

BK PRECISION

BA6010 Series

Battery Analyzers



Programming Manual

Contents

1	SCPI Introduction	5
2	SCPI Common Commands	6
2.1	*RST	6
2.2	*TRG	6
2.3	*IDN?	6
2.4	*TST?	7
2.5	*ESE	7
2.6	*SRE	8
2.7	*ESR	8
2.8	*STB	9
2.9	*OPC	9
2.10	*CLS	9
3	DISPlay commands	10
3.1	DISPlay:PAGE	10
3.2	DISPlay:STATe	10
4	Function	12
4.1	FUNcTion:IMPedance	12
4.2	FUNcTion:IMPedance:RANGe	13
4.3	FUNcTion:IMPedance:RANGe:AUTO	14
4.4	FUNcTion:SMONitor:VAC	14
4.5	FUNcTion:SMONitor:IAC	15
4.6	FUNcTion:DEV1:MODE, FUNcTion:DEV2:MODE	15
4.7	FUNcTion:DEV1:REFerence, FUNcTion:DEV2:REFerence	16
4.8	FUNcTion:DEV1:REFerence:FILL, FUNcTion:DEV2:REFerence:FILL	16
4.9	FUNcTion:VDC:RANGe	17
4.10	FUNcTion:VDC:RANGe:AUTO	17
4.11	FUNcTion:REL	18
4.12	FUNcTion:ACFREQuency	18
4.13	FUNcTion:SHORT	18
4.14	FUNcTion:SHORT:IMM	19
5	APERture	20
5.1	APERture:(FAST, MEDium, SLOW)	20

6	TRIGger	21
6.1	TRIGger[IMMediate]	21
6.2	TRIGger:SOURce	21
6.3	TRIGger:DELay	21
7	FETCh	23
8	COMParator	24
8.1	COMParator:STATe	24
8.2	COMParator:BEEper	24
8.3	COMParator:CompMode	25
8.4	COMParator:LOADBinno	25
9	BINSETup	26
9.1	BINSETup:BinMode	26
9.2	BINSETup:COMPareA, BINSETup:COMPareB	26
9.3	BINSETup:NORmalA, BINSETup:NORmalB	27
9.4	BINSETup:BINA, BINSETup:BINB	27
10	STATistics	28
10.1	STATistics:STATe	28
10.2	STATistics:STATUS	29
10.3	STATistics:MODE	29
10.4	STATistics:CLEAR	29
10.5	STATistics:START	30
10.6	STATistics:COUNt	30
10.7	STATistics:MEAN	30
10.8	STATistics:MAXimum	30
10.9	STATistics:MINimum	31
10.10	STATistics:SET	31
10.11	STATistics:NORmalA or STATistics:NORmalA	31
10.12	STATistics:DEViation	32
10.13	STATistics:VARiance	32
10.14	STATistics:CP	32

11	TRACe	33
11.1	TRACe:TOTAL	33
11.2	TRACe:INTERval	33
11.3	TRACe:AM or TRACe:BM	34
11.4	TRACe:ASTOP1, TRACe:BSTOP1, TRACe:ASTOP2, TRACe:BSTOP2)	34
11.5	TRACe:SCAN	35
12	SYSTem	36
12.1	SYSTem:BEEP	36
12.2	SYSTem:LANGuage	36
13	MMEMory	37
13.1	MMEMory:LOAD:STATe	37
13.2	MMEMory:STORe:STATe	37

1 SCPI Introduction

General syntax for SCPI commands or query is a ":" (colon) separated string with either a "?" or an argument following the command string separated by a SPACE character. Commands are terminated by the linefeed character (0x10, "\n").

Arguments are listed using "< ARG | ARG |... >" in the following descriptions. The "ARG" will be from the following:

Parameter	Format
<NR1>	Number with an implicit decimal point at the end. Ex. 100
<NRf>	Number with an explicit decimal point. Ex. 100.5
<Boolean>	Boolean value. Ex. 0, OFF, 1, ON
<STR>	Named value. Ex. phase

Table 1.1 SCPI Command Parameter Formats

Most commands have a long and short format, the capitalized portion of the name is the short form, and the complete name is the long form. For example, the FETch can be sent as either "fet" or fetch. Short and long forms may be mixed in a command string.

An optional portion of a command is shown within "[]".

This command is in the SYStem section of the SCPI command set. The command is a "query" command and will return a string containing the serial number. As a "query" it must end with a "?" character.

The value returned will be terminated by 2 characters "\r" "\n" (0x0D 0x0A).

Command string: "sys:ser?" OR "system:serial?" OR "sys:serial?" etc...

2 SCPI Common Commands

2.1	*RST	6
2.2	*TRG	6
2.3	*IDN?	6
2.4	*TST?	7
2.5	*ESE	7
2.6	*SRE	8
2.7	*ESR	8
2.8	*STB	9
2.9	*OPC	9
2.10	*CLS	9

2.1 *RST

Description Reset the instrument. Resets the unit to factory defaults (including the communication interface).

Command Syntax *RST

2.2 *TRG

Description Triggers a measurement when the unit is in “BUS” trigger mode. (Setup->TRIG BUS)

Command Syntax *TRG

2.3 *IDN?

Description Returns the BA6010/11 ID String

Query Syntax *IDN?

Returned Parameters <manufacturer>,<model>,<serial number>,<firmware>
Example: B&K Precision,BA6011,521J16101,1.3.5

2.4 *TST?

Description Executes an internal self test and returns the test result as the sum of all existing errors codes.

Query Syntax *TST?

Returned Parameters <NR1>
0 = No Error

2.5 *ESE

Description (standard Event Status Enable command) command sets each open bit of the standard event status register (ESR). This command returns state of each bit.

Command Syntax *ESE <value>

Bit number	Description
7	Power On(PON) Bit
6	User Request(URQ) Bit
5	Command Error(EME) Bit
4	Execution Error(EXE) Bit
3	Device Dependent Error(DDE) Bit
2	Query Error(QYE) Bit
1	Request Control(RQC) Bit
0	Operation Complete(OPC) Bit

Query Syntax *ESE?

Returned Parameters <nr1> see the command value table for bit descriptions.

2.6 *SRE

Description The “Service Request Enable” command sets each open bit of the service status byte register. This command returns the current status for each bit of the status byte permission register.

Command Syntax *SRE<value>

Bit number	Description
7	Operation Status Register Summary Bit
6	RQS(Request Service) Bit
5	Standard Event Status Register Summary Bit
4	MAV(Message Available) Bit
3-0	Always 0(zero):

Parameters

Query Syntax *SRE?

2.7 *ESR

Description Returns the contents of the standard event status register.

Query Syntax *ESR?

Bit number	Description
7	Power On(PON) Bit
6	User Request(URQ) Bit
5	Command Error(EME) Bit
4	Execution Error(EXE) Bit
3	Device Dependent Error(DDE) Bit
2	Query Error(QYE) Bit
1	Request Control(RQC) Bit
0	Operation Complete(OPC) Bit

Returned Parameters

2.8 *STB

Description Returns the contents of the standard service status byte register. The execution of this command will not affect contents of the standard status byte register.

Query Syntax *STB?

Returned Parameters

Bit number	Description
7	Operation Status Register Summary Bit
6	RQS(Request Service) Bit
5	Standard Event Status Register Summary Bit
4	MAV(Message Available) Bit
3-0	Always 0(zero)

2.9 *OPC

Description The *OPC command sets the OPC bit of the standard event status register to 0 when BA6010/11 finishes all commands. Query of this command returns 1 when all commands are complete.

Command Syntax *OPC

Parameters none

Examples *OPC

Query Syntax *OPC?

Returned Parameters 1 if all commands are complete.

2.10 *CLS

Description The *CLS command clears the standard event status register and the service request status register.

Command Syntax *CLS

3 DISPlay commands

3.1	DISPlay:PAGE	10
3.2	DISPlay:STATe	10

3.1 DISPlay:PAGE

Description Which screen shown on the display.

Note Return when on the MSETup page, the return value is “CSET”

Command Syntax DISPlay:PAGE <str>

<str> parameter	Description
MEASurement	Basic measurement screen
BCOmp	Bin comparison and sorting screen
TSWEEP	Trace screen
STATistics	Statistical analysis screen
MSETup	Measurement setup screen
BinSETup	Bin comparison setup screen
TSETup	Trace setup screen
SYSTem	System setup screen
FLISt	File listing and utilities screen

Parameters

Examples disp:page meas

Query Syntax DISPlay:PAGE?

Returned Parameters <str><lf>

Related Commands

3.2 DISPlay:STATe

Description Set or query the display or measurements on the screen. “OFF” disables, and “ON” enables this feature.

Note

Command Syntax DISPlay:STATe STR

Parameters ON, OFF

Examples disp:state on

Query Syntax DISPlay:STATe?

Returned Parameters "0" for off and "1" for on.

4 Function

4.1	FUNCtion:IMPedance	12
4.2	FUNCtion:IMPedance:RANGe	13
4.3	FUNCtion:IMPedance:RANGe:AUTO	14
4.4	FUNCtion:SMONitor:VAC	14
4.5	FUNCtion:SMONitor:IAC	15
4.6	FUNCtion:DEV1:MODE, FUNCtion:DEV2:MODE	15
4.7	FUNCtion:DEV1:REFerence, FUNCtion:DEV2:REFerence	16
4.8	FUNCtion:DEV1:REFerence:FILL, FUNCtion:DEV2:REFerence:FILL	16
4.9	FUNCtion:VDC:RANGe	17
4.10	FUNCtion:VDC:RANGe:AUTO	17
4.11	FUNCtion:REL	18
4.12	FUNCtion:ACFREQuency	18
4.13	FUNCtion:SHORT	18
4.14	FUNCtion:SHORT:IMM	19

4.1 FUNCtion:IMPedance

Description Set/get the current measurement function.

Command Syntax FUNCtion:IMPedance <STR>

R	Resistance
RV	Resistance and Voltage
V	Voltage
RQ	Resistance and Quality Factor
LQ	Inductance and Quality Factor
LR	Inductance and Resistance
RX	Resistance and Reactance
ZTD	Impedance and Angle (Degrees)
ZTR	Impedance and Angle (Radians)
CD	Capacitance and Dissipation Factor

Parameters

Examples func:imp RV

Query Syntax FUNCtion:IMPedance?

Returned Parameters Returns the mode in lower case. r, rv, v, rq, lq, lr, rx, ztd, ztr, cd

4.2 FUNCtion:IMPedance:RANGe

Description Set or get the range setting. Set

Command Syntax FUNCtion:IMPedance:RANGe <NR1>

Parameters

Range	Parameter
30mΩ	0
300mΩ	1
3Ω	2
30Ω	3
300Ω	4
3kΩ	5

Examples func:imp:range 1

Query Syntax FUNCtion:IMPedance:RANGe?

Returned Parameters

Range	Returned Value
30mΩ	0.03
300mΩ	0.3
3Ω	3
30Ω	30
300Ω	300
3kΩ	3000

4.3 FUNCtion:IMPedance:RANGe:AUTO

Description Enable or disable automatic range switching.

Command Syntax FUNCtion:IMPedance:RANGe:AUTO <str>

Parameters OFF, ON

Examples func:imp:range:auto on

Query Syntax FUNCtion:IMPedance:RANGe:AUTO?

Returned Parameters

State	Returned Value
OFF	0
ON	1

4.4 FUNCtion:SMONitor:VAC

Description Enable or disable the voltage monitoring switch. On screen this is the Vm field monitoring the sense voltage.

Command Syntax FUNCtion:SMONitor:VAC <str>

Parameters OFF or ON

Examples func:smon:vac on

Query Syntax FUNCtion:SMONitor:VAC?

Returned Parameters

State	Returned Value
OFF	0
ON	1

4.5 FUNCtion:SMONitor:IAC

Description Enable or disable monitoring the measurement current.

Command Syntax FUNCtion:SMONitor:IAC <bool>

Parameters OFF or ON

Examples func:smon:iac on

Query Syntax FUNCtion:SMONitor:IAC?

Returned Parameters

State	Returned Value
OFF	0
ON	1

4.6 FUNCtion:DEV1:MODE, FUNCtion:DEV2:MODE

Description Sets the deviation measurement mode. Gives the deviation from the REF value set on the setup page. DEV1 and DEV2 refer to the primary and secondary measurements respectively.

Command Syntax FUNCtion:DEV1:MODE

Parameters OFF, ABS, PERCent

Examples func:dev2:mode perc

Query Syntax FUNCtion:DEV1:MODE?, FUNCtion:DEV2:MODE?

Returned Parameters

State	Returned Value
OFF	OFF
PERCent	%
ABS	ABS

Related Commands FUNCtion:DEV(1/2):REFerence

4.7 FUNCtion:DEV1:REFerence, FUNCtion:DEV2:REFerence

Description The nominal reference value, DEV1 is the primary measurement and DEV2 is the secondary measurement.

Command Syntax FUNCtion:DEV1:REFerence <NRf>

Parameters <value> may be a number in NR1, NR2 or NR3 format.

Examples func:dev2:ref 0.03

Query Syntax FUNCtion:DEV1:REFerence?, FUNCtion:DEV2:REFerence?

Returned Parameters Value in exponential format +x.xxxxxE+xx

4.8 FUNCtion:DEV1:REFerence:FILL, FUNCtion:DEV2:REFerence:FILL

Description Set the reference value used in the deviation function to the current measured value.

Note The respective deviation states (DEV_A, or DEV_B (aka DEV1, DEV2)) should be set to OFF when issuing this command. The value set with deviation modes active is undefined.

Command Syntax FUNCtion:DEV1:REFerence:FILL, FUNCtion:DEV2:REFerence:FILL

Parameters None

Examples func:dev1:ref:fill

4.9 FUNCtion:VDC:RANGe

Description the range of DC voltage.

Command Syntax FUNCtion:VDC:RANGe

	Parameter	BA6010 Voltage Range	BA6011 Voltage Range
Parameters	0	6V	30V
	1	60V	300V

Examples function:vdc:range 0

Query Syntax FUNCtion:VDC:RANGe?

Returned Parameters The return values are not 0,1 as in the command, they are the voltages.

Model	Returned Values	
BA6010	6V	60V
BA6011	30V	300V

4.10 FUNCtion:VDC:RANGe:AUTO

Description	Enable or disable automatic voltage ranging.
Command Syntax	FUNCtion:VDC:RANGe:AUTO <bool>
Parameters	OFF, ON
Examples	func:vdc:range:auto on
Query Syntax	FUNCtion:VDC:RANGe:AUTO?
Returned Parameters	0 for off and 1 for on.

4.11 FUNCtion:REL

Description	Enable or disable the relative measurement mode. When this command is written, the reference value for relative measurement is set as the current measured value.
Command Syntax	FUNCtion:REL <bool>
Parameters	OFF, ON
Examples	func:rel on
Query Syntax	FUNCtion:REL?
Returned Parameters	0 for off and 1 for on.

Note When using the L and C functions, OL will be shown if the relative value measured is less than the initial value measured when REL is enabled.

4.12 FUNCtion:ACFREQuency

Description	Set the AC input frequency used for line noise sensitivity reduction.
Command Syntax	FUNCtion:ACFREQuency <nr1>

Parameters 50 or 60

Examples func:acfreq 60

Query Syntax FUNCtion:ACFREQuency?

Returned Parameters 50 or 60

4.13 FUNCtion:SHORT

Description Enable/disable the short function.

Command Syntax FUNCtion:SHORT <bool>

Parameters ON or OFF

Examples func:short on

Query Syntax FUNCtion:SHORT?

Returned Parameters 0 for OFF or 1 for ON

4.14 FUNCtion:SHORT:IMM

Description Execute the short calibration operation.

Command Syntax FUNCtion:SHORT:IMM

Parameters none

Examples func:short:imm

5 APERture

5.1 APERture:(FAST, MEDium, SLOW)

20

5.1 APERture:(FAST, MEDium, SLOW)

Description Set the measurement speed, and optionally, the number of measurements to average.

Slow	6.25 measurements/sec
Medium	50 measurements/sec
Fast	100 measurements/sec

Command Syntax APERture <str>[,<nr1>]

Parameters <str> = Speed FAST, MEDium, SLOW
<nr1> = Samples to average

Examples APER MED,10

Query Syntax APERture?

Returned Parameters <str>,<nr1>
ex. SLOW,6

6 TRIGger

6.1	TRIGger[IMMediate]	21
6.2	TRIGger:SOURce	21
6.3	TRIGger:DELay	21

6.1 TRIGger[IMMediate]

Description Triggers a measurement.

Command Syntax TRIGger[:IMMediate]

Examples trig

6.2 TRIGger:SOURce

Description Set the trigger source.

Command Syntax TRIGger:SOURce <str>

Parameters

INTernal	Be automatically triggered by the instrument and be the default setting of the instrument.
EXTernal	Signal via the handler connector.
BUS	Signal via a remote interface.
MAN	Press the blue "TRIG" button to trigger.

Examples trig:source bus

Query Syntax TRIGger:SOURce?

Returned Parameters Returns one of the following: INT, EXT, BUS, or MAN in upper case.

6.3 TRIGger:DELay

Description the delay time after triggering.

Command Syntax TRIGger:DELay <str or nrf>

Parameters MIN, MAX or a number in decimal or exponential format.

Examples trig:del max (60s)
trig:del 0.5 (500ms)
trig:del 5E-1 (500ms)
trig:del 1 (1 second)

Query Syntax TRIGger:DELay?

Returned Parameters <nrf> i.e. the value in exponential notation.

7 FETCh

Description Returns the most recently measured values. Times out if none exist.

Query Syntax FETCh?

Returned Parameters <nrf>,<nrf>,+0
Parameter 1 and 2 are in exponential format. I.E. +9.00000E+99

The third parameter is not currently described.

8 COMPArator

8.1	COMPArator:STATE	24
8.2	COMPArator:BEEper	24
8.3	COMPArator:CompMode	25
8.4	COMPArator:LOADBinno	25

8.1 COMPArator:STATE

Description Enable or disable the comparator function.

Command Syntax COMPArator:STATE <str>

Parameters OFF, ON

Examples comp:state on

Query Syntax COMPArator:STATE?

Returned Parameters 0 for OFF and 1 for ON

8.2 COMPArator:BEEper

Description sets the beeper of comparator function.

Command Syntax COMPArator:BEEper <str>

Parameters	NotGood	when the DUT fails, the buzzer beepers.
	Good	when the DUT passes, the buzzer beepers
	OFF	the beeper function is off.

Examples comp:bee notgood

Query Syntax COMPArator:BEEper?

Returned Parameters NG, GD, OFF

8.3 COMPARATOR:CompMode

Description Set/get the comparator mode, either using the bin or comparator methods.

Command Syntax COMPARATOR:CompMode <str>

Parameters BIN, COMPARE

Examples comp:cm bin

Query Syntax COMPARATOR:CompMode?

Returned Parameters BIN or COMP

8.4 COMPARATOR:LOADBINNO

Description The BIN values used for comparison in compare mode. This command is only valid in compare mode. (Bin Disp -> Mode:COMP) Sets the "Load Bin:" value.

Command Syntax COMPARATOR:LOADBINNO <str>

Parameters BIN1...BIN9

Examples comp:loadb bin2

Query Syntax COMPARATOR:LOADBINNO?

Returned Parameters <str> (BIN1, BIN2, etc...)

9 BINSETup

9.1	BINSETup:BinMode	26
9.2	BINSETup:COMPareA, BINSETup:COMPareB	26
9.3	BINSETup:NORmalA, BINSETup:NORmalB	27
9.4	BINSETup:BINA, BINSETup:BINB	27

9.1 BINSETup:BinMode

Description Set or get the bin compare mode.

Command Syntax BINSETup:BinMode

Parameters	ABS	absolute value mode
	PERcent	percentage mode

Examples binset:bm abs

Query Syntax BINSETup:BinMode?

Returned Parameters 0 for Absolute, and 1 for Percentage

9.2 BINSETup:COMPareA, BINSETup:COMPareB

Description Enable the comparator function of the primary (A) or secondary (B) measurement.

Command Syntax BINSETup:COMPareA <bool> or BINSETup:COMPareB <bool>

Parameters OFF, ON

Examples binset:compa on

Query Syntax BINSETup:COMPareA? or BINSETup:COMPareB?

Returned Parameters 0 for OFF and 1 for ON

9.3 BINSETup:NORmalA, BINSETup:NORmalB

Description	The nominal value of the primary (A), or secondary (B) parameter.
Command Syntax	BINSETup:NORmalA <nrf> or BINSETup:NORmalB <nrf>
Parameters	Nominal (normal) value.
Examples	binset:norb 1.2345
Query Syntax	BINSETup:NORmalA? or BINSETup:NORmalA?
Returned Parameters	<nrf> exponential representation of the nominal value.

9.4 BINSETup:BINA, BINSETup:BINB

Description	Set the upper and lower limit of the primary/secondary parameter. According to different modes, the upper and lower limit of absolute value or percentage can be set.
Command Syntax	BINSETup:BINA N:<nrf>,<nrf> or BINSETup:BINB N:<nrf>,<nrf>
Parameters	The upper and lower bin limit values.
Note	Write the limits in order, upper,lower. "Data out of range" otherwise.
Examples	BINSETup:BINA 2:3,2
Query Syntax	BINSETup:BINA <nr1>? or BINSETup:BINB <nr1>?
Returned Parameters	The upper and lower bin limit values in exponential format, comma separated and with a terminating semicolon. (3.000000e+00,2.000000e+00;)

10 STATistics

10.1	STATistics:STATe	28
10.2	STATistics:STATUS	29
10.3	STATistics:MODE	29
10.4	STATistics:CLEAR	29
10.5	STATistics:START	30
10.6	STATistics:COUNt	30
10.7	STATistics:MEAN	30
10.8	STATistics:MAXimum	30
10.9	STATistics:MINimum	31
10.10	STATistics:SET	31
10.11	STATistics:NORmalA or STATistics:NORmalA	31
10.12	STATistics:DEViation	32
10.13	STATistics:VARiance	32
10.14	STATistics:CP	32

10.1 STATistics:STATe

Description Set or get the measurement parameter used for statistical analysis.

Command Syntax STATistics:STATe <str>

	Setting	Value used
Parameters	A	Primary
	B	Secondary

Examples stat:stat a

Query Syntax STATistics:STATe?

Returned Parameters A or B

10.2 STATistics:STATUS

Description Set the statistical function to ON or OFF.

Command Syntax STATistics:STATUS <bool>

Parameters OFF or ON

Examples stat:status on

Query Syntax STATistics:STATUS?

Returned Parameters **0** for OFF and **1** for ON

10.3 STATistics:MODE

Description Set the mode of high and low limit in statistical function.

Command Syntax STATistics:MODE

Parameters ABS, PERcent

Examples stat:mode abs

Query Syntax STATistics:MODE?

Returned Parameters

Return value	Mode
0	percentage
1	absolute

10.4 STATistics:CLEAR

Description Clears statistical results.

Command Syntax STATistics:CLEAR

10.5 STATistics:START

Description Start or stop taking statistical samples.

Command Syntax STATistics:START <bool>

Parameters OFF, ON

Examples stat:start on

Query Syntax STATistics:START?

Returned Parameters **0** for OFF and **1** for ON

10.6 STATistics:COUNT

Description returns the statistical comparator result.

Query Syntax STATistics:COUNT?

Returned Parameters STATi: COUNT? Response: 1516, 9310, 737

10.7 STATistics:MEAN

Description Returns the statistical mean result.

Query Syntax STATistics:MEAN?

Returned Parameters <nrf>

10.8 STATistics:MAXimum

Description Return the max statistical value measured.

Query Syntax STATistics:MAXimum?

Returned Parameters <nrf>,<nr1> (value, index)

10.9 STATistics:MINimum

Description Returns the minimum value of statistical results.

Query Syntax STATistics:MINimum

Returned Parameters <nrf>,<nr1> (value, index)

10.10 STATistics:SET

- Description** Set or get the statistical count (Number), and high and low limits.
- Command Syntax** STATistics:SET <nr1>,<nrf>,<nrf>
- Parameters** The set of values refer to “NUMBER”, “HI[x]”, “LO[x]” values respectively.
- Examples** stat:set 10, 1.234, 2.5E-1
- Query Syntax** STATistics:SET?
- Returned Parameters** <nr1>,<nrf>,<nrf>. The set of values refer to “NUMBER”, “HI[x]”, “LO[x]” values respectively.

10.11 STATistics:NORmalA or STATistics:NORmalB

- Description** Sets the nominal value of primary or secondary parametera.
- Command Syntax** STATistics:NORmalA <nrf> or STATistics:NORmalB <nrf>
- Parameters** The nominal value for the measured value.
- Examples** stat:norb 50
- Query Syntax** STATistics:NORmalA? or STATistics:NORmalB?
- Returned Parameters** <nrf>

10.12 STATistics:DEViation

- Description** Query the measured statistical deviation.
- Query Syntax** STATistics:DEViation?
- Returned Parameters** <nrf>

10.13 STATistics:VARiance

Description Query the measured statistical variance.

Query Syntax STATistics:VARiance?

Returned Parameters <nrf>

10.14 STATistics:CP

Description Returns the Process Capability Indices (CP) and (CPK).

Query Syntax STATistics:CP?

Returned Parameters <nrf>,<nrf> (CP and CPK respectively)

11 TRACe

11.1	TRACe:TOTAL	33
11.2	TRACe:INTERval	33
11.3	TRACe:AM or TRACe:BM	34
11.4	TRACe:ASTOP1, TRACe:BSTOP1, TRACe:ASTOP2, TRACe:BSTOP2)	34
11.5	TRACe:SCAN	35

11.1 TRACe:TOTAL

Description The total trace measurement time. The value must be in seconds, fractions are rounded off.

Command Syntax TRACe:TOTAL <nrf>

Parameters The trace time in whole, decimal or exponential format.

Examples trace:total 1.23E+2
trace:total 12s

Query Syntax TRACe:TOTAL?

Returned Parameters <nr1>s

11.2 TRACe:INTERval

Description The measurement interval.

Command Syntax TRACe:INTERval <nrf>

Parameters The interval in seconds with decimal places, including exponential notation. Value must be greater than 1.

Examples trace:inter 1.5

Query Syntax TRACe:INTERval?

Returned Parameters <nrf>s (seconds with 6 decimal places)

11.3 TRACe:AM or TRACe:BM

Description	Set and get the trace A, B Max and Min values. That is, the trace plot scales, Yellow is A, and Green is B. A and B are the primary and secondary measurements respectively.
Command Syntax	TRACe:AM <nrf>, <nrf>
Parameters	MAX, MIN value in order.
Examples	trace:am 300m, 200m trace:bm 3e-1, 2e-1 trac:am 0.3, 0.1
Query Syntax	TRACe:AM? or TRACe:BM?
Returned Parameters	<nrf>, <nrf> MAX, MIN

11.4 TRACe:ASTOP1, TRACe:BSTOP1, TRACe:ASTOP2, TRACe:BSTOP2)

Description	Set or get the trace stop points. Sets the upper (1) and lower limits (2) of the trace, and stops the trace function when the limits are violated.
Command Syntax	TRACe:ASTOP1 <NR3> or OFF TRACe:ASTOP2 <NR3> or OFF TRACe:BSTOP1 <NR3> or OFF TRACe:BSTOP2 <NR3> or OFF
Parameters	Stop point values or OFF to disable.
Examples	trace:astop1 10 trace:astop2 5
Query Syntax	TRACe:ASTOP1? TRACe:ASTOP2? TRACe:BSTOP1? TRACe:BSTOP2?

Returned Parameters <nrf> the value in exponential notation.

11.5 TRACe:SCAN

Description Start or stop trace scanning and check the current state.

Command Syntax TRACe:SCAN <str>

Parameters START, STOP

Examples trace:scan start

Query Syntax TRACe:SCAN?

Returned Parameters <str> STOP or STAR

12 SYSTem

12.1	SYSTem:BEEP	36
12.2	SYSTem:LANGuage	36

12.1 SYSTem:BEEP

- Description** Enable or disable the beep.
- Command Syntax** SYSTem:BEEP <bool>
- Parameters** OFF, ON
- Examples** syst:beep off
- Query Syntax** SYSTem:BEEP?
- Returned Parameters** **0** or **1** for off and on respectively

12.2 SYSTem:LANGuage

- Description**
- Command Syntax** SYSTem:LANGuage <str>
- Parameters** ENGLISH, CHINESE
- Examples** syst:lang english

13 MMEMory

13.1	MMEMory:LOAD:STATe	37
13.2	MMEMory:STORe:STATe	37

13.1 MMEMory:LOAD:STATe

Description Loads the saved file. Saved states need to be stored internally, use the file menu in the system setup screen to move files between external and internal storage.

Command Syntax MMEMory:LOAD:STATe <NR1>

Parameters The serial number of file ranging from 1 to 100 (NR1).

Examples mmem:load:state 1

13.2 MMEMory:STORe:STATe

Description Saves the current settings to one of the internal slots.

Command Syntax MMEMory:STORe:STATe <nr1>,<str>

Parameters	<value>	The serial number of file ranging from 1 to 20 (NR1).
	<name>	File name (.STA is not attached, and the name length is not more than 15 characters)

Examples mmem:store:state 1,abc

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