owon®

SPM Series Source Measuring Unit
Programming Manual

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Introduction to the SCPI Language

Syntax

SCPI commands present a hierarchical tree structure and contain multiple sub-systems, each of which is made up of a root keyword and one or more sub-keywords. The command string usually starts with ":", the keywords are separated by ":" and are followed by the parameter settings available, "?" is added at the end of the command string to indicate query and the command and parameter are separated by "space".

For example,
VOLTage:LIMit <value>
VOLTage:LIMit?

VOLTage is the root keyword of the command. **LIMit** is the second-level keywords. The command string starts with "**:**" which separates the multiple-level keywords. **<value>** represents parameters available for setting, "**?**" represents query and the command **VOLTage:LIMit** and the parameter **<value>** are separated by "space".

Syntax Rules

SCPI language itself defines a group of sub-system keywords, and at the same time allows users to add or reduce keywords. Those keywords can be some meaningful English words and are easy to remember, which are called mnemonics. Mnemonic has long and short types. The short are the abbreviation of the long.

➢ **Rule to format mnemonics:**
1) If the letter number of an English word is less than or equal to 4, then the word itself can be the mnemonic.(such as "Free" can be "FREE")
2) If the letter number of an English word exceeds 4, then the first four letters will be the mnemonic.(such as "Frequency" can be "FREQ")
3) If the forth letter is vowel, then mnemonic uses the former three letters. Vowels consists of a, e, i, o, and u.(such as "Power" can be "POW")
4) If it is not a word but a sentence, then use the first letters of the former words and the whole of the last word. (such as "Input Voltage" can be "IVOLtage")

➢ **Usage of symbols**

1) Space

The space is used to separate command and parameter.

2) Colon :

If the colon is in front of the first character, it means the following is Root Command. When the colon is set between two keywords, then it means moving from the current level to the next level.

3) *asterisk

The commands start with asterisk are named Common Command, which is used to execute IEEE488.2 common commands.

4) Braces {}

The parameters enclosed in the braces are optional and are usually separated by the vertical bar "|". When using this command, one of the parameters must be selected.

5) Vertical Bar |

The vertical bar is used to separate multiple parameters and one of the parameters must be selected when using the command.

6) Triangle Brackets < >

The parameter enclosed in the triangle brackets must be replaced by an effective value.

7) Square Brackets [ ]

The content (command keyword) enclosed in the square brackets can be omitted. When the parameter is omitted, the instrument will set the parameter to its default.

➢ **Parameter Type**

1) **Real Number**

Commands that require numeric parameters accept all commonly used decimal representations of numbers including optional signs, decimal points, and scientific notation. Special values for numeric parameters such as MIN, MAX and DEF are also accepted.

2) **Discrete**

The parameter should be one of the values listed.

3) **Integer**

Unless otherwise noted, the parameter can be any integer (NR1 format) within the effective value range. Note that, do not set the parameter to a decimal, otherwise errors will occur.

4) **Bool**

The parameter could be "OFF", "ON". For example,
OUTPut {0|1|ON|OFF}

Command Abbreviation

Each SCPI command can be written mixed with uppercase and lowercase according to the syntax rules, and the capital letter part is just the abbreviation of the command. If abbreviation is used, all the capital letters in the command must be written completely. For parameters with units, please refer to the detail parameter specifications in the sub-system.

Example：
MEASure[:SCALar]:VOLTage?
Abbreviation Below：
MEAS:VOLT?

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Service & Support Hotline: +86-596-2130430
E-mail: info@owon.com.cn
Website： www.owon.com

Third-party API

The SCPI protocol communication of this instrument can use USB, serial port or LAN interface. Run the software on the computer. Select "Command Line" under the "Transfer" menu to open the SCPI command control window, and then you can send SCPI commands to control the power supply.

IEEE488.2 Common Commands

*IDN?

Return the ID character string of the instrument.
Description
   The query returns the ID character string of the instrument.

Return Format
manufacturer,<model>,<serial number>,FV:X.XX.XX
<model>：the model number of the instrument.
<serial number>：the serial number of the instrument.
FV:X.XX.XX：the software version of the instrument.

Example
   manufacturer, model,1715040,FV:V1.0.2

*RST

Syntax
*RST

Description
   Resets the instrument to the factory default settings.

Example
   Resets the instrument to the factory default settings.

Send:*RST

SCPI Commands

Power SCPI Commands

Measurement Commands

Measurement commands query the voltage, current and power measured on the output terminal of the channels.

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

Syntax
> MEASure:VOLTage?

Description
> Query the voltage measured on the output terminal of the channel.

Parameter
> (none)

Example
> MEAS:VOLT?
> The voltage measured on the output terminal of the channel is 1V.

Returns
> 1.000

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

Syntax
> MEASure:CURRent?

Description
> Query the current measured on the output terminal of the channel.

Parameter

(none)

Example
        MEAS:CURR?
        The current measured on the output terminal of the channel is 1A.

Returns
        1.000

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

Syntax
        MEASure:POWer?

Description
        Query the power measured on the output terminal of the channel.

Parameter
        (none)

Example
        MEAS:POW?
        The power measured on the output terminal of the channel is 1W.

Returns
        1.000

MEASure[:SCALar]:ALL[:DC]?

Syntax
        MEASure:ALL?
Description
        This command is used to query the voltage, current and power at the out put of the currently selected channel.
Parameter
        (none)
Example
        MEAS[:ALL]?
        1.000 2.000 2.000
The voltage at the output terminal of the currently selected channel is 1V, the

output current is 2A, and the output power is 2W.

MEASure[:SCALar]:ALL[:DC]:INFO?

Syntax

MEASure:ALL:INFO?

Description

This command is used to query the voltage, current, power and running status of the output terminal of the currently selected channel.

Parameter

(none)

Example

MEAS:ALL:INFO?

2.000 5.000 10.000 NR1 NR2 NR3 NR4

The voltage at the output terminal of the currently selected channel is 2V, the output current is 5A, and the output power is 10W.

NR1: Bool, output overvoltage: 1|ON means fault, 0|OFF means normal;

NR2: Bool, output overcurrent: 1|ON means fault, 0|OFF means normal;

NR3: Bool, output over temperature: 1|ON means fault, 0|OFF means normal;

NR4:Integer , operating mode, 0 means standby mode, 1 means CV mode, 2 means CC mode, 3 means failure mode.

Output Setup Commands

The Output setup commands are used to enable or disable the channel output, switch the output mode, as well as set the output value and limit value.

OUTPut

Syntax

OUTPut [:STATe]{0|1|ON|OFF}

OUTPut[:STATe]?

Description

Controls on/off of power supply output.

Parameter

Name	Type	Range	Default Value
{0|1|ON|OFF}	Bool	0|1|ON|OFF	OFF

Example

(1) The command below enables the channel output.

OUTP ON

(2) The command below queries if the channel is on. If the channels is on, return 1, otherwise return 0.

OUTP?

Returns

1

CURRent

Syntax

[SOURce:]CURRent[:LEVel][:IMMediate][:AMPLitude]<value>
[SOURce:]CURRent[:LEVel][:IMMediate][:AMPLitude]?

Description

Sets and queries the current of the channel.

Parameter

value: Current setting value

Example

(1) The command below sets the current of the channel to 1A.

CURR 1

(2) The command below queries the current setting value of the channel.

CURR?

Returns

1.000

CURRent:LIMit

Syntax

[SOURce:]CURRent:LIMit[:LEVel][:IMMediate][:AMPLitude]<value>
[SOURce:]CURRent:LIMit[:LEVel][:IMMediate][:AMPLitude]?

Description

Sets and queries the overcurrent protection (OCP) value of the channel.

Parameter

value: Overcurrent protection (OCP) value

Example

(1) The command below sets the overcurrent protection (OCP) value of the channel to 1A.

CURR:LIM 1

(2) The command below queries the overcurrent protection (OCP) value of the channel.

CURR:LIM?
Returns
1.000

VOLTage

Syntax
[SOURce:]VOLTage[:LEVel][:IMMediate][:AMPLitude] <value>
[SOURce:]VOLTage[:LEVel][:IMMediate][:AMPLitude]?
Description
Sets and queries the voltage of the channel.
Parameter
value: Voltage setting value
Example
(1) The command below sets the voltage of the channel to 1V.
VOLT 1
(2) The command below queries the voltage setting value of the channel.
VOLT?
Returns
1.000

VOLTage:LIMit

Syntax
[SOURce:]VOLTage:LIMit[:LEVel][:IMMediate][:AMPLitude]<value>
[SOURce:]VOLTage:LIMit[:LEVel][:IMMediate][:AMPLitude]?
Description
Sets and queries the overvoltage protection (OVP) value of the channel.
Parameter
value: Overvoltage protection (OVP) value
Example
(1) The command below sets the overvoltage protection (OVP) value of
the channel to 1V.
VOLT:LIM 1
(2) The command below queries the overvoltage protection (OVP) value
of the channel.
VOLT:LIM?
Returns
1.000

System control Commands

SYSTem:LOCal

Syntax

SYSTem:LOCal

Description

This command is used to set the power supply to the local operating state.

Example

SYST:LOC

SYSTem:REMote

Syntax

SYSTem:REMote

Description

This command is used to set the power supply to remote operation status.

Example

SYST:REM

Multimeter SCPI Commands

CONFigure:ALL?

Syntax

CONFigure:ALL?

Description

Query all customized parameter values for internal software use.

Parameter

(none)

Format：Measurement type, measurement value, measurement status, gear status.

Example

VOLT:DC,+0.0011V,AUTO,2V

RES,+000.26Ohm,AUTO,200Ohm

CURR:DC,+000.00mA,Manual,200mA

CONFigure?

Syntax

CONFigure?

Description

Query configuration function and measurement value, scientific counting method display.

Parameter

(none)

Example

RES +2.2000E-01

VOLT:DC +4.0000E-04

Unit：VOLTage---V

CURRent---A

RESistance--- Ω

CAPacitance---F

SENSe Subsystem

[SENSe:]FUNCtion VOLTage

Syntax

[SENSe:]FUNCtion:VOLTage?

Description

Query the current voltage measurement function.

Parameter

(none)

Example

[SENSe:]FUNCtion:VOLTage:AC

[SENSe:]FUNCtion:VOLTage[:DC]

Switch to AC voltage gear for measurement

Switch to DC voltage gear for measurement

Returns

VOLT:AC

VOLT:DC

[SENSe:]FUNCtion CURRent

Syntax
[SENSe:]FUNCtion:CURRent?

Description
Query the current measurement function.

Parameter
(none)

Example
[SENSe:]FUNCtion:CURRent:AC
[SENSe:]FUNCtion:CURRent[:DC]
Switch to AC current gear for measurement
Switch to DC current gear for measurement

Returns
CURR:AC
CURR:DC

[SENSe:]FUNCtion RESistance

Syntax
[SENSe:]FUNCtion:RESistance？

Description
Query the current resistance measurement function.

Parameter
(none)

Example
[SENSe:]FUNCtion:RESistance
Switch to resistance gear for measurement

Returns
RES

[SENSe:]FUNCtion CAPacitance

Syntax
[SENSe:]FUNCtion:CAPacitance?

Description

Query the current capacitance measurement function.

Parameter
(none)

Example
[SENSe:]FUNCtion:CAPacitance
Switch to capacitance gear measurement
Returns
CAP

[SENSe:]FUNCtion DIODe

Syntax
[SENSe:]FUNCtion:DIODe?

Description
Query the current diode measurement function.

Parameter
(none)

Example
[SENSe:]FUNCtion:DIODe
Switch to diode gear measurement
Returns
DIOD

[SENSe:]FUNCtion CONTinuity

Syntax
[SENSe:]FUNCtion:CONTinuity?

Description
Query the current continuity measurement function.

Parameter
(none)

Example
[SENSe:]FUNCtion:CONTinuity
Switch to continuity gear measurement
Returns
CONT

[SENSe:]VOLTage RANGe

Syntax

[SENSe:]VOLTage:AC:RANGe {<range>|MINimum|MAXimum}
[SENSe:]VOLTage:DC:RANGe {<range>|MINimum|MAXimum}
[SENSe:]VOLTage:AC:RANGe?
[SENSe:]VOLTage:DC:RANGe?

Description

Voltage measurement choose fixed measuring range, and it can only be effectively set after function gear is correctly set.

Parameter

Name	Type	Range
<range>	Discrete type	AC: 200E-3(200mV), 2(2V), 20(20V), 200(200V), 750(750V)
		DC: 200E-3(200mV), 2(2V), 20(20V), 200(200V), 1000(1000V)

Example

VOLTage:AC:RANGe 200

Syntax

[SENSe:]VOLTage:AC:RANGe:AUTO {OFF,0|ON,1}
[SENSe:]VOLTage:DC:RANGe:AUTO {OFF,0|ON,1}
[SENSe:]VOLTage:AC:RANGe:AUTO?
[SENSe:]VOLTage:DC:RANGe:AUTO?

Description

Disable or enable automatic range adjustment for voltage measurement.

Parameter

Name	Type	Range	Default Value
{0|1|ON|OFF}	Bool	0|1|ON|OFF	OFF

Syntax

[SENSe:]VOLTage:AC:RANGe:NULL {OFF,0|ON,1}
[SENSe:]VOLTage:DC:RANGe:NULL {OFF,0|ON,1}
[SENSe:]VOLTage:AC:RANGe:NULL?
[SENSe:]VOLTage:DC:RANGe:NULL?

Description

Voltage measurement enables or disables relative values.

Parameter

Name	Type	Range	Default Value
{0|1|ON|OFF}	Bool	0|1|ON|OFF	OFF

[SENSe:]CURRent RANGe

Syntax

[SENSe:]CURRent:AC:RANGe {<range>|MINimum|MAXimum}
[SENSe:]CURRent:DC:RANGe {<range>|MINimum|MAXimum}
[SENSe:]CURRent:AC:RANGe?
[SENSe:]CURRent:DC:RANGe?

Description

Current measurement choose fixed measuring range, and it can only be effectively set after function gear is correctly set.

Parameter

Name	Type	Range
<range>	Discrete type	AC: 200E-3(200mA), 10(10A)
		DC: 200E-3(200mA), 10(10A)

Syntax

[SENSe:]CURRent:AC:RANGe:NULL {OFF,0|ON,1}
[SENSe:]CURRent:DC:RANGe:NULL {OFF,0|ON,1}
[SENSe:]CURRent:AC:RANGe:NULL?
[SENSe:]CURRent:DC:RANGe:NULL?

Description

Current measurement enables or disables relative values.

Parameter

Name	Type	Range	Default Value
{0|1|ON|OFF}	Bool	0|1|ON|OFF	OFF

[SENSe:]RESistance RANGe

Syntax

[SENSe:]RESistance:RANGe {<range>|MINimum|MAXimum}
[SENSe:]RESistance:RANGe?

Description

Resistance measurement choose fixed measuring range, and it can only be effectively set after function gear is correctly set.

Parameter

Name	Type	Range
<range>	Discrete type	200(200 Ω), 2E3(2K Ω), 20E3(20K Ω), 200E3(200K Ω), 2E6(2M Ω), 20E6(20M Ω), 100E6(100M Ω)

Syntax

[SENSe:]RESistance:RANGe:AUTO {OFF,0|ON,1}
[SENSe:]RESistance:RANGe:AUTO
[SENSe:]RESistance:RANGe:NULL? {OFF,0|ON,1}
[SENSe:]RESistance:RANGe:NULL?

Description

Resistance measurement enables or disables relative values.

Parameter

Name	Type	Range	Default Value
{0|1|ON|OFF}	Bool	0|1|ON|OFF	OFF

[SENSe:]CAPacitance RANGe

Syntax

[SENSe:]CAPacitance:RANGe?
[SENSe:]CAPacitance:NULL {OFF,0|ON,1}
[SENSe:]CAPacitance:NULL?

Description

Query current measurement.

Parameter

Name	Type	Range
Return	Discrete type	2E-9(2nF), 20E-9(20nF), 200E-9(200nF), 2E-6(2uF), 20E-6(20uF), 200E-6(200uF), 10E-3(10mF)

MULTimeter

Syntax

MULTimeter:HOLD {OFF,0|ON,1}
MULTimeter:HOLD?

Description
Enables or disables holding measurements.

Parameter

Name	Type	Range	Default Value
{0|1|ON|OFF}	Bool	0|1|ON|OFF	OFF

SLMulation

Syntax
Knob emulation instruction
SIMulation:KEY:KNOB {<value>}

Description
Function key simulation.

Parameter
Value--Positive or negative numbers. It is the number for left or right knob rotating steps.

Example
SIMulation:KEY:DISP
SIMulation:KEY:V
SIMulation:KEY:I
SIMulation:KEY:OVP
SIMulation:KEY:OCP
SIMulation:KEY:ONOFf
SIMulation:KEY:OK
SIMulation:KEY:MODE
SIMulation:KEY:F1
SIMulation:KEY:F2
SIMulation:KEY:F3
SIMulation:KEY:F4