Benchtop LCR Meter
SCPI Communication Protocol

Catalog

1. SCPI Command Syntax

1.1. Grammer Conventions

Take the following two commands as examples to illustrate the meaning of symbols in the SCPI command:

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

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

According to command syntax, most commands (and some parameters) are represented in a mixture of upper and lower case letters.For shorter program lines, you can send commands in abbreviated format. If you want better program readability, you can send long-form commands. For example, in the syntax above, VOLT and VOLTAGE are acceptable formats.You can use uppercase or lowercase letters.Therefore, VOLTAGE, volt, and volt are all acceptable formats.Other formats, such as VOL and VOLTAG, are invalid and will cause errors.

Braces ({}) contain the parameter options for the given command string.Braces are not sent with the command string.

The brackets ([ ]) contain the parameter options for the given command string. The brackets are not sent with the command string.

Bar (|) separated by a given command string multiple parameter selection.For example, in the above command, {VPP | VRMS | DBM} said can specify "VPP", "VRMS" or "DBM" one of the parameters.A bar is not sent with a command string.

The Angle brackets (< >) in the second example indicate that a value must be specified for the parameter inside the brackets.For example, in the syntax statement above, the parameter in Angle brackets is < frequency >.Angle brackets are not sent with the command string. You must specify a value for the parameter (for example, "FREQ:CENT 1000") unless you select other options shown in the syntax (for example, "FREQ:CENT MIN").

Some syntax elements(such as nodes and parameters), are contained within square brackets ([]).This means that the element is optional and can be omitted. Angle brackets are not sent with the command string. If no value is specified for the optional parameter, the instrument selects the default value. In the example above, the “SOURce[1|2]” says you can choose the "SOURce" or "SOURce1", or "SOUR1" or "SOUR" referring to the SOURce channel 1.Besides, since the entire Source node is optional (in square brackets), you can refer to channel 1 by omitting the Source node entirely, because channel 1 is the default channel of the Source node.On the other hand, to refer to channel 2, you can only use "SOURce2" or "SOUR2" in the program line.

1.2. Command Separator

The colon (:) is used to separate the command keyword from the keyword at the next level.Spaces must be inserted to separate the parameters from the command key. If a command requires more than one parameters, the adjacent arguments must be separated by a comma, as follows:

APPL:SIN 455E3,1.15,0.0

In this example, the APPLy command specifies a sine wave with a frequency of 455 kHz, an amplitude of 1.15 V, and a DC offset of 0.0 V.

The semicolon (;)is Used to separate multiple commands within the same subsystem and to minimize typing. For example, send the following command string:

TRIG:SOUR EXT; COUNT 10

It has the same effect as sending the following commands:

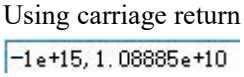
TRIG:SOUR EXT

TRIG:COUNT 10

1.3. Communication Sample

The baud rate is 9600, no frame header, no check, 8-bit data, one stop bit, and no hardware data flow control. The instruction format will be: no frame header + instruction content + no check +0A (frame tail).

Using carriage return to return



2. Command Set

The section entitled "Description" describes the use of the command or the actions it performs.

The section entitled "Parameters" describes the parameters required to send the command. When the parameter is a numeric or string type in <>, the definition of the parameter, the allowable numeric range, the default (factory setting) value, and so on are given, and when the parameter is a selection type in {}, the description of each option is given.

The section titled "Command Syntax" indicates that the command does not require an answer, and the instrument only needs to execute the corresponding action according to the command. The

section titled "Query Grammar" indicates that the command requires an answer and the instrument needs to return data to the upper computer. Please refer to "Query Return" for the specific answer content. Command Syntax and Query Syntax are both syntaxes sent to the lcr meter from external controllers.
This communication agreement provides that:
NR1: Integer, such as 123
NR2: Decimal number (fixed point number), e.g. 12.3
NR3: floating point number, e.g., 12.3E+5
NRf: NR1, NR2, or NR3
NL: carriage return, integer 10

2.1. IEEE488.2Mandatory Command

***IDN?**
Description This Command is used to query instrument information
Query syntax *IDN?
Query return <manufacturer>,<model>,<firmware>,<hardware>,<SN><NL>
Note: < Manufacturer > gives the manufacturer,< model> gives the machine model,< firmware > the software version number,< hardware> gives hardware version number, and <SN> gives serial number.

***TRG**
Description This command is used to generate one trigger
Command Syntax *TRG

2.2. SCPI Instrument Request Command

2.2.1. SYSTem Subsystem Command Set

:VERSion?
Description Query the SCPI version number conform to the instrument
Query syntax SYSTem:VERSion?
Query return 1999.0<NL>

2.3. Command Set

2.3.1. APERture Subsystem Command Set

The APERture subsystem command is used to set the measurement speed mode. Can query the current measurement speed mode

Command sybtax　APERture {FAST|MEDium|SLOW}

Parameter

	describe
FAST	Set the measurement speed mode to FAST
MEDium	Set the measurement speed mode to MEDium
SLOW（预设值）	Set the measurement speed mode to SlOW

Query syntax　APERture?

Query return　{FAST|MEDium|SLOW}<NL>

2.3.2. OUTput Subsystem Command Set

OUTput subsystem command is mainly used to set the output impedance. Can query current output impedance

:RESistance

Command syntax　OUTput:RESistance {0|1}

Parameter

	Description
0	Set output impedance to 100Ω
1	Set output impedance to 30Ω

Query syntax　OUTput:RESistance?

Query return　{0|1}<NL>

2.3.3. BIAS Subsystem Command Set

:VOLTage[:LEVel]

Sets the DC bias voltage, character? The current DC bias voltage value can be queried.

Command syntax BIAS:　BIAS:VOLTage:LEVel <numeric>

Parameter

	< numeric >
Range	0～1500
Preset value	0
Unit	mV

Query syntax　BIAS:VOLTage:LEVel?

Query return　<NR3><NL>

For example, set Bias to 1500mv

BIAS:VOLTage 1500　(note the middle space)；

Query：BIAS:VOLTage:LEVel?

Return：1500

2.3.4. VOLTage Subsystem Command Set

VOLTage subsystem command is used to set the measuring level voltage. If using :CURRent[:LEVel] to set the signals, the query command will return error number -230。Character? You can query the current measurement level voltage.

Command syntax VOLTage:LEVel <numeric>

Parameter

	<numeric>
Range	10~2000
Preset value	1000mV
unit	mV

Query syntax VOLTage:LEVel?

Query return<NR3><NL>

2.3.5. FREQuency Subsystem Command Set

FREQuency subsystem command set is mainly used to set the measurement FREQuency of the instrument.You can query the current measurement frequency

Command syntax FREQuency:CW <numeric>

Command syntax

	<numeric>
Range	10～100000
Preset value	1000
unit	Hz
The resolution of the	Depends on the frequency set.

Query syntax FREQuency:CW?

Query return <NR3><NL>

2.3.6. FUNCtion Subsystem Command Set

The FUNCtion subsystem command is mainly used to set "FUNCtion", range, current and voltage monitoring switches, and deviation display mode and nominal Settings, etc.

:DEV:MODE

Description Can query set relative measurement mode, character?The current deviation measurement mode status

Command syntax FUNCtion:DEV:MODE {ON|OFF}

Parameter

	describe
ON	Turn on relative measurement mode
OFF（preset value）	Disable relative measurement mode

Query syntax FUNCtion:DEV:MODE?

Query return {ON|OFF}<NL>

:IMPedance:A

Description Set the main measurement parameter, character?Can query the status of the current range.

Command syntax FUNCtion:IMPedance:A {AUTO|R|C|L|Z|DCR|ECAP}

Parameter

	describe
AUTO	auto switch for main parameter
R	resistance
C	capacitance
L	inductance
Z	impedance
DCR	Dc resistance
ECAP	Electrolytic capacitor

Query syntax FUNCtion:IMPedance:A?

Query return {AUTO|R|C|L|Z|DCR|ECAP}<NL>

:IMPedance:B

Description set second measurement parameters, characters?Can query the status of the current range.

Command syntax FUNCtion:IMPedance:B {X|D|Q|THR|ESR}

Parameter

	describe
X	reactance
D	Dissipation factor
Q	The quality factor
THR	radian
ESR	Equivalent series resistance

Query syntax FUNCtion:IMPedance:B?

Query return {X|D|Q|THR|ESR}<NL>

:IMPedance:EUUivalent

Description Set measurement parameters for serial and parallel properties, characters?Can query the status of the current range.

Command syntax FUNCtion:IMPedance: EQUivalent

Parameter

	describe
SERial	In series
PALlel	parallel

Query syntax FUNCtion:IMPedance:EQUivalent?

Query return {SERial|PALlel}<NL>

:IMPedance:RANGe:AUTO

Description Start the auto range switch function of impedance measurement, Character? Can query current range status

Command syntax FUNCtion:IMPedance:RANGe:AUTO {ON|OFF|1|0}

Parameter

	describe
ON or 1（preset）	Automatic conversion range turned on
OFF or 0	Automatic conversion range closed, set range

Query syntax FUNCtion:IMPedance:RANGe:AUTO?

Query return <NR1><NL>

:COM

Description Start the maximum, minimum, and mean functions. Can query current status.

Command syntax FUNCtion:COM {MAX|MIN|AVG|OFF}

Query syntax FUNCtion:COM?

Query return {MAX|MIN|AVG|OFF}<NL>

:COMValue

Description Query the maximum, minimum, and mean values. What is the current function, then query what value, if the maximum, minimum, average function is not enabled, return OFF

Query syntax FUNCtion: COMValue?

Query return <NR1><NL>

2.3.7. CORRection Subsystem Command Set

2.3.8.

CORRection subsystem command set is used to set open circuit correction and short circuit correction.

Open circuit correction and short circuit correction are decided by hardware.

:EXECute

Description open/ short circuit correction to all frequency points

Command syntax CORRection:EXECute

Query return <NL>

2.3.9. DISPlay Subsystem Command Set

DISPlay subsystem command set is mainly used to set display interface

:PAGE

Description Set the target display page, character?

Command Grammar DISPlay:PAGE{MEASurement| COMPset |SYSTem}

Parameter

	describe

MEASurement（preset value）	Set display page as < MEAS DISPLAY>
COMPset	Set comparator setttings screen as < COMP set >
SYSTem	Set display page as <SYSTEM INFO>

Query syntax DISPlay:PAGE?

Query return {MEASurement| COMPset |SYSTem}<NL>

2.3.10. FETCh Command

Description query measurement results.

Query syntax FETCh?

Query returns <NR3>,<NR3><NL>

Ex:

Query：FETCh?

Return： 1e-3, 0.1025

2.3.11. COMParator Subsystem Command Set

COMParator subsystem command is used to set the COMParator functions, including comparison switch Settings, tolerance, and nominal Settings.

[:STATe]

Description Set comparator function on or off, can query current comparator function's status.

Command Grammar COMParator:STATe {ON|OFF|1|0}

Parameter

	describe
ON or 1	Start the comparator function.
OFF or 0 (default value)	Disable the comparator function.

Query syntax COMParator:STATe?

query return <NR1><NL>

:TOLerance:BIN?

Description Query the tap position of the current comparator BIN. This command is valid only when the comparator is open.

Query syntax COMParator**:TOLerance:BIN?**

Query return <NR1><NL>

:TOLerance:NOMinal （Only available in comparator setting interface ）

Description Sets the nominal value of the comparator function

can query the nominal value of the current tolerance mode.

Command syntax COMParator:TOLerance:NOMinal <numeric>

Parameter

	<numeric>
Preset value	0

Query syntax COMParator:TOLerance:NOMinal?

Query return <NR3><NL>

: TOLerance:RANGe:CH

Description Set the tolerance range of comparator

Command syntax COMParator:TOLerance:RANGe:CH <value>

Parameter

Channel	CH	CH
Range	1L、1H、2L、2H、3L、3H	2ndL、2ndH
Unit	/	/
	<value>	<value>
Range	-50~+50	/
Unit	%	/
/Default	+1%	Current measurement value

Query syntax COMParator:TOLerance:RANGe:1H?

Query return <value><NL >

Ex: Set lower limit level 1 to 0.1%

COMParator:TOLerance:RANGe:1L -0.1 (Notice the space in the middle)；

Query：COMParator:TOLerance:RANGe:1L?

Return：-0.10

2.3.12. LIST Subsystem Command Set

:STATe

Description Set the list scanning function on/ off.

Command syntax LIST:STATe {ON|OFF|1|0} Command syntax

Parameter

	Description
ON or 1	Allow list scanning operations
OFF or 0(preset value）	Disabled list scanning operations

Query syntax LIST:STATe?

Query return <NR1><NL>

:MODE

Description Set List scanning mode

Command syntax LIST:MODE {STEP|SEQuence}

Parameter	Describe
STEP	Scanning mode is stepping
SEQuence(preset value)	Scanning mode is sequential

Query syntax LIST:MODE?

Query return {STEP|SEQuence}<NL>

:PARAmeter

Description Set parameter of list scanning

Command syntax LIST:PARAmeter <num>,<freq>,<limitlow>,<limithigh>

Parameter	Range	Describe
num	0-6	sequence number
freq	supported frequency points（“--”means no parameter）	testing frequency
limitlow	supported measured range（“--”means no parameter）	lower limit
limithigh	supported measured range（“--”means no parameter）	upper limit
test	supported measured range（“--”means no parameter）	measured value when comparing
compare	0（HIGH）,1(LOW),2(IN)	comparing result

Query syntax LIST:PARAmeter <num>?

Query return <num>,<freq>,<limitlow>,<limithigh>,<test>,<compare><NL>

2.3.13. SYSTem Subsystem Command Set

:BEEPer[:IMMediate]

Description Make a beep. The BEEPer can be beeped even if it has been disabled by :SYSTem:BEEPer:STATe. Description

Command syntax SYSTem:BEEPer:IMMediate

:BEEPer:STATe

Description Set the promote tone on/ off

Command syntax SYSTem:BEEPer:STATe {ON|OFF|1|0}

Parameter

	Describe
ON or1	start the beeper
OFF or 0 （ preset value）	Disabled the beeper

Query syntax SYSTem:BEEPer:STATe?

Query return <NR1><NL>

:BEEPer:PASS

Description Set qualified prompt tone

Command syntax SYSTem:BEEPer:PASS {LON|SHO|OFF}

Parameter

	Describe
LON	Set to long tone
SHO	Set to short tone
OFF	disabled the prompt tone

Query syntax SYSTem:BEEPer:PASS?

Query return {LON|SHO|OFF}<NL>

:BEEPer:FAIL

Description Set qualified prompt tone

Command syntax SYSTem:BEEPer:FAIL {LON|SHO|OFF}

Parameter

	Describe
LON	Set to long tone
SHO	Set to short tone
OFF	disabled the prompt tone

Query syntax SYSTem:BEEPer:FAIL?

Query return {LON|SHO|OFF}<NL>

:STARt

Description Set the auto on mode

Command syntax SYSTem:STARt {DEFAULT|LAST}

Query syntax SYSTem:STARt?

Query return {DEFAULT|LAST}<NL>

:LOCal

Description Set the instrument to local operation status (The program control command that sets the instrument to a local or remote operating state interacts with the power key switching of the instrument)

Command syntax SYSTem:LOCal

:REMote

Description Set the instrument to remote operation status

Command syntax SYSTem:REMote

:SOURce

Description Set to query trigger source

Command syntax SYSTem:SOURce {INT|MAN|EXT}

Query syntax SYSTem:SOURce?

Query return {INT|MAN|EXT}<NL>