XDM 2041 Digital Multimeter

Programming Manual

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Introduction to the SCPI Language

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. Use specific character to separate keywords, data and sentences.

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.

Parameter Type

1) **Value**

The command required to use value type parameter. It’ s compatible with all the common decimal display terms including optional symbol, decimal point, scientific notation and etc.

Specific value such as MIN, MAX and DEF are available.

VOLTage:{AC|DC}:RANGe {<range>|MINimum|MAXimum}

2) **Discrete**

The parameter should be one of the values listed. For example,

TEMPerature:RTD:UNIT {C|F|K}

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,

TEMPerature:RTD:NULL {OFF|ON}

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.

VOLTage:DC:RANGe
Abbreviation Below:
VOLT:DC:RANG

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Third-party API

The SCPI protocol of this product adopts USB port or LAN port to communication.

If you want to use the software of our company, after you open the software, click to enter remote control, then click the SCPI command on the remoter control interface to enable SCPI protocol and communicate through SCPI protocol.

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

OWON,<model>,<serial number>,X.XX.XX,{3}

<model>: the model number of the instrument

<serial number>: the serial number of the instrument

X.XX.XX: the software version of the instrument.

Example

OWON,XDM2041,1546011,V1.0.0,3

***RST**

Restore the instrument to its default value.

SCPI Command List

SENSe command subsystem

SenSe subsystem configuration. The basic SenSe command is [SENSe:]FUNCtion[1|2], which can choose main display and sub display measurement function. FUNCtion[1|2] to switch mode. Other SenSe command only change specific mode parameter, don’ t change mode, for example: *VOLT:AC:RANGE:AUTO ON* command will start AC voltage mode and auto-measure, but don’ t switch to AC voltage mode.

[SENSe:]FUNCtion[1|2]

Command format

[SENSe:]FUNCtion[2] "<function>"
[SENSe:]FUNCtion[1|2]?

Function description

Select measure function, some functions can only be selected as main display.

Parameter

[1|2]

1 for main display, 2 for sub display. If leave out this parameter, display defaults at 1 (main display).

The parameter for [SENSe:]FUNCtion[2] "<function>", that is, can only been used as sub display:

Name	Type	Parameter	Measure Function
<function>	discrete	FREQuency	Secondary display opening frequency measurement
		NONe	close sub display

Return format

Use quotation to keep abbreviated selected return function, no available keyword.

Return value	Measure function
VOLT AC	AC voltage measure
VOLT	DC voltage measure
CURR AC	AC current measure
CURR	DC current measure
FREQ	Frequency measure
PER	Period measure
CAP	Capacitance measure
CONT	Continuity test
DIOD	Diode test
FRES	Four-wire Resistance measure
RES	Resistance measure
TEMP	Temperature measure

For FUNCtion2? command, if not start dual display, then return NONe.

[SENSe:]TEMPerature:RTD:TYPe

Syntax

[SENSe:]TEMPerature:RTD:TYPe {<RTD Type>}
[SENSe:]TEMPerature:RTD:TYPe?

Description

Select RTD type for temperature measurement.

Parameter

Name	Type	Range
<RTD Type >	Discrete	KITS90, PT100

Return format

Return the query result by character.

[SENSe:]TEMPerature:RTD:UNIT

Syntax

[SENSe:]TEMPerature:RTD:UNIT {C|F|K}

Description

Select temperature unit for temperature measurement, optional for C (Celsius), F(Fahrenheit), K(Kelvin).

Return format

Return the query result by character

[SENSe:]TEMPerature:RTD:SHOW

Syntax

[SENSe:]TEMPerature:RTD:SHOW {TEMP|MEAS|ALL}

Description

Select temperature measurement display mode, optional for TEMP (only display temperature),

MEAS (only display measured value), ALL (display both temperature and measured value)

Return format

Return the query result by character

[SENSe:]CONT:THREshold

Syntax

[SENSe:]CONT:THREshold <values>

Description

Sets the continuity threshold

CONFigure command sub system

CONFigure sub system is used to switch measure mode

CONFigure[:SCALar][:VOLTage]:{AC|DC}

Syntax

CONFigure[:SCALar][:VOLTage]:{AC|DC} [<range>]

Description

Restore all the measurement and trigger parameters to default, process AC/DC voltage measurement. Then set the measuring range.

Parameter

Name	Type	Range
<range>	Discrete	AC: 500E-3(500mV), 5(5V), 50(50V), 500(500V), 750(750V) DC: 500E-3(500mV), 5(5V), 50(50V), 500(500V), 1000(1000V)

CONFigure[:SCALar]:CURRent:{AC|DC}

Syntax

CONFigure[:SCALar]:CURRent:{AC|DC} [<range>]

Description

Restore all the measurement and trigger parameters to default, process AC/DC current measurement. Then set the measuring range.

Parameter

Name	Type	Range
<range>	Discrete	AC: 500E-3(500mV), 5(5V), 50(50V), 500(500V), 750(750V) DC: 50E-3(50mV), 500E-3(500mV), 5(5V), 50(50V), 500(500V), 1000(1000V)

CONFigure[:SCALar]:{RESistance|FRESistance}

Syntax

CONFigure[:SCALar]:{RESistance|FRESistance} [<range>]

Description

Restore all the measurement and trigger parameters to default, process RESistance and FRESistance measurement. Then set the measuring range.

Parameter

Name	Type	Range
<range>	Discrete	500(500Ω), 5E3(5KΩ), 50E3(50KΩ), 500E3(500KΩ), 5E6(5MΩ), 50E6(50MΩ), 500E6(500MΩ)

Note: the maximum range of four-wire resistance is 50KΩ.

CONFigure[:SCALar]:{FREQuency|PERiod}

Syntax

CONFigure[:SCALar]:{FREQuency|PERiod}

Description

Restore all the measurement and trigger parameters to default, process FREQuency/PERiod measurement.

CONFigure[:SCALar]:CAPacitance

Syntax

CONFigure[:SCALar]:CAPacitance [<range>]

Description

Restore all the measurement and trigger parameters to default, process capacitance measurement. Then set the scale.

Parameter

Name	Type	Range
<range>	Discrete	50E-9(50nF),500E-9(500nF),5E-6(5uF),50E-6(50uF),500E-6(500uF),5E-3(5mF), 50E-3(50mF)

CONFigure[:SCALar]:TEMPerature:RTD

Syntax

CONFigure[:SCALar]:TEMPerature:RTD [{<RTD Type>}]

Description

Restore all the measurement and trigger parameters to default, process temperature measurement. Then set the PT type.

Parameter

Name	Type	Range
<RTD Type >	Discrete	KITS90, PT100

CONFigure[:SCALar]:DIODe

Syntax

CONFigure[:SCALar]:DIODe

Description

Restore all the measurement and trigger parameters to default, process diode measurement.

Parameter

CONFigure[:SCALar]:CONTinuity

Syntax

CONFigure[:SCALar]:CONTinuity

Description

Restore all the measurement and trigger parameters to default, process continuity test.

Parameter

CALCulate command Subsystem

CALCulate command is used to manage math function (Sum up, db/dbm, relative value), Function command is used to switch math mode (from three modes). AVERage, DB,DBM, NULL command is used to set corresponding function parameter, won’ t change the current math function.

CALCulate:AVERage:ALL?

Syntax

CALCulate:AVERage:ALL?

Description

Query returns the minimum value, maximum value , average value and count of all measurements taken since the statistics were last cleared.

Parameter

(none)

CALCulate:AVERage:AVERage?

Syntax

CALCulate:AVERage:AVERage?

Description

Query returns the average value of all measurements taken since the statistics were last cleared.

Parameter

(none)

CALCulate:AVERage:MAXimum?

Syntax

CALCulate:AVERage:MAXimum?

Description

Query returns the maximum value of all measurements taken since the statistics were last cleared.

Parameter

(none)

CALCulate:AVERage:MINimum?

Syntax

CALCulate:AVERage:MINimum?

Description

Query returns the minimum value of all measurements taken since the statistics were last cleared.

Parameter

(none)

CALCulate:DB:REFerence

Syntax

CALCulate:DB:REFerence <Ref R>
CALCulate:DB:REFerence?

Description

Set DB relative resistance.

Parameter

Name	Type	Range
<Ref R>	Discrete	50, 75, 93, 110, 124, 125, 135, 150, 250, 300, 500, 600, 800, 900, 1000, 1200, 8000

CALCulate:DBM:REFerence

Syntax

CALCulate:DBM:REFerence <Ref R>
CALCulate:DBM:REFerence?

Description

Set DBM relative resistance.

Parameter

Name	Type	Range
<Ref R>	Discrete	50, 75, 93, 110, 124, 125, 135, 150, 250, 300, 500, 600, 800, 900, 1000, 1200, 8000

CALCulate:FUNCtion

Syntax

CALCulate:FUNCtion {NULL|DB|DBM|AVERage}
CALCulate:FUNCtion?

Description

Set mathematic calculation as NULL, DB, DBM, AVERage.

CALCulate:NULL:OFFSet

Syntax

CALCulate:NULL:OFFSet {<value>|MINimum|MAXimum}
CALCulate:NULL:OFFSet? [MINimum|MAXimum]

Description

Set relative value.

Parameter

Name	Type	Range
<value>		

CALCulate:STATe

Syntax

CALCulate:STATe {OFF}

Description

Close MATH function

Parameter

Name	Type	Range
<bool>	Bool	{OFF}

SYSTem command Subsystem

SYSTem:BEEPer:STATe

Syntax

SYSTem:BEEPer:STATe {ON|OFF}
SYSTem:BEEPer:STATe?

Description

Start or close the buzzer

Parameter

Name	Type	Range	默认值
<bool>	Bool	{ON|OFF}	ON

Return format

Return 0 (OFF) or 1 (ON) after query。

SYSTem:DATE?

Syntax

SYSTem:DATE?

Description

Query date (includes year, month and day) inside device real-time clock

Parameter

Return format

Return query result

SYSTem:TIME?

Syntax

SYSTem:TIME?

Description

Query time (includes hour, minute and second) inside device real-time clock

Parameter

Return format

Return query result

SYSTem:LOCal

Syntax

SYSTem:LOCal

Description

Exit SCPI mode

Parameter

SYSTem:REMote

Syntax

SYSTem:REMote

Description

Enter SCPI mode

Parameter

Other commands

AUTO

Syntax

AUTO
AUTO?

Description

Enable autoscale

Parameter

Return format

Return autoscale setting, 1 for auto, 0 for manual

RANGE

Syntax

RANGE {<range1>|DEF}

Description

Set measuring range

Parameter

Name	Type	Range	
<range1>	Discrete	DCV	1(50mV), 2(500mV), 3(5V), 4(50V), 5(500V), 6(1000V)
		ACV	1(500mV), 2(5V), 3(50V), 4(500V), 5(750V)
		DCI	1(500uA), 2(5mA), 3(50mA), 4(500mA), 5(5A), 6(10A)
		ACI	1(500uA), 2(5mA), 3(50mA), 4(500mA), 5(5A), 6(10A)
		RES	1(500Ω), 2(5KΩ), 3(50KΩ), 4(500KΩ), 5(5MΩ), 6(50MΩ)
		CAP	1(50nF), 2(500nF), 3(5uF), 4(50uF), 5(500uF), 6(5mF) ,7(50mF)
		TEMP	1(KITS90),2(PT100)

RATE

Syntax

RATE <speed>
RATE?

Description

Set speed.

Parameter

Name	Type	Range
<speed>	Discrete	F:high speed; M:middle speed; L:low speed

Return format

Return current speed, F for high speed, M for middle speed, L for low speed.

MEAS?

Syntax

MEAS?

Description

If start dual display, return main and sub display measured value; or return main display measure value.

Parameter

Return format

Return measured result by scientific notation. If start dual display, the return format is: main display measured value, sub display measured value.

MEAS1?

Syntax

MEAS1?

Description

Return main display measured value

Parameter

Return format

Return measured result by scientific notation.

MEAS2?

Syntax

MEAS2?

Description

Return sub display measured value

Parameter

Return format

Return measured result by scientific notation.