER:PROT:DEL 10.00

Query Syntax

[SOURce:]VOLTage:OVER:PROTection:DELay? [MINimum|MAXimum]

Return Parameters

NR3

[SOURce:]VOLTage:OVER:PROTection:STATe <bool>

This command is used to set the power supply overvoltage protection status.

Command Syntax

[SOURce:]VOLTage:OVER:PROTection:STATe <bool>

Parameters

0|OFF|1|ON

RST Value

0

Example

VOLT:OVER:PROT:STAT ON

Query Syntax

[SOURce:]VOLTage:OVER:PROTection:STATe?

Return Parameters

0|1

[SOURce:]VOLTage:DECimal?

This command returns the number of digits after the decimal point of the voltage.

Command Syntax

[SOURce:]VOLTage:DECimal?

Parameters

None

Example

VOLT:DEC?

Return Parameters:

<NR1>

[SOURce:]VOLTage[:LEVel]:MAXimum <NRf+>

This command is used to set the maximum voltage setting of the power supply.

Command Syntax

[SOURce:]VOLTage[:LEVel]:MAXimum <NRf+>

Parameters

<NRf+> MIN TO MAX

RST Value

MAX

Example

[SOURce:]VOLTage[:LEVel]:MAXimum 50.00

Query Syntax

[SOURce:]VOLTage[:LEVel]:MAXimum? [MINimum|MAXimum]

Return Parameters

NR3

[SOURce:]POWer[:LEVel]:LIMit[:MAX]?

This command is used to query the maximum output power of the power supply.

Command Syntax

[SOURce:]POWer[:LEVel]:LIMit[:MAX]?

Parameters

None

RST Value

Not applicable

Example

POW:LIM?

Return Parameters

NR3

[SOURce:]POWer:PROTection[:LEVel] <NRf+>

This command is used to set the over-power protection limit of the power supply.

Command Syntax

[SOURce:]POWer:PROTection[:LEVel] <NRf+>

Parameters

<NRf+> MIN TO MAX

RST Value

MAX

Example

POW:PROT 860.0

Query Syntax

[SOURce:]POWer:PROTection[:LEVel]? [MINimum|MAXimum]

Return Parameters

NR3

[SOURce:]POWer:PROTection:DELay <NRf+>

This command is used to set the over-power protection delay time of the power supply.

Command Syntax

[SOURce:]POWer:PROTection:DELay <NRf+>

Parameters

<0.00-10.00>

RST Value

10.00

Example

POW:PROT:DEL 10.00

Query Syntax

[SOURce:]POWer:PROTection:DELay? [MINimum|MAXimum]

Return Parameters

NR3

[SOURce:]POWer:PROTection:STATe <Bool>

This command is used to set the over-power protection status of the power

supply.

Command Syntax

[SOURce:]POWer:PROTection:STATe <Bool>

Parameters

0|OFF|1|ON

RST Value

0

Example

POW:PROT:STAT ON

Query Syntax

[SOURce:]POWer:PROTection:STATe?

Return Parameters

0|1

[SOURce:]POWer:DECimal?

This command returns the number of digits after the decimal point of the power.

Command Syntax

[SOURce:]POWer:DECimal?

Parameters

None

Example

POW:DEC?

Return Parameters:

<NR1>

[SOURce:]LOOP:SPEEd <LOW|MEDium|HIGH>

This command is used to set the loop speed of the power supply.

Command Syntax

[SOURce:]LOOP:SPEEd <LOW|MEDium|HIGH>

Parameters

<LOW|MEDium|HIGH>

Example

LOOP:SPEE HIGH

Query Syntax

LOOP:SPEE?

Return Parameters

<LOW|MEDium|HIGH>

[SOURce:]NPLC <NR1>

This command is used to set the filtering factor of the power supply, which is the sampling rate, and the default is 1.

Command Syntax

[SOURce:]NPLC <NR1>

Parameters

<NR1>

<1-25>

Example

NPLC 5

Query Syntax

[SOURce:]NPLC?

Return Parameters

<NR1>

[SOURce:]LINE:FREQ <NR1>

This command is used to set the AC input frequency of the power supply.

Command Syntax

[SOURce:]LINE:FREQ <NR1>

Parameters

<NR1>

<45-70>

Example

LINE:FREQ 50

Query Syntax

[SOURce:]LINE:FREQ?

Return Parameters

<NR1>

[SOURce:]LEAK[:STATe] <Bool>

This command sets the bleeder circuit to be turned on or off.

Command Syntax

[SOURce:]LEAK[:STATe] <Bool>

Parameters

0|OFF|1|ON

RST Value

Not applicable

Example

LEAK ON

Query Syntax

[SOURce:]LEAK[:STATe]?

Return Parameters

0|1

Chapter7 System Subsystem

SYSTem:VERSion?

This command is used to return the version number of the SCPI command.

Command Syntax

SYSTem:VERSion?

Parameters

None

RST Value

Not applicable

Example

- > SYST:VERS?
< - "1993.1"

Note

- " - >" indicates the commands that you send to the power supply.
- "< -" indicates the response from the power supply.

Return Parameters

AARD

SYSTem:ERRor[:NEXT]?

This command is used to return the error code and error description of the next entry.

Command Syntax

SYSTem:ERRor[:NEXT]?

Parameters

None

RST Value

Not applicable

Example

- > SYST:ERR?
< - 0, "No error"

Note

- " - >" indicates the commands that you send to the power supply.

- "< -" indicates the response from the power supply.

Return Parameters

AARD

SYSTem:REMote

This command is used to set the instrument to remote status.

Command Syntax

SYSTem:REMote

Parameters

None

RST Value

Not applicable

Example

SYST:REM

Query Syntax

SYSTem:REMote?

Return Parameters

0|1

SYSTem:LOCal

This command is used to set the instrument to the local state.

Command Syntax

SYSTem:LOCal

Parameters

None

RST Value

Not applicable

Example

SYST:LOC

Query Syntax

None

SYSTem:RWLock

This command locks the power supply in the remote control mode. When this command is executed, pressing the LOCAL keys cannot switch the instrument to the local control mode.

Command Syntax

SYSTem:RWLock

Parameters

None

RST Value

Not applicable

Example

SYST:RWL

Query Syntax

None

Chapter8 TRIGger Subsystem

TRIGger[:IMMediate]

This command is used to generate a trigger signal. When the power trigger source is in command trigger (BUS) mode, this command will generate a trigger signal. Same function as *TRG command.

Command Syntax

TRIGger[:IMMediate]

Parameters

None

Related Commands

*TRG TRIG:SOUR

TRIGger:SOURce <MANUal|BUS|EXTernal>

This command is used to select the source of the trigger signal. The power supply can receive a trigger signal from the panel (panel Trigger key) or receive a bus trigger signal or external level signal. When the *RST command is executed, the trigger source will be set to MANUal trigger.

Command Syntax

TRIGger:SOURce <MANUal|BUS|EXTernal>

Parameters

MANUal|BUS|EXTernal

Query Syntax

TRIGger:SOURce?

RST Value

MANUal

TRIGger:EXTernal:DIRection <IN|OUT>

The command sets the signal direction of the external trigger pin.

IN: Receive the trigger signal.

OUT: Output the trigger signal.

Command Syntax

TRIGger:EXTernal:DIRection <IN|OUT>

Parameters

IN|OUT

Query Syntax

TRIGger:EXTernal:DIRection?

RST Value

IN

Chapter9 IEEE-488 Command

*CLS

This order can clean the register as follows:

- Standard event status register
- Query event register
- Status byte register

Command Syntax:

*CLS

Parameters:

None

*ESE <NRf>

This order can set the parameter of standard event enable register. Setting parameter can determine which bit value of standard event register is 1 and the byte will enable ESB of status byte register is 1.

Command Syntax:

***ESE <NRf>**

Parameters:

0~255

PowerOn Value:

Refer to the *PSC command

Example:

***ESE 128**

Query Syntax:

***ESE?**

Return Parameters:

<NR1>

Related Commands:

***ESR? *PSC *STB?**

*IDN?

This order can read information about power supply. The parameter it returns contains 4 segments divided by comma.

Query Syntax:

*IDN?

Parameters:

None

Return Parameters:

<AARD>

Example:

ITECH Electronics,IT-N2123,60234567890123456,1.01.1101-1.02-1.03-0.05

*OPC

When all orders before this order are executed, OPC is 1 for the standard event status register. Sending query order will return 1 to output buffer.

Command Syntax:

*OPC

Parameters:

None

Query Syntax:

*OPC?

Return Parameters:

<NR1>

*PSC <Bool>

This order control if power supply send a request or not when it is re-powered.

Query Syntax:

*PSC?

Return Parameters:

1

Related Commands:

*ESE *SRE STAT:OPER:ENAB STAT:QUES:ENAB

*RST

This order reset the power supply to default setting.

Command Syntax:

*RST

Parameters:

None

*SRE <NRf>

This order can set the parameter of standard event register. When query status bit enable register, the power will return a decimal number, this number is the binary weighted of enable register.

Command Syntax:

***SRE <NRf>**

Parameters:

0~255

PowerOn Value:

Refer to the *PSC command

Example:

***SRE 128**

Query Syntax:

***SRE?**

Return Parameters:

<NR1>

Related Commands:

*ESE *ESR? *PSC *STB?

*STB?

This order can read the data from status byte register. This order is similar to a statistics of series, but the equivalent of another instrument orders, it returns the value the same as series statistics, but after this order is executed, the bit 6 value of status byte register is cleared, while the status bit will not be cleared when system statistics implemented.

Query Syntax:

*STB?

Parameters:

None

Return Parameters:

<NR1>

Related Commands:

*CLS *ESE *ESR

*TRG

When the trigger mode of the power supply is BUS order trigger mode, the order will generate a trigger signal. The function is the same as **TRIGger[:IMMediate].**

Command Syntax:

*TRG

Parameters:

None

Related Commands:

TRIG TRIG:SOUR

*TST?

This command can be used to query the self-test status of the instrument. If the query result is 0, it means the instrument self-test is successful, other parameters mean the self-test is failed, and an error message will be generated to explain the reason of failure.

Query Syntax:

*TST?

Parameters:

None

Return Parameters:

<NR1>,<str>

Chapter10 STATus Subsystem

STATus:QUEStionable[:EVENt]?

This command is used to read the value of the query event register. After this command is executed, the value of the query event register is cleared.

Query Syntax

STATus:QUEStionable[:EVENt]?

Parameter

None

Return Parameters

<NR2>

Related Command

STATus:QUEStionable:ENABle

STATus:QUEStionable:ENABle <state>

The command edits the value of the Query Event Enable Register. The programming parameter determines which bits in the Query Event Register are 1, which will make QUES in the Status Register to be 1.

Command Syntax

STATus:QUEStionable:ENABle <state>

Parameter

0~65535 (Parameter range is related to the definition of query event enable register.)

PowerOn Value

Refer to the ***PSC** command.

Example

STATus:QUEStionable:ENABle 128

Query Syntax

STATus:QUEStionable:ENABle?

Return Parameters

<NR2>

STATus:QUEStionable:PTRansition <NR1>

Sets the value of the PTR (Positive-Transition) registers. These registers serve as a polarity filter between the Questionable Condition and Questionable Event registers. When a bit in the PTR register is set to 1, then a 0-to-1 transition of the corresponding bit in the Questionable Condition register causes that bit in the Questionable Event register to be set. **STATus:PRESet** sets all bits in the PTR registers and clears all bits in the NTR registers.

Subsystem

STATus

Command Syntax

STATus:QUEStionable:PTRansition <NR1>

Parameter

<NR1>

A decimal value corresponding to the binary weighted sum of the register's bits. Setting range: 0 to 65535.

Default Value

0

Example

Enable bit 3 and 4 in the questionable PTR register: STATus:QUEStionable: PTRansition 24

Query Syntax

STATus:QUEStionable:PTRansition?

Return Parameters

<NR1>

STATus:QUEStionable:NTRansition <NR1>

Sets the value of the NTR (Negative-Transition) registers. These registers serve as a polarity filter between the Questionable Condition and Questionable Event registers. When a bit in the NTR register is set to 1, then a 1-to-0 transition of the corresponding bit in the Questionable Condition register causes that bit in the Questionable Event register to be set. **STATus:PRESet** sets all bits in the PTR registers and clears all bits in the NTR registers.

If the same bits in both NTR and PTR registers are set to 1, then any transition of that bit at the Questionable Condition register sets the corresponding bit in the Questionable Event register.

If the same bits in both NTR and PTR registers are set to 0, then no transition of that bit at the Questionable Condition register can set the corresponding bit in

the Questionable Event register.

The value returned is the binary-weighted sum of all enabled bits in the register.

Subsystem

STATus

Command Syntax

STATus:QUEStionable:NTRansition <NR1>

Parameter

<NR1>

A decimal value corresponding to the binary weighted sum of the register's bits. Setting range: 0 to 65535.

Default Value

0

Example

Enable bit 3 and 4 in the questionable NTR register: STATus:QUEStionable: NTRansition 24

Query Syntax

STATus:QUEStionable:NTRansition?

Return Parameters

<NR1>

STATus:QUEStionable:CONDition?

Queries the condition register for the Questionable Status group. This is a read-only register, which holds the live (unlatched) operational status of the instrument. Reading the Questionable Status Condition register does not clear it.

Query Syntax

STATus:QUEStionable:CONDition?

Parameter

None

Return Parameters

<NR2>

STATus:OPERation[:EVENt]?

Queries the event register for the Operation Status group. This is a read-only register, which stores (latches) all events that are passed by the Operation NTR and/or PTR filter. Reading the Operation Status Event register clears it.

Query Syntax

STATus:OPERation[:EVENt]?

Parameter

None

Return Parameters

<NR1>

Related Command

STATus:OPERation:ENABle

STATus:OPERation:CONDition?

Queries the condition register for the Operation Status group. This is a read-only register, which holds the live (unlatched) operational status of the instrument. Reading the Operation Status Condition register does not clear it.

- The value returned is the binary-weighted sum of all enabled bits in the register. For example, with bit 3 (value 8) and bit 5 (value 32) set and enabled, the query returns +40.
- The condition register bits reflect the current condition. If a condition goes away, the corresponding bit is cleared.
- *RST clears this register, other than those bits where the condition still exists after *RST.

Query Syntax

STATus:OPERation:CONDition?

Parameter

None

Return Parameters

<NR1>

STATus:OPERation:ENABle

Sets the value of the enable register for the Operation Status group. The enable register is a mask for enabling specific bits from the Operation Event register to set the OPER (operation summary) bit of the Status Byte register. **STATus:PRESet** clears all bits in the enable register. ***CLS** does not clear the enable register, but does clear the event register.

Command Syntax

STATus:OPERation:ENABle <NR1>

Parameter

0~65535

Example

STATus:OPERation:ENABle 128

Query Syntax

STATus:OPERation:ENABle?

Return Parameters

<NR1>

STATus:OPERation:PTRansition <NR1>

Sets the value of the PTR (Positive-Transition) registers. These registers serve as a polarity filter between the Operation Condition and Operation Event registers. When a bit in the PTR register is set to 1, then a 0-to-1 transition of the corresponding bit in the Operation Condition register causes that bit in the Operation Event register to be set. **STATus:PRESet** sets all bits in the PTR registers and clears all bits in the NTR registers.

Subsystem

STATus

Command Syntax

STATus:OPERation:PTRansition <NR1>

Parameter

<NR1>

A decimal value corresponding to the binary weighted sum of the register's bits. Setting range: 0 to 65535.

Default Value

0

Example

Enable bit 3 and 4 in the PTR register: STATus:OPERation:PTRansition 24

Query Syntax

STATus:OPERation:PTRansition?

Return Parameters

<NR1>

STATus:OPERation:NTRansition <NR1>

Sets the value of the NTR (Negative-Transition) registers. These registers serve as a polarity filter between the Operation Condition and Operation Event registers. When a bit in the NTR register is set to 1, then a 1-to-0 transition of the corresponding bit in the Operation Condition register causes that bit in the Operation Event register to be set. **STATus:PRESet** sets all bits in the PTR registers and clears all bits in the NTR registers.

- If the same bits in both NTR and PTR registers are set to 1, then any transition of that bit at the Operation Condition register sets the corresponding bit in the Operation Event register.
- If the same bits in both NTR and PTR registers are set to 0, then no transition of that bit at the Operation Condition register can set the corresponding bit in the Operation Event register.
- The value returned is the binary-weighted sum of all enabled bits in the register.

Subsystem

STATus

Command Syntax

STATus:OPERation:NTRansition <NR1>

Parameter

<NR1>

A decimal value corresponding to the binary weighted sum of the register's bits. Setting range: 0 to 65535.

Default Value

0

Example

Enable bit 3 and 4 in the NTR register: STATus:OPERation:NTRansition 24

Query Syntax

STATus:OPERation:NTRansition?

Return Parameters

<NR1>

STATus:PRESet

Presets all Enable, PTR, and NTR registers.

Operation register	Questionable register	Preset setting
STAT:OPER:ENAB	STAT:QUES:ENAB	All defined bits are disabled
STAT:OPER:NTR	STAT:QUES:NTR	All defined bits are disabled
STAT:OPER:PTR	STAT:QUES:PTR	All defined bits are enabled

Command Syntax

STATus:PRESet

Parameter

None

Chapter11 LIST Subsystem

LIST:MODE:COUNt:REPeat <FIXed|CURVe|TABLe|USER>,<NR1>,<NR1>

Set the LIST running mode, number of steps, and number of repetitions.

Command Syntax

LIST:MODE:COUNt:REPeat <FIXed|CURVe|TABLe|USER>,<NR1>,<NR1>

Parameters

<FIXed|CURVe|TABLe|USER>,<NR1>,<NR1>
<FIXed|CURVe|TABLe|USER>,<1-100>,<1-65535>

RST Value

Not applicable

Example

LIST:MODE:COUNt:REPeat FIX,10,2

Query Syntax

LIST:MODE:COUNt:REPeat?

Return Parameters

<FIXed|CURVe|TABLe|USER>,<NR1>,<NR1>

LIST:FIXed:PARameter <NR1>,<"volt,curr,res,time,jump">

Set the parameters of step N of the LIST in FIXed mode.

Command Syntax

LIST:FIXed:PARameter <NR1>,<"volt,curr,res,time,jump">

Parameters

<NR1>: <1-100>
The volt, curr, and res ranges refer to the range of SAS FIXed mode related commands.
time: <0.1-10.0> Pulse width. Resolution is 0.1s.
jump: <0:manual, manually triggered; 1:time, means the list runs according to the pulse width specified by time>

RST Value

Not applicable

Example

LIST:FIX:PAR 1,"5,1,0,1,1"

Query Syntax

LIST:FIXed:PARameter? <NR1>

Return Parameters

<"NRf,NRf,NRf,NRf,NR1">

LIST:CURVe:PARameter <NR1>,<"reg,vmp,pmp,material,time,jump">

Set the parameters of step N of the CURVe mode LIST.

Command Syntax

LIST:CURVe:PARameter <NR1>,<"reg,vmp,pmp,material,time,jump">

Parameters

<NR1>: <1-100>
reg: <0|1:SANDIA|EN50530>
The vmp, pmp, material refer to the range of SAS CURVe mode related commands.
time: <0.1-10.0> Pulse width. Resolution is 0.1s.
jump: <0:manual, manually triggered; 1:time, means the list runs according to the pulse width specified by time>

RST Value

Not applicable

Example

LIST:CURV:PAR 1,"1,2,4,0,3,1"

Query Syntax

LIST:CURVe:PARameter? <NR1>

Return Parameters

<"NR1,NRf,NRf,NR1,NRf,NR1">

LIST:TABLe:PARameter <NR1>,<"file,voc,isc,time,jump">

Set the parameters of step N of the TABLe mode LIST.

Command Syntax

LIST:TABLe:PARameter <NR1>,<"file,voc,isc,time,jump">

Parameters

<NR1>: <1-100>
file:<1-20>
The voc, isc refer to the range of SAS TABLe mode related instructions.
time: <0.1-10.0> Pulse width. Resolution is 0.1s.
jump: <0:manual, manually triggered; 1:time, means the list runs according to

the pulse width specified by time>

RST Value

Not applicable

Example

LIST:TABL:PAR 1,"1,20,5,2,1"

Query Syntax

LIST:TABLe:PARameter? <NR1>

Return Parameters

<"NR1,NRf,NRf,NRf,NR1">

LIST:USER:PARameter <NR1>,<"voc,vmp,isc,imp,time,jump">

Set the parameters of step N of the four-point mode LIST.

Command Syntax

LIST:USER:PARameter <NR1>,<"voc,vmp,isc,imp,time,jump">

Parameters

<NR1>: <1-100>
The voc, vmp, isc, imp refer to the range of SAS USER mode related commands.
time: <0.1-10.0> Pulse width. Resolution is 0.1s.
jump: <0:manual, manually triggered; 1:time, means the list runs according to the pulse width specified by time>

RST Value

Not applicable

Example

LIST:USER:PAR 1,"3,2.4,1,0.8,0.1,1"

Query Syntax

LIST:USER:PARameter? <NR1>

Return Parameters

<"NRf,NRf,NRf,NRf,NRf,NR1">

LIST:SAVE <NR1>

Save LIST to the nth memory cell.

Command Syntax

LIST:SAVE <NR1>

Parameters

<1-10>

RST Value

Not applicable

Example

LIST:SAVE 1

Query Syntax

None

LIST:RECall <NR1>

Execute the **LIST:SAVE <NR1>** command before recalling the LIST stored in the Nth memory cell.

Command Syntax

LIST:RECall <NR1>

Parameters

<1-10>

RST Value

Not applicable

Example

LIST:REC 1

Query Syntax

None

LIST[:STATe] <bool>

Turns the LIST function on or off.

Command Syntax

LIST[:STATe] <bool>

Parameters

<0|OFF|1|ON>

RST Value

Not applicable

Example

LIST ON

Query Syntax

LIST[:STATe]?

Return Parameters

0|1

LIST:PAUSe[:STATe] <BOOLEAN>

Set the state of PAUSE of LIST.

Command Syntax

LIST:PAUSe[:STATe] <BOOLEAN>

Parameters

<0|OFF|1|ON>

RST Value

Not applicable

Example

LIST:PAUS 1

Query Syntax

LIST:PAUSe[:STATe]?

Return Parameters

0|1

LIST:RUN:STEP?

Queries what step LIST is currently running at.

Command Syntax

LIST:RUN:STEP?

Parameters

None

RST Value

Not applicable

Example

LIST:RUN:STEP?

Return Parameters

NR1

LIST:RUN:REPeat?

Queries the number of repeats that LIST has currently run.

Command Syntax

LIST:RUN:REPeat?

Parameters

None

RST Value

Not applicable

Example

LIST:RUN:REP?

Return Parameters

NR1

Chapter12 Example

Four Point

```
SYST:REM       //Enter remote mode
SOLar:Vmax 80       // Set the maximum output voltage to 80V
SOLar:USER:VOC   50   // Set VOC to 50V
SOLar:EDIT:USER:IMP   10   // Set IMP to 10A
SOLar:USER:VMP   35   // Set VMP to 35V
SOLar:USER:ISC    20   // Set ISC to 20A
SOLar:FILTer:LEVel FAST      // Set the filter level to high speed
SOL:OUT:MODE USER   // Select output as four-point mode
SOL:DOWN     // Sending data points to the instrument
OUTP 1          // Turn on the instrument output
FETCh[:SCALar]:MPPT?     // Query the present efficiency
```

Regulation

```
SYST:REM        // Enter remote mode
SOLar:Vmax 80   // Set the maximum output voltage to 80V
SOLar:EDIT:CURVe:PMP 400   // Set pmp to 400W
SOLar:EDIT:SAS:VMP    80    // Set vmp to 80V
SOLar:EDIT:SAS:MATERial 0   // Setting materials
SOLar:EDIT:SAS:FORMula SANDIA   // Select regulations
SOLar:FILTer:LEVel FAST      // Set the filter level to high speed
SOL:OUT:MODE CURV       // Select output as regulation curve mode
SOL:DOWN     // Sending data points to the instrument
OUTP 1          // Turn on the instrument output
FETCh[:SCALar]:MPPT?     // Query the present efficiency
```

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