Remote Manual

SDM3045X Digital Mulimeter

RC06034-E01A

Catalogue

SCPI Command

Introduction to the SCPI Language

SCPI (Standard Commands for Programmable Instruments) is an ASCII-based programming language for test and measurement instruments. SCPI commands use a hierarchical structure known as a tree system. Associated commands are grouped under a common node or root, thus forming subsystems. A portion of the SENSe subsystem illustrates this, below.

SENSe:

VOLTage:

DC:RANGe {<*range*>|MIN|MAX|DEF}

DC:RANGe? [MINimum | MAXimum | DEFault]

SENSe is the root keyword of the command, **VOLTage** is a second-level keyword, and **DC** is a third-level keyword. A colon (**:**) separates consecutive keywords.

Syntax Conventions

The command syntax format is illustrated below:

VOLTage:DC:RANGe {<range>|MIN|MAX|DEF}

Most commands (and some parameters) are a mixture of upper- and lower-case letters. The upper-case letters indicate the command's abbreviated spelling, which yields shorter program lines. For better program readability, use the long form.

For example, consider the keyword VOLTage, above. You can type VOLT or VOLTage in any combination of upper- or lower-case letters. Therefore, VolTaGe, volt and Volt are all acceptable. Other forms, such as VOL and VOLTAG, will generate an error.

- Braces (**{ }**) enclose the parameter choices. The braces are not sent with the command string.
- A vertical bar (**|**) separates parameter choices. For example, {<*range*>|MIN|MAX|DEF} in the above command indicates that you can specify a numeric range parameter, or "MIN", "MAX" or "DEF". The bar is not sent with the command string.
- Angle brackets (**< >**) indicate that you must specify a value for the enclosed parameter. For example, the above syntax statement shows the <*range*> parameter in angle brackets. Do not send the brackets with the command string. You must specify a value for the parameter (for example "VOLT:DC:RANG 10") unless you select one of the other options shown in the syntax (for example "VOLT:DC:RANG MIN").
- Optional parameters are enclosed in square brackets (**[ ]**). The brackets are not sent with the command string. If you do not specify a value for an optional parameter, the instrument uses a default value.

Command Separators

A colon (:) separates consecutive different levels of keywords.. You must insert a blank space to separate a parameter from a command keyword. If a command requires more than one parameter, separate adjacent parameters using a comma:

```
DATA:REMove?5,1
```

A semicolon (;) separates commands within the same subsystem and can also minimize typing. For example, the following string:

```
TRIG:COUNT 2;SOUR EXT
```

Equivalent to the following two commands:

```
TRIG:COUNT 2
TRIG:SOUR EXT
```

Use a colon and a semicolon to link commands from different subsystems. For example, in the following example, an error is generated if you do not use both the colon and semicolon:

```
TRIG:COUN 2;:SAMP:COUN 2
```

Using the MIN, MAX and DEF Parameters

For many commands, you can substitute "MIN" or "MAX" in place of a parameter. In some cases you may also substitute "DEF". For example, consider The following example:
VOLTage:DC:RANGe {<range>|MIN|MAX|DEF}
Instead of selecting a specific value for the <*range*> parameter, you can substitute MIN to set the range to its minimum value, MAX to set the range to its maximum value or DEF to set the range to its default value.

Querying Parameter Settings

You can query the current value of most parameters by adding a question mark (**?**) to the command. For example,The following example sets the trigger count to 10 measurements:

```
TRIG:COUN 10
```

You can then query the count value by sending:

```
TRIG:COUN?
```

You can also query the minimum or maximum count allowed as follows:

```
TRIG:COUN? MIN
TRIG:COUN? MAX
```

IEEE-488.2 Common Commands

The IEEE-488.2 standard defines a set of common commands that perform functions such as reset, self-test and
status operations. Common commands always begin with an asterisk (*****), are three characters in length and may
include one or more parameters. The command keyword is separated from the first parameter by a blank space. Use a
semicolon (**;**) to separate multiple commands as shown below:
*RST; *CLS; *ESE 32; *OPC?

SCPI Parameter Types

The SCPI language defines several data formats to be used in program messages and response messages.

Numeric Parameters

Commands that require numeric parameters will 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. You can also send engineering unit suffixes with numeric parameters (e.g., M, k, m or u). If a command accepts only certain specific values, the instrument will automatically round the input numeric parameters to the accepted values. The following command requires a numeric parameter for the range value:

VOLTage:DC:RANGe {<range>|MIN|MAX|DEF}

Because the SCPI parser is case-insensitive, there is some confusion over the letter "M" (or "m"). For your convenience, the instrument interprets "mV" (or "MV") as millivolts, but "MHZ" (or "mhz") as megahertz. Likewise "MΩ" (or "mΩ") is interpreted as megΩ. You can use the prefix "MA" for mega. For example, "MAV" is interpreted as megavolts.

Discrete Parameters

Discrete parameters are used to program settings that have a limited number of values (like IMMediate, EXTernal or BUS). They have a short form and a long form just like command keywords. You can mix upper- and lower-case letters. Query responses will always return the short form in all upper-case letters. The following example requires discrete parameters for the temperature units:

UNIT:TEMPerature{C|F|K}

Boolean Parameters

Boolean parameters represent a single binary condition that is either true or false. For a false condition, the instrument will accept "OFF" or "0". For a true condition, the instrument will accept "ON" or "1". When you query a Boolean setting, the instrument will always return "0" or "1". The following example requires a Boolean parameter:

DISPlay:STATe {ON|1|OFF|0}

Command in this Manual

1.1 ABORt

Aborts a measurement in progress, returning the instrument to the trigger idle state.

Pameter	Typical Return
(none)	(none)
Abort a measurement in progress: TRIG:SOUR IMM //Set the trigger source for immediate trigger TRIG:COUN 10 //Set the trigger source for 10 times INIT //Set the trigger state for “wait for trigger” ABOR //Interrupt the measurement	

This command may be used to abort a measurement when the instrument is waiting for a trigger, or for aborting a long measurement or series of measurements.

1.2 FETCh?

Waits for measurements to complete and copies all available measurements to the instrument's output buffer. The readings remain in reading memory.

Parameter	Typical Return
(none)	-5.75122019E-04, -5.77518360E-04, -5.73923848E-04, -5.76020647E-04
Set the trigger source for immediate trigger,the INIT command will instrument in "waiting for trigger" state, in the immediate trigger condition, measurements will immediately be triggered and the measurement results are sent to the measurement of memory. The FETCh? query transfers the measurement from reading memory to the instrument's output buffer. TRIG:SOUR IMM //Set the trigger source for immediate trigger TRIG:COUN 10 //Set the trigger source for 10 times INIT //Set the trigger state for “wait for trigger” FETC? //Read the resulting measurement value	

- The **FETch?** query does not erase measurements from the reading memory. You can send the query multiple times to retrieve the same data.
- You can store up to 1,000 measurements in the reading memory of theSDM3045x . If reading memory overflows, new measurements will overwrite the oldest measurements stored; the most recent measurements are always preserved. No error is generated, but the Reading Mem Ovfl bit (bit 14) is set in the Questionable Data Register's condition register (see Status System Introduction).
- The instrument clears all measurements from reading memory when the measurement configuration changes, or when any of these commands is executed:
  INITiate
  MEASure:<function>?
  READ?

1.3 INITiate[:IMMediate]

Set the trigger state for “wait for trigger”.Measurements will begin when the specified trigger conditions are satisfied following the receipt of the INITiate command. This command also clears the previous set of measurements from reading memory.

Parameter	**Typical Return**
(none)	(none)
Set the trigger source for “wait for trigger”, it can effectively receives the trigger signal: TRIG:SOUR BUS //Set the trigger source to trigger bus TRIG:COUN 10 //Set the trigger source for 10 times INIT //Set the trigger state for “wait for trigger” *TRG //Send a trigger signal FETCh? //After measuring can read the measured memory	

- Storing measurements in reading memory with I**NITiate** is faster than sending measurements to the instrument's output buffer using **READ?** (provided you do not send **FETCh?** until done). The INITiate command is also an "overlapped" command. This means that after executing INITiate, you can send other commands that do not affect the measurements.
- You can store up to 1,000 measurements in the reading memory of the SDM3055x. If reading memory overflows, new measurements will overwrite the oldest measurements stored; the most recent measurements are always preserved. No error is generated, but the Reading Mem Ovfl bit (bit 14) is set in the Questionable Data Register's condition register (see Status System Introduction).
- To retrieve the measurements from the reading memory, use **FETCh?.** Use **DATA:REMove?** or **R?** to read and erase all or part of the available measurements.
- The **ABORt** command may be used to return to idle.

1.4 OUTPut:TRIGger:SLOPe {POSitive|NEGative}

OUTPut:TRIGger:SLOPe?

Selects the slope of the *voltmeter complete* output signal on the rear-panel VM Comp BNC connector.

Parameter	Typical Return
{POSitive|NEGative}, default NEGative	(none)
Configure DC voltage measurements and make two measurements. The signal on the rear-panel **VM Comp** connector will output a positive pulse as each measurement is completed: CONF:VOLT:DC 10 SAMP:COUN 2 OUTP:TRIG:SLOP POS INIT	

- This parameter is set to its default value after a Factory Reset .

1.5 R? [<max_readings>]

Reads and erases all measurements from the reading memory up to the specified <*max_readings*>. The measurements are read and erased from the reading memory starting with the oldest measurement first.

Parameter	**Typical Return**
1 to 10,000 readings Default is all readings in memory	#247-1.06469770E-03,-1.08160033E-03,-1.22469433E-03 The "#2" means that the next 2 digits indicate how many characters will be in the returned memory string. These two digits are the "47" after the "#2". Therefore, the remainder of the string is 47 digits long: -1.06469770E-03,-1.08160033E-03,-1.22469433E-03
Read and remove the three oldest readings: TRIG:COUN 3 INIT R? 3	

- The R? and DATA:REMove? queries allow you to periodically remove measurements from the reading memory that would normally cause the reading memory to overflow.
- You can store up to 1,000 measurements in the reading memory of the SDM3055x. If reading memory overflows, new measurements will overwrite the oldest measurements stored; the most recent measurements are always preserved. No error is generated, but the Reading Mem Ovfl bit (bit 14) is set in the Questionable Data Register's condition register (see Status System Introduction).
- The instrument clears all measurements from reading memory when the measurement configuration changes, or when any of these commands is executed:
  INITiate
  MEASure:<function>?
  READ?

1.6 READ?

Read and erase measurement results from reading storage ,up to the specified < max_readings >.This command reads the data will begin with the first measurement results.

Parameter	Typical Return
(none)	-1.23006735E-03,-1.30991641E-03,-1.32756530E-03, -1.32002814E-03
Transmission measurements from the reading memory: TRIG:COUN 4 SAMP:COUN 1 READ?	

- The FETch? query does not erase measurements from the reading memory. You can send the query multiple times to retrieve the same data.
- You can store up to 1,000 measurements in the reading memory of the SDM3055. If reading memory overflows, new measurements will overwrite the oldest measurements stored; the most recent measurements are always preserved. No error is generated, but the Reading Mem Ovfl bit (bit 14) is set in the Questionable Data Register's condition register .
- It is important to note that the following command will measurements to empty, leading to FETCh? The return value of the change:
  INITiate
  MEASure:<function>?
  READ?

1.7 SAMPle:COUNt {<count>|MIN|MAX|DEF}

SAMPle:COUNt? [{MIN|MAX|DEF}]

Specifies the number of measurements (samples) the instrument will take per trigger.

Parameter	Typical Return
1(default) to10,000	1
Set a single trigger sampling frequency for 10 times, the back panel of the VM Comp BNC connector on the oscilloscope will only observe a pulse: SAMP:COUN 10 //Set the sampling frequency for 10 times TRIG:COUN 1 //Set the trigger for 1 times TRIG:SOUR EXT;SLOP NEG //Set the trigger source to the external trigger and trigger signal is set to the falling edge OUTP:TRIG:SLOP POS //Set the trigger output signal to rise READ? //Start the wheel measurement and reading	

- You can use the specified sample count in conjunction with a trigger count (TRIGger:COUNt), which sets the number of triggers to be accepted before returning to the "idle" trigger state. The total number of measurements returned will be the product of the sample count and trigger count.
- You can store up to 10,000 measurements in the reading memory of the SDM3055x. If reading memory overflows, new measurements will overwrite the oldest measurements stored; the most recent measurements are always preserved. No error is generated, but the Reading Mem Ovfl bit (bit 14) is set in the Questionable Data Register's condition register .
- This parameter is set to its default value after a Factory Reset.

1.8 UNIT:TEMPerature {C|F|K}

UNIT:TEMPerature?

Selects the units (°C, °F or Kelvin) to be used for all temperature measurements.

Parameter	Typical Return
{C|F|K},default C	C, F or K
Set to return the result in °F UNIT:TEMP F //Set the temperature measurement unit in °F MEAS:TEMP? //Recovery temperature default configuration and read a set of temperaturemeasurements	

- The command also accepts CEL or FAR, but the query returns C or F.
- This parameter is set to its default value after a Factory Reset.

System Command

2.1 CALCulate Subsystem

2.1.1 CALCulate:CLEar[:IMMediate]

Clears all limits, histogram data, statistics and measurements.

Parameter	Typical Return
(none)	(none)
Clear all limits, histogram data, statistics, and measurements: CALC:CLE:IMM CALC:CLE:IMM	

- The items cleared by this command are cleared synchronously, so that the histogram, statistics, and limit data all restart at the same time that measurements restart.

2.2 CALCulate:LIMit Subsystem

This subsystem specifies measurements and indicates when a limit has been exceeded.

Example

The following example enables limit testing of 100 DC voltage measurements and indicates whether measurements were outside the range of 2.4 to 3.6 V. Measurements above 3.6 V will set bit 12 (Upper Limit Failed) of the Questionable Status Register; measurements below 2.4 V will set bit 11 (Lower Limit Failed).

```
*CLS
CONF:VOLT 10
SAMP:COUN 100
CALC:LIM:LOW 2.4
CALC:LIM:UPP 3.6
CALC:LIM:STAT ON
```

Command Summary

CALCulate:LIMit:CLEar[:IMMediate]
CALCulate:LIMit:{LOWer|UPPer}[:DATA]
CALCulate:LIMit[:STATe]

2.2.1 CALCulate:LIMit:CLEar[:IMMediate]

Clears front-panel indications of limits being exceeded and clears bit 11 ("Lower Limit Failed") and bit 12 ("Upper Limit Failed") in the Condition Register of the Questionable Data Register event register group. The corresponding event register bits are unaffected.
A condition register continuously monitors the state of the instrument. Condition register bits are updated in real time;they are neither latched nor buffered.
An event register is a read-only register that latches events from the condition register. While an event bit is set,subsequent events corresponding to that bit are ignored.

Parameter	Typical Return
(none)	(none)
Clear the limit test results: CALC:LIM:CLE	

- This command does not clear measurements in reading memory.
- The instrument clears front-panel indications of limits being exceeded and clears bits 11 and 12 in the Questionable Data Register when the measurement function changes, or when any of the executed:
  CALCulate:LIMit:STATe ON
  INITiate
  MEASure:<function>?
  READ?
  CALCulate:LIMit:CLEar
- To clear statistics, limits, histogram data, and measurement data, use CALCulate:CLEar[:IMMediate].

2.2.2 CALCulate:LIMit:{LOWer|UPPer}[:DATA] {<value>|MIN|MAX|DEF}

CALCulate:LIMit:{LOWer|UPPer}[:DATA]? [{MIN|MAX|DEF}]

Sets an upper or lower limit.

Parameter	Typical Return
-1.0E+15 to -1.0E-15， or 0.0(default) or +1.0E-15 to 1.0E+15	+1.00000000E+00
See Example.	

- You can assign a lower limit, an upper limit or both. Do not set the lower limit above the upper limit.If the limit set is higher than the upper limit, the limit value is set to the same limitwill force the same value.
- Limit crossing: If a measurement is less than the specified lower limit, bit 11 ("Lower Limit Failed") is set in the Questionable Data Condition Register. A measurement greater than the specified upper limit sets bit 12 ("Upper Limit Failed"). See STATus Subsystem Introduction for further information.
- This parameter is set to its default value after a Factory Reset.

2.2.3 CALCulate:LIMit[:STATe]{ON|1|OFF|0}

CALCulate:LIMit[:STATe]?

Enables or disables limit testing.

Parameter	Typical Return
{ON|1|OFF|0}, default OFF	0 (OFF) or 1 (ON)
See Example.	

- The instrument clears front-panel indications of limits being exceeded and clears bits
- 11 and 12 in the Questionable Data Register when the measurement function changes, or when any of the following commands is executed:
  CALCulate:LIMit:STATe ON
  INITiate
  MEASure:<function>?
  READ?
  CALCulate:LIMit:CLEar
- The instrument turns this setting OFF when the measurement function is changed
  .

2.3 CALCulate:TRANsform:HISTogram Subsystem

The HISTogram subsystem configures the histogram display. The instrument clears histogram data when the measurement function changes and when any of the following commands is sent:
CALCulate:TRANsform:HISTogram:CLEar[:IMMediate]
CALCulate:TRANsform:HISTogram:POINts
CALCulate:TRANsform:HISTogram:RANGe:AUTO
CALCulate:TRANsform:HISTogram:RANGe:{LOWer|UPPer}
CALCulate:TRANsform:HISTogram[:STATe]
INITiate[:IMMediate]
MEASure:<*function*>?
READ?

Command Summary
CALCulate:TRANsform:HISTogram:ALL?
CALCulate:TRANsform:HISTogram:CLEar[:IMMediate]
CALCulate:TRANsform:HISTogram:COUNt?
CALCulate:TRANsform:HISTogram:DATA?
CALCulate:TRANsform:HISTogram:POINts
CALCulate:TRANsform:HISTogram:RANGe:AUTO
CALCulate:TRANsform:HISTogram:RANGe:{LOWer|UPPer}
CALCulate:TRANsform:HISTogram[:STATe]

Example
This example enables an automatically scaled, 100-bin histogram of 1000 DCV measurements. It then returns the computed histogram, including the lower and upper range values, the total measurement count, and the bin data.
CONF:VOLT:DC 10,0.001
SAMP:COUN 1000
CALC:TRAN:HIST:RANG:AUTO ON
CALC:TRAN:HIST:POIN 100
CALC:TRAN:HIST:STAT ON
INIT
*WAI
CALC:TRAN:HIST:ALL?
Typical Response: +9.99383828E+00,+1.00513398E+01,+1000,<*102 bin counts*>
Note: The above response indicates 102 bin counts because the histogram includes bins for values below and above the histogram range.

2.3.1 CALCulate:TRANsform:HISTogram:ALL?

CALCulate:TRANsform:HISTogram:DATA?

The ALL form of the query returns a comma-separated list of the lower and upper range values, the number of measurements, and the bin data collected since the last time the histogram data was cleared. The DATA form returns only the bin data.

Parameter	Typical Return
(none)	See Example.
See Example.	

- The bin data includes the following, in order:
  - The number of measurements less than the lower range value .
  - The number of measurements in the each of the bins, starting at the lower range value bin
  - The number of measurements greater than the upper range value
- Range values are real numbers returned in the form +1.00000000E+00. The number of measurements and bin data are signed, positive integers returned in the form +100.

2.3.2 CALCulate:TRANsform:HISTogram:CLEar[:IMMediate]

Clears the histogram data and restarts histogram ranging if it is enabled (CALCulate:TRANsform:HISTogram:RANGe:AUTO ON).

Parameter	Typical Return
（none）	（none）
Clear the histogram data: CALC:TRAN:HIST:CLE	

- This command does not clear measurements in reading memory.
- To clear statistics, limits, histogram data, and measurement data, use CALCulate:CLEar[:IMMediate].

2.3.3 CALCulate:TRANsform:HISTogram:COUNt?

Returns the number of measurements collected since the last time the histogram was cleared.

Parameter	Typical Return
（none）	+96
Return the number of measurements used to compute the current histogram: CALC:TRAN:HIST:COUN?	

2.3.4 CALCulate:TRANsform:HISTogram:POINts{<value>|MIN|MAX|DEF}

CALCulate:TRANsform:HISTogram:POINts?[{MIN|MAX|DEF}]

Sets the number of bins between the lower and upper range values for the histogram. Two additional bins always exist: one for measurements below the lower range and one for measurements above the upper range.

Parameter	Typical Return
{10|20|40|100|200|400|MIN|MAX|DEF},default 100	+100
See Example.	

- You can specify the lower and upper range values using CALCulate:TRANsform:HISTogram:RANGe: {LOWer|UPPer}. Lower and upper range values are computed automatically if CALCulate:TRANsform:HISTogram:RANGe:AUTO is ON.
- This parameter is set to its default value after a Factory Reset.

2.3.5 CALCulate:TRANsform:HISTogram:RANGe:AUTO{ON|1|OFF|0}

CALCulate:TRANsform:HISTogram:RANGe:AUTO?

Enables or disables automatic selection of the histogram's lower and upper range values.

Parameter	Typical Return
{ON|1|OFF|0}，default ON	0 (OFF) or 1 (ON)
See Example.	

- **ON:** the instrument set the lower and upper range values automaticly.
- **OFF:** the lower and upper range values are specified by CALCulate:TRANsform:HISTogram:RANGe:{LOWer|UPPer}.
- Setting the lower or upper range value (CALCulate:TRANsform:HISTogram:RANGe:{LOWer|UPPer) disables automatic selection of the lower and upper range values (CALCulate:TRANsform:HISTogram:RANGe:AUTO OFF).
- The instrument restarts automatic range value selection (if enabled) when INITiate, MEASure? or READ? is executed.
- This parameter is set to its default value after a Factory Reset.

2.3.6

CALCulate:TRANsform:HISTogram:RANGe:{LOWer|UPPer}{<value>|MIN|MAX|DEF}

CALCulate:TRANsform:HISTogram:RANGe:{LOWer|UPPer}?[{MIN|MAX|DEF}]

Sets the histogram's lower and upper range values. Setting the lower or upper range value. (CALCulate:TRANsform:HISTogram:RANGe:{LOWer|UPPer}) disables automatic selection of the lower and upper range values (CALCulate:TRANsform:HISTogram:RANGe:AUTO OFF).

Parameter	Typical Return
-1.0E+15 to -1.0E-15, or 0.0 (default) or +1.0E-15 to 1.0E+15	+1.00000000E+06
See Example.	

- If automatic range value selection is enabled (CALCulate:TRANsform:HISTogram:RANGe:AUTO ON), the query returns the computed range value. If no histogram data exists, 9.91E37 (Not a Number) is returned.
- Lower and upper range values are computed automatically if CALCulate:TRANsform:HISTogram:RANGe:AUTO is ON.
- This parameter is set to its default value after a Factory Reset.

2.3.7 CALCulate:TRANsform:HISTogram[:STATe]{ON|1|OFF|0}

CALCulate:TRANsform:HISTogram[:STATe]?

Enables or disables histogram computation.

Parameter	Typical Return
{ON|1|OFF|0}, default OFF	0 (OFF) or 1 (ON)
See Example.	

2.4 CALCulate:SCALe Subsystem

This subsystem scales ACV and DCV measurements.

Command Summary

CALCulate:SCALe:DB:REFerence
CALCulate:SCALe:DBM:REFerence
CALCulate:SCALe:FUNCtion
CALCulate:SCALe:REFerence:AUTO
CALCulate:SCALe[:STATe]

2.4.1 CALCulate:SCALe:DB:REFerence {<reference>|MIN|MAX|DEF}

CALCulate:SCALe:DB:REFerence? [{MIN|MAX}]

Stores a relative value in the multimeter's dB Relative Register, which is used for the dB function in CALCulate:SCALe:FUNCtion. When the dB function is enabled, this value will be subtracted from the each voltage measurement after the measurement is converted to dBm.

Note: This command applies only to ACV and DCV measurement functions.

Parameter	Typical Return
-200.0 dBm to +200.0 dBm, default 0	+5.00000000E+02
Enable dB scaling with a -10 dB reference reference resistance: CALC:SCAL:DB:REF -10.0 CALC:SCAL:FUNC DB CALC:SCAL:STAT ON	

- Specifying a reference value disables automatic reference selection (CALCulate:SCALe:REFerence:AUTO OFF).
- The dB relative value parameter is relative to the dBm reference set with CALCulate:SCALe:DBM:REFerence.
- The instrument sets the reference value to 0.0 with automatic reference selection enabled after a Factory Reset, a change in math function, or a change in measurement function.

2.4.2 CALCulate:SCALe:DBM:REFerence {<reference>|MIN|MAX|DEF}

CALCulate:SCALe:DBM:REFerence? [{MIN|MAX}]

Selects the reference resistance for converting voltage measurements to dBm. This reference value affects the dBm and dB scaling functions.
Note:This command applies only to ACV and DCV measurement functions.

Parameter	Typical Return
50、75、93、110、124、125、135、150、250、300、500、600((default)、800、900、1000、1200 or 8000Ω	+6.00000000E+02
Enable dBm scaling with a reference resistance of 600 Ω: CALC:SCAL:DBM:REF 600 CALC:SCAL:FUNC DBM CALC:SCAL:STAT ON	

- The instrument sets the reference value to its default value after a Factory Reset, a change in math function, or a change in measurement function.

2.4.3 CALCulate:SCALe:FUNCtion {DB|DBM}

CALCulate:SCALe:FUNCtion?

Selects the operation that will be performed by the scaling function:

- DB performs a relative dB computation. The result will be the difference between the input signal and the stored DB relative value (CALCulate:SCALe:DB:REFerence), with both values converted to dBm (dB = measurement indBm – relative value in dBm).
- DBM performs a dBM computation. The result is logarithmic and is based on a calculation of power delivered to a reference resistance (CALCulate:SCALe:DBM:REFerence), relative to 1 milliwatt. (dBm = 10 × log10 (measurement 2 / reference resistance / 1 mW)).

Note: This command applies only to ACV and DCV measurement functions.

Parameter	**Typical Return**
{DB|DBM}	DBorDBM
Enable the DB scaling function referenced to the next measurement taken: CALC:SCAL:FUNC DBM CALC:SCAL:STAT ON	

- For the dB function, the reference value can be automatically selected using the first measurement converted to dBm as the reference value (see CALCulate:SCALe:REFerence:AUTO), or it can be specified by CALCulate:SCALe:DB:REFerence.
- Scaling function results must be in the range of -1.0E+24 to -1.0E-24, or +1.0E-24 to 1.0E+24. Results outside these limits will be replaced with -9.9E37 (negative infinity), 0, or 9.9E37 (positive infinity).
- This parameter is set to its default value after a Factory Reset.

2.4.4 CALCulate:SCALe:REFerence:AUTO {ON|1|OFF|0}

CALCulate:SCALe:REFerence:AUTO?

Enables or disables automatic reference selection for the dB scaling functions
Note:This command applies only to ACV and DCV measurement functions.

Parameter	Typical Return
{ON|1|OFF|0}, default ON	0(OFF)or1(ON)
Enable the DB function with automatic reference selection and use the first measurement as the reference value: CALC:SCAL:DBM:REF 50 CALC:SCAL:FUNC DB CALC:SCAL:REF:AUTO ON CALC:SCAL:STAT ON READ?	

- **ON:** the first measurement made will be used as the reference for all subsequent measurements, and automatic reference selection will be disabled:
  - For the dB scaling function, the first measurement is converted to dBm, and CALCulate:SCALe:DB:REFerence is set to the result.
- **OFF:**CALCulate:SCALe:DB:REFerence specifies the reference for DB scaling.
- The instrument enables automatic reference selection when the scaling function is enabled (CALCulate:SCALe:STATe ON).
- This parameter is set to its default value after a Factory Reset.

2.4.5 CALCulate:SCALe[:STATe] {ON|1|OFF|0}

CALCulate:SCALe[:STATe]?

Enables or disables the scaling function.
Note :This command applies only to ACV and DCV measurement functions.

Parameter	Typical Return
{ON|1|OFF|0}，default ON	0 (OFF) or 1 (ON)
Enable the DB function with automatic reference selection and use the first measurement as the reference value: CALC:SCAL:DBM:REF 50 CALC:SCAL:FUNC DB CALC:SCAL:REF:AUTO ON CALC:SCAL:STAT ON READ?	

- Enabling the scaling function also enables automatic null value selection (CALCulate:SCALe:REFerence:AUTO).
- The instrument turns this setting OFF when the measurement function is changed.

2.5 CALCulate:AVERage Subsystem

This subsystem calculates measurement statistics.

Command Summary

CALCulate:AVERage[:STATe]
CALCulate:AVERage:CLEar[:IMMediate]
CALCulate:AVERage:ALL?
CALCulate:AVERage:AVERage?
CALCulate:AVERage:COUNt?
CALCulate:AVERage:MAXimum?
CALCulate:AVERage:MINimum?
CALCulate:AVERage:PTPeak?
CALCulate:AVERage:SDEViation?

2.5.1 CALCulate:AVERage[:STATe]{ON|1|OFF|0}

CALCulate:AVERage[:STATe]?

Enables or disables statistics computation.

Parameter	Typical Return
{ON|1|OFF|0}, default OFF	0 (OFF) or 1 (ON)
Return the statistics of 100 frequency measurements: CONF:FREQ SAMP:COUN 100 CALC:AVER:STAT ON INIT CALC:AVER:ALL? Typical Response: -4.10466677E-04,+3.13684184E-04,+1.75743178E-02,-6.74799085E-04	

- Statistics are cleared when the measurement function changes or when any of these commands is executed:
  CALCulate:AVERage:STATe ON
  CALCulate:AVERage:CLEar
  INITiate
  MEASure:<*function*>?
  READ?
- The instrument turns this setting OFF when the measurement function is changed.

2.5.2 CALCulate:AVERage:ALL?

CALCulate:AVERage:AVERage?

CALCulate:AVERage:COUNt?

CALCulate:AVERage:MAXimum?

CALCulate:AVERage:MINimum?

CALCulate:AVERage:PTPeak?

CALCulate:AVERage:SDEViation?

The CALCulate:AVERage:ALL? query returns the arithmetic mean (average), standard deviation, minimum value and maximum value of all measurements taken since the statistics were last cleared. The count and peak-to-peak statistics are not returned by CALCulate:AVERage:ALL?.
The other six queries listed above return individual values.

Parameter	Typical Return
(none)	(see below)
Return the statistics of 100 frequency measurements: CONF:FREQ SAMP:COUN 100 CALC:AVER:STAT ON INIT CALC:AVER:ALL? Typical Response: -4.10466677E-04,+3.13684184E-04,+1.75743178E-02,-6.74799085E-04	

- Statistics are cleared when the measurement function changes or when any of these commands is executed:
  CALCulate:AVERage:STATe ON
  CALCulate:AVERage:CLEar
  INITiate
  MEASure:<*function*>?
  READ?
- All values except the COUNt are returned in the form +1.23450000E+01. The count is as a signed, positive integer: +129.
- When dB or dBm scaling is used, the CALC:AVER:AVER and CALC:AVER:SDEV queries return +9.91000000E+37 (not a number).

2.5.3 CALCulate:AVERage:CLEar[:IMMediate]

Clears all computed statistics: minimum, maximum, average, peak-to-peak, count and standard deviation.

Parameter	Typical Return
(none)	(none)
Clear the stored statistical data: CALC:AVER:CLE	

- This command does not clear measurements in reading memory.
- Statistics are cleared when the measurement function changes or when any of these commands is executed:
  CALCulate:AVERage:STATe ON
  CALCulate:AVERage:CLEar
  INITiate
  MEASure:<*function*>?
  READ?
- To clear statistics, limits, histogram data, and measurement data, use CALCulate:CLEar[:IMMediate].

2.6 CONFigure Subsystem

The CONFigure commands are the most concise way to configure measurements.These commands use default measurement configuration values. However, these commands do not automatically start measurements, so you can modify measurement attributes before initiating the measurement.
Use INITiate or READ? to initiate measurements.

Command Summary

CONFigure?
CONFigure:CONTinuity
CONFigure:CURRent:{AC|DC}
CONFigure:DIODe
CONFigure:{FREQuency|PERiod}
CONFigure:{RESistance|FRESistance}
CONFigure:TEMPerature
CONFigure[:VOLTage]:{AC|DC}
CONFigure:CAPacitance

Default Settings for the CONFigure Command

The CONFigure commands select the function, range and sampling rate in one command. All other parameters are set to their default values (below).If no range and sampling speed settings, which will restore the default value.

Measurement Parameter	Default Setting
Autozero	OFF
Range	AUTO
Samples per Trigger	1 sample
Trigger Count	1 trigger
Trigger Delay	1 trigger
Trigger Source	Immediate
Trigger Slope	NEGative
Math Functions	Disabled

Using CONFigure

The following example uses CONFigure and READ? to make an externally-triggered measurement. The CONFigure command configures DC voltage measurements but does not place the instrument in the "wait-for-trigger" state.
The READ? query places the instrument in the "wait-for-trigger" state, initiates a measurement when the rear-panel **Ext Trig** input is pulsed (low by default), stores the measurement in reading memory, and transfers the measurement to the instrument's output buffer. The default range (auto range) and resolution (0.3 PLC) are used for the measurement.

```
CONF:VOLT:DC
TRIG:SOUR EXT
READ?
```

Typical Response: -5.21391630E-04

The following example is like the previous one, but it uses INITiate and FETCh? instead of READ?. The INITiate command places the instrument in the "wait-for-trigger" state, triggers a measurement when the rear-panel **Ext Trig** input is pulsed (low by default), and sends the measurement to reading memory. The FETCh? query transfers the measurement from reading memory to the instrument's output buffer.

```
CONF:VOLT:DC
TRIG:SOUR EXT
READ?
```

Typical Response: -5.21205366E-04

Storing measurements in reading memory with INITiate is faster than sending measurements to the instrument's output buffer using READ? (provided you do not send FETCh? until done). The INITiate command is also an "overlapped" command. This means that after executing INITiate, you can send other commands that do not affect the measurements. This allows you to check for data availability before initiating a read attempt that might otherwise time out. Note that the FETCh? query waits until all measurements are complete to terminate. You can store up to 1,000 measurements in the reading memory of the SDM3055.

The following example configures the instrument for 2-wire resistance measurements, triggers the instrument to make one measurement using INITiate, and stores the measurement in reading memory. The 10 kΩ range is selected.

```
CONF:RES 10000
INIT
FETC?
```

Typical Response:+5.21209585E+04

2.6.1 CONFigure?

Returns a quoted string indicating the present function, range, and resolution. The short form of the function name (CURR:AC, FREQ) is always returned.

Parameter	Typical Return
(none)	“VOLT +2.00000000E-01”
Return the present function, range, and resolution. CONF?	

2.6.2 CONFigure:CONTinuity

Sets all measurement parameters and trigger parameters to their default values for continuity measurements.

Parameter	Typical Return
(none)	(none)
Configure the instrument for continuity measurements. Then make a measurement using an external trigger with positive slope (rising edge) and read the measurement: CONF:CONT TRIG:SOUR EXT;SLOP POS READ?	

- The range and resolution are fixed at 1 kΩ for continuity tests (a 2-wire resistance measurement).
- The instrument beeps (if the beeper is enabled) for each measurement less than or equal to the continuity threshold (The threshold can be passed by [:SENSe]: CONTinuity:THReshold:VALue command), and the actual resistance measurement appears on the display.
- From threshold to 2 kΩ, the instrument displays the actual resistance measurement with no beep. Above 2 kΩ, the instrument displays "OPEN" with no beep.
- The FETCh?, READ?, and MEASure:CONTinuity? queries return the measured resistance, regardless of its value.
- Use READ? or INITiate to start the measurement.

2.6.3 CONFigure:CURRent:{AC|DC} [{<range>|AUTO|MIN|MAX|DEF}]

Sets all measurement parameters and trigger parameters to their default values for AC or DC current measurements. Also specifies the range and resolution through the incoming parameters.

Parameter	Typical Return
<range>：{600uA|6mA|60mA|600mA|6A|10A|AUTO}， default AUTO (autorange),The 600uA and 6mA file can be set only in DC current mode , The minimum gear for 60mA in AC mode .	(none)
Using 6 a range configuration ac current measurements. Two measurement and reading: CONF:CURR:AC 6 SAMP:COUN 2 READ? Typical Response： +4.32133675E-04,+4.18424606E-04	

- You can let autoranging select the measurement range, or you can manually select a fixed range. Autoranging conveniently selects the range for each measurement based on the input signal. For fastest measurements, use manual ranging (autoranging may require additional time for range selection).
- If the input signal is greater than can be measured on the specified manual range, the instrument displays the word Overload on front panel and returns "9.9E37" from the remote interface.
- Use READ? or INITiate to start the measurement.

2.6.4 CONFigure:DIODe

Sets all measurement parameters and trigger parameters to their default values for diode tests.

Parameter	Typical Return
（none）	（none）
Configure, make, and read a default diode measurement: CONF:DIOD READ? Typical Response： +1.32130000E-01	

- The range and resolution are *fixed* for diode tests: the range is 2 VDC.
- The FETCh?, READ?, and MEASure:DIODe? queries return the measured voltage, regardless of its value.
- Use READ? or INITiate to start the measurement.

2.6.5 CONFigure:{FREQuency|PERiod}

Sets all measurement parameters and trigger parameters to their default values in the frequency/period mode.

Parameter	Typical Return
(none)	（none）
Configure, make, and read a default frequency measurement： CONF:FREQ READ? Typical Response： +7.79645018E+01	

- If the input signal is greater than can be measured on the specified manual range, the instrument displays the word Overload on front panel and returns "+9.90000000E+37" from the remote interface.

2.6.6 CONFigure:{RESistance|FRESistance}

[{<range>|AUTO|MIN|MAX|DEF}]

Sets all measurement parameters and trigger parameters to their default values for 4-wire (FRESistance) or 2-wire (RESistance) resistance measurements.Also specifies the range and resolution.

Parameter	**Typical Return**
<range>：{600 Ω|6 kΩ|60 kΩ|600 kΩ|6 MΩ|60 MΩ|100 MΩ}，AUTO(default)	（none）
Configure 4-wire resistance measurements using the 600 Ω range with default resolution.Make and read two measurements CONF:FRES 600 SAMP:COUN 2 READ? Typical Response： +6.71881065E+01,+6.83543086E+01	

- You can let autoranging select the measurement range, or you can manually select a fixed range. Autoranging conveniently selects the range for each measurement based on the input signal. For fastest measurements, use manual ranging (autoranging may require additional time for range selection).
- If the input signal is greater than can be measured on the specified manual range, the instrument displays the word Overload on front panel and returns "9.9E37" from the remote interface.
- Use READ? or INITiate to start the measurement.

2.6.7 CONFigure:TEMPerature [{RTD|THER|DEFault}[,{<type>|DEFault}]]

Sets all measurement parameters and trigger parameters to their default values in temperature measurements.

Parameter	Typical Return
<probe_type>：{RTD|THER}，default THER. The default command can only choose the built-in sensormanufacturers, does not support user defined sensor selection.	none
<type>：PT100 (for RTD only choice) or {BITS90|EITS90|JITS90|KITS90|NITS90|RITS90|SITS90|TITS90} (for THER can choose the sensor)	
Configuration RTD measurement. Then read measurement results: CONF:TEMP RTD,PT100 READ? Typical Response：-2.00000000E+02	

- To change temperature units, use UNIT:TEMPerature.
- If the input signal is greater than can be measured on the specified manual range, the instrument displays the word Overload on front panel and returns "9.9E37" from the remote interface.
- Use READ? or INITiate to start the measurement.

2.6.8 CONFigure[:VOLTage]:{AC|DC} [{<range>|AUTO|MIN|MAX|DEF}]

Sets all measurement parameters and trigger parameters to their default values for AC or DC voltage measurements. Also specifies the stalls through the incoming parameters.

Parameter	**Typical Return**
<range>：{600 mV|6 V|60 V|600 V|1000 V(DC)/750V(AC)}，default AUTO (autorange)	（none）
Configure AC voltage measurements using the 600 V range. Make and read two measurements: CONF:VOLT:AC 600 SAMP:COUN 2 READ? Typical Response： +2.43186951E-02,+2.56896019E-02	

- You can let autoranging select the measurement range, or you can manually select a fixed range. Autoranging conveniently selects the range for each measurement based on the input signal. For fastest measurements, use manual ranging (autoranging may require additional time for range selection).
- If the input signal is greater than can be measured on the specified manual range, the instrument displays the word Overload on front panel and returns "9.9E37" from the remote interface.
- Use READ? or INITiate to start the measurement.

2.6.9 CONFigure:CAPacitance[{<range>|AUTO|MIN|MAX|DEF}]

Sets all measurement parameters and trigger parameters to their default values for capacitance measurement. Also specifies the stalls through the incoming parameters.

Parameter	Typical Return
<range>：{2nF|20nF|200nF|2uF |20uF| 200uF|10000uF}，default AUTO (autorange)	（none）
Configure capacitance measurement using the 2uv range.Make and read two measurements: CONF:CAP 2uF SAMP:COUN 2 READ? Typical Response： +7.26141264E-10,+7.26109188E-10	

- You can let autoranging select the measurement range, or you can manually select a fixed range. Autoranging conveniently selects the range for each measurement based on the input signal. For fastest measurements, use manual ranging (autoranging may require additional time for range selection).
- If the input signal is greater than can be measured on the specified manual range, the instrument displays the word Overload on front panel and returns "9.9E37" from the remote interface.
- Use READ? or INITiate to start the measurement.

2.7 DATA Subsystem

This subsystem allows you to configure and remove data from reading memory. The instrument clears all measurements from reading memory when the measurement configuration changes, or when any of these commands is executed:
INITiate
MEASure:<*function*>?
READ?

Command Summary
DATA:LAST?
DATA:POINts?
DATA:REMove?

2.7.1 DATA:LAST?

Returns the last measurement taken. You can execute this query at any time, even during a series of measurements.

Parameter	Typical Return
（none）	One measurement with units. If no data is available, 9.91E37 (Not a Number) is returned with units Example： -4.79221344E-04 VDC
Return the last measurement： DATA:LAST?	

2.7.2 DATA: POINts?

Returns the total number of measurements currently in reading memory. You can execute this query at any time, even during a series of measurements.

Parameter	Typical Return
（none）	+20
Return the number of measurements in reading memory:DATA:POIN?DATA:POIN?	

You can store up to 1,000 measurements in the reading memory on the SDM3055x.

2.7.3 DATA:REMove?<num_readings> [,WAIT]

Reads and erases <*num_readings*> measurements from the reading memory. If fewer than <*num_readings*> measurements are available, the query will return an error unless the WAIT parameter is specified, in which case the query will wait until <*num_readings* measurements are available.

Parameter	Typical Return
1~10000	-4.55379486E-04,-4.55975533E-04,-4.56273556E-04, -4.53591347E-04,-4.55379486E-04
Read and erase the five oldest readings from reading memory:： DATA:REMove? 5	

- The R? and DATA:REMove? queries allow you to periodically remove measurements from the reading memory that would normally cause the reading memory to overflow.

2.8 MEASure Subsystem

The MEASure queries are the easiest way to program measurements because they always use default measurement parameters. You set the function, range, and resolution in one command, but you cannot change other parameters from their default values. The results are sent directly to the instrument's output buffer.

Note: A MEASure query is functionally equivalent to sending CONFigure followed immediately by READ?. The difference is that CONFigure commands allow you to change parameters between the CONFigure and the READ?

Command Summary

MEASure:CONTinuity?
MEASure:CURRent:{AC|DC}?
MEASure:DIODe?
MEASure:{FREQuency|PERiod}?
MEASure:{RESistance|FRESistance}?
MEASure:TEMPerature?
MEASure[:VOLTage]:{AC|DC}?
MEASure:CAPacitance?

Default Settings for MEASure?

With the MEASure? queries, you can select the function, range and resolution in one command. All other parameters are set to their default values (below).

Parameter	Default Setting
OFF	OFF
Range	AUTO
Samples per Trigger	1 sample
Trigger Count	1 trigger
Trigger Delay	Automatic delay
Trigger Source	Immediate
Trigger Slope	NEGative
Math Functions	Disabled

Using the MEASure? Query

The following example configures DC voltage measurements, internally triggers the instrument to take a measurement, and reads the measurement. The default range (autorange) and resolution (10 PLC) are used for the measurement.

```
MEAS:VOLT:DC?
```

Typical Response: +4.23450000E-03

The following example configures the instrument for 2-wire resistance measurements, triggers the instrument to take a measurement, and reads the measurement with the 2kΩ range.

```
MEAS:RES? 2000
```

Typical Response: +3.27150000E+02

2.8.1 MEASure:CONTinuity?

Sets all measurement parameters and trigger parameters to their default values for continuity test and immediately triggers a measurement. The results are sent directly to the instrument's output buffer.

Parameter	Typical Return
（none）	+9.84739065E+02
Configure the instrument for continuity measurements. Then make and read one measurement: MEAS:CONT?	

- The range and resolution are fixed at 2 kΩ for continuity tests (a 2-wire resistance measurement).
- The instrument beeps (if the beeper is enabled) for each measurement less than or equal to the continuity threshold, and the actual resistance measurement appears on the display.
- From threshold to 2 kΩ, the instrument displays the actual resistance measurement with no beep. Above 2 kΩ, the instrument displays "OPEN" with no beep.
- The FETCh?, READ?, and MEASure:CONTinuity? queries return the measured resistance, regardless of its value.

2.8.2 MEASure:CURRent:{AC|DC}? [{<range>|AUTO|MIN|MAX|DEF}]

Sets all measurement parameters and trigger parameters to their default values for AC or DC current measurements and immediately triggers a measurement. Also specifies the stalls through the incoming parameters.

Parameter	**Typical Return**
<range> ： {600uA|6mA|60mA|600mA|6A|10A|AUTO} ，default AUTO(autorange).The 600uA and 6mA file can only be set in DC current mode,AC mode minimum gear for 60mA	None
Configure AC current measurement using the 6A range.Make and read two measurements: CONF:CURR:AC 6 SAMP:COUN 2 READ? Typical Response： +4.32133675E-04,+4.18424606E-04	

- You can let autoranging select the measurement range, or you can manually select a fixed range. Autoranging conveniently selects the range for each measurement based on the input signal. For fastest measurements, use manual ranging (autoranging may require additional time for range selection).
- Autoranging (AUTO or DEFault), will generate an error if you specify a <*resolution*> because the instrument cannot accurately resolve the integration time (especially if the input continuously changes). If your application requires autoranging, specify DEFault for the <*resolution*> or omit the <*resolution*> altogether.
- If the input signal is greater than can be measured on the specified manual range, the instrument displays the word Overload on front panel and returns "9.9E37" from the remote interface.

2.8.3 MEASure:DIODe?

Sets all measurement parameters and trigger parameters to their default values for diode test measurements and immediately triggers a measurement. The results are sent directly to the instrument's output buffer.

Parameter	Typical Return
（none）	+9.84733701E-01
Configure, make, and read a default diode measurement: MEAS:DIOD?	

- The range and resolution are *fixed* for diode tests: the range is 2 VDC.
- The FETCh?, READ?, and MEASure:DIODe? queries return the measured voltage, regardless of its value.

2.8.4 MEASure:{FREQuency|PERiod}?

Sets all measurement parameters and trigger parameters to their default values for frequency or period measurements and immediately triggers a measurement. The results are sent directly to the instrument's output buffer.

Parameter	Typical Return
（none）	+7.19480528E+01
configure and read the default frequency measurements： MEAS:FREQ?	

- If the input voltage is too large for the selected voltage range (manual ranging), the instrument displays the word Overload on the front panel and returns "9.9E37" from the remote interface. Autoranging can be enabled for the input voltage.

2.8.5 MEASure:{RESistance|FRESistance}?

[{<range>|AUTO|MIN|MAX|DEF}]

Sets all measurement and trigger parameters to their default values for 4-wire resistance (FRESistance) or 2-wire (RESistance) measurements, and immediately triggers a measurement. The results are sent directly to the instrument's output buffer. Also specifies the stalls through the incoming parameters.

Parameter	Typical Return
<range>：{600 Ω|6 kΩ|60 kΩ|600 kΩ|6 MΩ|60 MΩ|100 MΩ}，AUTO (default) or DEFault	（none）
Configure 4-wire resistance measurements using the 600 Ω range with default resolution. Then make and read one measurement:： MEAS:FRES? 600 Typical Response： +6.71881065E+01	

- You can let autoranging select the measurement range, or you can manually select a fixed range. Autoranging conveniently selects the range for each measurement based on the input signal. For fastest measurements, use manual ranging (autoranging may require additional time for range selection).
- If the input signal is greater than can be measured on the specified manual range, the instrument displays the word Overload on front panel and returns "9.9E37" from the remote interface.

2.8.6 MEASure:TEMPerature?[{RTD|THER|DEFault}[,{<type>|DEFault}]]

Sets all measurement parameters and trigger parameters to their default values and immediately triggers a measurement. The results are sent directly to the instrument's output buffer.

Parameter	Typical Return
<probe_type>: {RTD|THER}，default THER. The default command can only choose the built-in sensor manufacturers, does not support user defined sensor selection.	（none）
<type>: PT100(only possible value for RTD) or {BITS90|EITS90|JITS90|KITS90|NITS90|RITS90|SITS90|TITS90}(The sensor can be selected for THER)	
Configure the RTD measurement. Then read out the measuring results: MEAS:TEMP? RTD,PT100 Typical Response： -2.00000000E+02	

- To change temperature units, use UNIT:TEMPerature.
- If the input signal is greater than can be measured, the instrument displays the word Overload on front panel and returns "9.9E37" from the remote interface.

2.8.7 MEASure[:VOLTage]:{AC|DC}? [{<range>|AUTO|MIN|MAX|DEF}]

Sets all measurement parameters and trigger parameters to their default values and immediately triggers a measurement. The results are sent directly to the instrument's output buffer. Also specifies the stalls through the incoming parameters.

Parameter	Typical Return
<range>：{600 mV|6 V|60 V|600 V|1000 V(DC)/750V(AC)}，default AUTO (automatic adjustment range)	（none）
Configure AC voltage measurements using the 600 V range. Then make and read one measurement： MEAS:VOLT:AC? 600 Typical Response: +2.43186951E-02,+2.56896019E-02	

- You can let autoranging select the measurement range, or you can manually select a fixed range. Autoranging conveniently selects the range for each measurement based on the input signal. For fastest measurements, use manual ranging (autoranging may require additional time for range selection).
- If the input signal is greater than can be measured on the specified manual range, the instrument displays the word Overload on front panel and returns "9.9E37" from the remote interface.

2.8.8 MEASure:CAPacitance [{<range>|AUTO|MIN|MAX|DEF}]

Sets all measurement parameters and trigger parameters to their default values for capacitance measurement. Also specifies the stalls through the incoming parameters
.

Parameter	Typical Return
<range>：{2nF|20nF|200nF|2uF |20uF| 200uF|10000uF}，AUTO (default) or DEFault	（none）
Configure DC voltage ratio measurements using the 2uF resolution. Then make and read one measurement: MEAS:CAP? 2uF READ? Typical Response： +7.26141264E-10	

- For the Input terminals, you can allow the instrument to select the measurement range by autoranging or you can select a fixed range using manual ranging. Autoranging decides which range to use for each measurement based on the input signal. For faster measurements, use manual ranging on each measurement (additional time is required for autoranging to select a range).
- If the input signal is greater than can be measured on the specified manual range, the instrument displays the word Overload on front panel and returns "9.9E37" from the remote interface.

2.9 SENSe Subsystem Introduction

The SENSe subsystem configures measurements. The most basic SENSe command is [SENSe:]FUNCtion[:ON], which selects the measurement function. All other SENSe commands are associated with specific measurement types:
Current
Frequency and Period
Resistance
Temperature
Voltage
Capacitance

2.9.1 [SENSe:]FUNCtion[:ON] "<*function*>"

[SENSe:]FUNCtion[:ON]?

Selects the measurement function (all function-related measurement attributes are retained).

Parameter	Typical Return
CONTinuity CURRent:AC CURRent[:DC] DIODe FREQuency FRESistance PERiod RESistance TEMPerature VOLTage:AC VOLTage[:DC] CAPacitance The default is VOLTage [: DC].	The short form of the selected function is returned in quotation marks, with no optional keywords： "CONT"、"CURR:AC"、"CURR"、"DIOD" and so on.
Select the AC voltage function: FUNC "VOLT:AC"	

- If you change the measurement function, all measurement attributes of the previous function (range, resolution, etc.) are remembered. If you return to the original function, those measurement attributes will be restored.
- This parameter is set to its default value after a Factory Reset.

[SENSe:]CURRent Subsystem

This subsystem configures AC and DC current measurements.

Command Summary

[SENSe:]CURRent:{AC|DC}:NULL[:STATe]
[SENSe:]CURRent:{AC|DC}:NULL:VALue
[SENSe:]CURRent:{AC|DC}:NULL:VALue:AUTO
[SENSe:]CURRent:{AC|DC}:RANGe
[SENSe:]CURRent:{AC|DC}:RANGe:AUTO
[SENSe:]CURRent[:DC]:NPLC

2.9.2 [SENSe:]CURRent:{AC|DC}:NULL[:STATe] {ON|1|OFF|0}

[SENSe:]CURRent:{AC|DC}:NULL[:STATe]?

Enables or disables the null function for AC or DC current measurements.
Note:This parameter is not shared between AC and DC measurements. The parameters are independent for AC and DC measurements.

Parameter	Typical Return
{ON|1|OFF|0}，default OFF	0 (OFF) or 1 (ON)
Configure AC current measurements, using the null function to subtract 100 mA from the measurements. Then make two measurements and send them to the instrument's output buffer:CONF:CURR:AC CURR:AC:NULL:STAT ON;VAL 100mA SAMP:COUN 2 READ? Typical Response： -9.92150377E-02,-9.98499843E-02	

- Enabling the scaling function also enables automatic null value selection ([SENSe:]CURRent: {AC|DC}:NULL:VALue:AUTO ON).
- To set a fixed null value, use this command: [SENSe:]CURRent:{AC|DC}:NULL:VALue.
- The instrument disables the null function after a Factory Reset .

2.9.3 [SENSe:]CURRent:{AC|DC}:NULL:VALue {<value>|MIN|MAX|DEF}

[SENSe:]CURRent:{AC|DC}:NULL:VALue? [{MIN|MAX|DEF}]

Sets the null value for AC or DC current measurements.
Note:This parameter is not shared between AC and DC measurements. The parameters are independent for AC and DC measurements.

Parameter	Typical Return
-12 to 12 A, default 0	+1.00000000E-01
Configure AC current measurements, using the null function to subtract 100 mA from the measurements. Then make two measurements and send them to the instrument's output buffer: CONF:CURR:AC CURR:AC:NULL:STAT ON;VAL 100mA SAMP:COUN 2 READ? Typical Response： -9.92150377E-02,-9.98499843E-02	

- Specifying a null value disables automatic null value selection ([SENSe:]CURRent:{AC|DC}:NULL:VALue:AUTO OFF).
- To use the null value, the null state must be on ([SENSe:]CURRent:{AC|DC}:NULL:STATe ON).
- This parameter is set to its default value after a Factory Reset or CONFigure function.

2.9.4 [SENSe:]CURRent:{AC|DC}:NULL:VALue:AUTO{ON|1|OFF|0}

[SENSe:]CURRent:{AC|DC}:NULL:VALue:AUTO?

Enables or disables automatic null value selection for AC or DC current measurements.
Note:This parameter is not shared between AC and DC measurements. The parameters are independent for AC and DC measurements.

Parameter	Typical Return
{ON|1|OFF|0}，default ON	0 (OFF) or 1 (ON)
Using automatic selection of zero value to measure: CURR:AC:NULL:VAL:AUTO ON READ? Typical Response： -4.67956379E-08,+2.33978190E-08	

- When automatic reference selection is ON, the first measurement made is used as the null value for all subsequent measurements.
  [SENSe:]CURRent:{AC|DC}:NULL:VALue will be set to this value. Automatic null value selection will be disabled.
- When automatic null value selection is disabled (OFF), the null value is specified by this command: [SENSe:] CURRent:{AC|DC}:NULL:VALue.
- The instrument enables automatic null value selection when the null function is enabled ([SENSe:]CURRent:{AC|DC}:NULL:STATe ON).
- This parameter is set to its default value after a Factory Reset or CONFigure function.

2.9.5 [SENSe:]CURRent:{AC|DC}:RANGe {<range>|MIN|MAX|DEF}

[SENSe:]CURRent:{AC|DC}:RANGe? [{MIN|MAX|DEF}]

Manually choose measurement range.
Note:This parameter is not shared between AC and DC measurements. The parameters are independent for AC and DC measurements.

Parameter	**Typical Return**
<range>：{600uA|6mA|60mA|600mA|6A|10A|AUTO}，default is AUTO(autorange).	+2.00000000E-01
Configure AC current measurements using the 2 A range. Make and read two measurements: CONF:CURR:AC CURR:AC:RANG 2 SAMP:COUN 2 READ? Typical Response： +3.53049833E-04,+3.54828343E-04	

- Selecting a fixed range ([SENSe:]<*function*>:RANGe) disables autoranging.
- If the input signal is greater than can be measured on the specified manual range, the instrument displays the word Overload on front panel and returns "9.9E37" from the remote interface.
- This parameter is set to its default value after a Factory Reset

2.9.6 [SENSe:]CURRent:{AC|DC}:RANGe:AUTO {OFF|ON|ONCE}

[SENSe:]CURRent:{AC|DC}:RANGe:AUTO?

Disables or enables autoranging for AC or DC current measurements.
Note:This parameter is not shared between AC and DC measurements. The parameters are independent for AC and DC measurements.

Parameter	Typical Return
{ON|1|OFF|0}，default ON	0 (OFF) or 1 (ON)
Configure AC current measurements and perform an immediate autorange. Make and read two measurements: CONF:CURR:AC CURR:AC:RANG:AUTO ONCE SAMP:COUN 2 READ? Typical Response： +5.79294185E-06,+5.79294185E-06	

- With autoranging enabled, the instrument selects the range based on the input signal.
- This parameter is set to its default value after a Factory Reset.

2.9.7 [SENSe:]CURRent:{AC|DC}:NPLC {<PLC>|MIN|MAX|DEF}

[SENSe:]CURRent:{AC|DC}:NPLC? [{MIN|MAX|DEF}]

Sets the integration time in number of power line cycles (PLC) for DC current measurements. Integration time is the period that the instrument's analog-to-digital (A/D) converter samples the input signal for a measurement.

Parameter	Typical Return
{0.3|1|10}，default 10 On the front panel, 0.3|1|10 corresponds to the Speed menu under fast|middle|slow	+1.00000000E+01
Configure DC current measurements using a 10 PLC integration time.: CONF:CURR:DC CURR:DC:NPLC 10	

- This parameter is set to its default value after a Factory Reset.

[SENSe:]{FREQuency|PERiod}

This subsystem configures frequency and period measurements.

Command Summary

[SENSe:]{FREQuency|PERiod}:NULL[:STATe] {ON|1|OFF|0}
[SENSe:]{FREQuency|PERiod}:NULL:VALue {<value>| minimum | maximum | default}
[SENSe:]{FREQuency|PERiod}:NULL:VALue:AUTO {ON|1|OFF|0}
[SENSe:]{FREQuency|PERiod}:VOLTage:RANGe {<range>|MIN|MAX|DEF}
[SENSe:]{FREQuency|PERiod}:VOLTage:RANGe:AUTO {OFF|ON|ONCE}

2.9.8 [SENSe:]{FREQuency|PERiod}:NULL[:STATe] {ON|1|OFF|0}

[SENSe:]{FREQuency|PERiod}:NULL[:STATe]?

Enables or disables the null function for frequency and period measurements.
This parameter is shared between frequency and period measurements.

Parameter	Typical Return
{ON|1|OFF|0}，default OFF	0 (OFF) or 1 (ON)
Configure frequency measurements, using the null function to subtract 1kHz from the measurements. Make and read two measurements: CONF:FREQ FREQ:NULL:STAT ON;VAL 1 kHz SAMP:COUN 2 READ? Typical Response： +1.15953012E+02,+1.07954466E+02	

◆ Enabling the scaling function also enables automatic null value selection ([SENSe:]{FREQuency|PERiod}:NULL:VALue:AUTO ON).

◆ To set a fixed null value, use this command: [SENSe:]{FREQuency|PERiod}:NULL:VALue.

◆ The instrument disables the null function after a Factory Reset or CONFigure function.

2.9.9 [SENSe:]{FREQuency|PERiod}:NULL:VALue

{<value>|MIN|MAX|DEF}

[SENSe:]{FREQuency|PERiod}:NULL:VALue? [{MIN|MAX|DEF}]

Sets the null value for frequency or period measurements.
This parameter is shared between frequency and period measurements.

Parameter	Typical Return
-1.2E6 to +1.2E6, default 0	+1.00000000E-02
Configure frequency measurements, using the null function to subtract 1kHz from the measurements. Make and read two measurements: FREQ:NULL:STAT ON;VAL 1 kHz SAMP:COUN 2 READ? Typical Response： +1.15953012E+02,+1.07954466E+02	

- Specifying a null value disables automatic null value selection ([SENSe:]{FREQuency|PERiod}:NULL:VALue:AUTO OFF).
- To use the null value, the null state must be on ([SENSe:]{FREQuency|PERiod}:NULL:STATe ON).
- This parameter is set to its default value after a Factory Reset or CONFigure function.

2.9.10 [SENSe:]{FREQuency|PERiod}:NULL:VALue:AUTO {ON|1|OFF|0}

[SENSe:]{FREQuency|PERiod}:NULL:VALue:AUTO?

Enables or disables automatic null value selection for frequency and period measurements.
This parameter is shared between frequency and period measurements.

Parameter	Typical Return
{ON|1|OFF|0}，default ON	0 (OFF) or 1 (ON)
Using automatic selection of zero value measurement: FREQ:NULL:VAL:AUTO ON READ? Typical Response： +1.15953012E+02,+1.07954466E+02	

- When automatic reference selection is ON, the first measurement made is used as the null value for all subsequent measurements.
  [SENSe:]{FREQuency|PERiod}:NULL:VALue will be set to this value. Automatic null value selection will be disabled.
- When automatic null value selection is disabled (OFF), the null value is specified by this command: [SENSe:]{FREQuency|PERiod}:NULL:VALue.
- The instrument enables automatic null value selection when the null function is enabled ([SENSe:]{FREQuency|PERiod}:NULL:STATe ON).
- This parameter is set to its default value after a Factory Reset or CONFigure function.

2.9.11 [SENSe:]{FREQuency|PERiod}:VOLTage:RANGe

{<range>|MIN|MAX|DEF}

[SENSe:]{FREQuency|PERiod}:VOLTage:RANGe? [{MIN|MAX|DEF}]

Manually choose frequency/period measurement mode voltage range:
Note：This parameter is shared between frequency and period measurements.

Parameter	Typical Return
<range>：{600 mV|6 V|60 V|600 V|750V}，default 60V	+6.00000000E+01
Configures frequency measurements using the 60 VAC range. Make and read two measurements CONF:FREQ FREQ:VOLT:RANG 60 SAMP:COUN 2 READ?	

- Selecting a fixed range ([SENSe:]<*function*>:RANGe) disables autoranging.
- If the input voltage is too large for the selected voltage range (manual ranging), the instrument displays the word Overload on the front panel and returns "9.9E37" from the remote interface.
- This parameter is set to its default value after a Factory Reset or CONFigure function..

2.9.12 [SENSe:]{FREQuency|PERiod}:VOLTage:RANGe:AUTO

{OFF|ON|ONCE}

[SENSe:]{FREQuency|PERiod}:VOLTage:RANGe:AUTO?

Disables or enables voltage autoranging for frequency and period measurements.
Note：This parameter is shared between frequency and period measurements.

Parameter	Typical Return
{ON|1|OFF|0}，default ON	0 (OFF) or 1 (ON)
Configure frequency measurements and perform an immediate AC voltage autorange. Make and read two measurements: CONF:FREQ FREQ:VOLT:RANG:AUTO ONCE SAMP:COUN 2 READ?	

- With autoranging enabled, the instrument selects the range based on the input signal.
- Selecting a fixed range ([SENSe:]<*function*>:RANGe) disables autoranging.
- This parameter is set to its default value after a Factory Reset.

[SENSe:]{RESistance|FRESistance} Subsystem

This subsystem configures two- and four-wire resistance measurements.

Command Summary

[SENSe:]{RESistance|FRESistance}:NPLC
[SENSe:]{RESistance|FRESistance}:NULL[:STATe]
[SENSe:]{RESistance|FRESistance}:NULL:VALue
[SENSe:]{RESistance|FRESistance}:NULL:VALue:AUTO
[SENSe:]{RESistance|FRESistance}:RANGe
[SENSe:]{RESistance|FRESistance}:RANGe:AUTO

2.9.13 [SENSe:]{RESistance|FRESistance}:NPLC {<PLC>|MIN|MAX|DEF}

[SENSe:]{RESistance|FRESistance}:NPLC? [{MIN|MAX|DEF}]

Sets the integration time in number of power line cycles (PLC) for all alternating current measurements.Integration time is the period that the instrument's analog-to-digital (A/D) converter samples the input signal for a measurement.

Parameter	Typical Return
{0.3|1|10}，default 10 On the front panel, 0.3|1|10 corresponds to the Speed menu under fast|middle|slow	+1.00000000E+01
Configure 2-wire resistance measurements using a 10 PLC integration time. CONF:RES RES:NPLC 10	

◆ This parameter is set to its default value after a Factory Reset or CONFigure function.

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2.9.14 [SENSe:]{RESistance|FRESistance}:NULL[:STATe] {ON|1|OFF|0}

[SENSe:]{RESistance|FRESistance}:NULL[:STATe]?

Enables or disables the null function for all resistance measurements.

Parameter	Typical Return
{ON|1|OFF|0}，default OFF	0 (OFF) or 1 (ON)
Configure 2-wire resistance measurements, using the null function to remove 100 mΩ of wiring resistance. Make and read two measurements CONF:RES RES:NULL:STAT ON;VAL 0.1 SAMP:COUN 2 READ?	

- Enabling the scaling function also enables automatic null value selection ([SENSe:]{RESistance/FRESistance}:NULL:VALue:AUTO ON).
- To set a fixed null value, use this command: [SENSe:]{RESistance/FRESistance}:NULL:VALue.
- The instrument disables the null function after a Factory Reset or CONFigure function.

2.9.15 [SENSe:]{RESistance|FRESistance}:NULL:VALue {<value>|MIN|MAX|DEF}

[SENSe:]{RESistance|FRESistance}:NULL:VALue? [{MIN|MAX|DEF}]

Stores a null value for all resistance measurements.

Parameter	Typical Return
-120 MΩ to +120 MΩ，default 为 0	+1.00000000E+02
Configure 2-wire resistance measurements, using the null function to remove 100 mΩ of wiring resistance. Make and read two measurements: CONF:RES RES:NULL:STAT ON;VAL 0.1 SAMP:COUN 2 READ? **Typical Return**： +1.04530000E+02,+1.04570000E+02	

- Specifying a null value disables automatic null value selection ([SENSe:]{RESistance/FRESistance}:NULL:VALue:AUTO OFF).
- To use the null value, the null state must be on ([SENSe:]{RESistance|FRESistance}:NULL:STATe ON).
- This parameter is set to its default value after a Factory Reset or CONFigure function.

2.9.16 [SENSe:]{RESistance|FRESistance}:NULL:VALue:AUTO {ON|1|OFF|0}

[SENSe:]{RESistance|FRESistance}:NULL:VALue:AUTO?

Enables or disables automatic null value selection for all resistance measurements.

Parameter	Typical Return
{ON|1|OFF|0}，default on	0 (OFF) or 1 (ON)
Using automatic selection of zero value to measuret： RES:NULL:VAL:AUTO ON READ? **Typical Return**： +1.23765203E+02,+1.16564762E+02	

- When automatic reference selection is ON, the first measurement made is used as the null value for all subsequent measurements. [SENSe:]{RESistance/FRESistance}:NULL:VALue will be set to this value. Automatic null value selection will be disabled.
- When automatic null value selection is disabled (OFF), the null value is specified by this command: [SENSe:] {RESistance/FRESistance}:NULL:VALue.
- The instrument enables automatic null value selection when the null function is enabled ([SENSe:] {RESistance/FRESistance}:NULL:STATe ON).
- This parameter is set to its default value after a Factory Reset or CONFigure function.

2.9.17 [SENSe:]{RESistance|FRESistance}:RANGe {<range>|MIN|MAX|DEF}

[SENSe:]{RESistance|FRESistance}:RANGe? [{MIN|MAX|DEF}]

Selects a fixed measurement range for all resistance measurements.

Parameter	Typical Return
<range>：{600 Ω|6 kΩ|60 kΩ|600 kΩ|6 MΩ|60 MΩ|100 MΩ}，default 6kΩ	+6.00000000E+03
Configure 2-wire resistance measurements using the 6 kΩ range. Then make and read one measurement: CONF:RES RES:RANG 6000 SAMP:COUN 2 READ?	

- Selecting a fixed range ([SENSe:]<*function*>:RANGe) disables auto ranging.
- If the input signal is greater than can be measured on the specified manual range, the instrument displays the word Overload on front panel and returns "9.9E37" from the remote interface.

2.9.18 [SENSe:]{RESistance|FRESistance}:RANGe:AUTO

{OFF|ON|ONCE}

[SENSe:]{RESistance|FRESistance}:RANGe:AUTO?

Disables or enables autoranging for all resistance measurements. Autoranging is convenient because it automatically selects the range for each measurement based on the input signal. Specifying ONCE performs an immediate autorange and then turns autoranging off.

Parameter	Typical Return
{ON|1|OFF|0}，default ON	0(OFF) or 1(ON)
Configure 2-wire resistance measurements and perform an immediate autorange. Make and read two measurements: CONF:RES RES:RANG:AUTO ONCE SAMP:COUN 2 READ?	

- Autoranging goes down a range at less than 10% of range and up a range at greater than 120% of range.
- Selecting a fixed range ([SENSe:]<*function*>:RANGe) disables autoranging.
- This parameter is set to its default value after a Factory Reset.

[SENSe:]TEMPerature Subsystem

This subsystem configures temperature measurements.

Command Summary

[SENSe:]TEMPerature:NULL[:STATe]
[SENSe:]TEMPerature:NULL:VALue
[SENSe:]TEMPerature:NULL:VALue:AUTO
[SENSe:]TEMPerature:TRANsducer?
[SENSe:]TEMPerature:{UDEFine|MDEFine}:{THER|RTD}:TRANsducer:LIST?
[SENSe:]TEMPerature:{UDEFine|MDEFine}:{THER|RTD}:TRANsducer
[SENSe:]TEMPerature:{UDEFine|MDEFine}:{THER|RTD}:TRANsducer:POINt?

2.9.19 [SENSe:]TEMPerature:NULL[:STATe] {ON|1|OFF|0}

[SENSe:]TEMPerature:NULL[:STATe]?

Enables or disables the null function for temperature measurements.

Parameter	Typical Return
{ON|1|OFF|0}，default ON	0(OFF)or1(ON)
Use the null function to subtract 25°. TEMP:NULL:STAT ON;VAL 25	

- Enabling the scaling function also enables automatic null value selection ([SENSe:]TEMPerature:NULL:VALue:AUTO ON).
- To set a fixed null value, use this command: [SENSe:]TEMPerature:NULL:VALue.
- The instrument disables the null function after a Factory Reset or CONFigure function.

2.9.20 [SENSe:]TEMPerature:NULL:VALue {<value>|MIN|MAX|DEF}

[SENSe:]TEMPerature:NULL:VALue? [{MIN|MAX|DEF}]

Stores a null value for temperature measurements.

Parameter	Typical Return
-1.0E15 to +1.0E15，default 0	+0.00000000E+00
Use the null function to subtract 25°. TEMP:NULL:STAT ON;VAL 25	

- Specifying a null value disables automatic null value selection ([SENSe:]TEMPerature:NULL:VALue:AUTO OFF).
- To use the null value, the null state must be on ([SENSe:]TEMPerature:NULL:STATe ON).
- This parameter is set to its default value after a Factory Reset or CONFigure function.

2.9.21 [SENSe:]TEMPerature:NULL:VALue:AUTO {ON|1|OFF|0}

[SENSe:]TEMPerature:NULL:VALue:AUTO?

Enable or disable the automatic zero value choice

Parameter	Typical Return
{ON|1|OFF|0}，default ON	0(OFF)or1(ON)
Use automatic zero value choice for measurement： TEMP:NULL:VAL:AUTO ON	

- When automatic reference selection is ON, the first measurement made is used as the null value for all subsequent measurements. [SENSe:]TEMPerature:NULL:VALue will be set to this value. Automatic null value selection will be disabled.
- When automatic null value selection is disabled (OFF), the null value is specified by this command: [SENSe:] TEMPerature:NULL:VALue.
- The instrument enables automatic null value selection when the null function is enabled ([SENSe:] TEMPerature:NULL:STATe ON).
- This parameter is set to its default value after a Factory Reset or CONFigure function.

2.9.22 [SENSe:]TEMPerature:TRANsducer?

Query current effective sensor

Parameter	Typical Return
(none)	MANU DEFINE,THER,BITS90
Query current effective sensor: TEMP:TRAN? Typical Response：PT100	

2.9.23

[SENSe:]TEMPerature:{UDEFine|MDEFine}:{THER|RTD}:TRANsducer:

LIST?

Query user-defined/manufacturer curing RTD/THER sensor list.

Parameter	Typical Return
(none)	BITS90,EITS90,JITS90,KITS90,NITS90, RITS90,SITS90,TITS90
Query manufacturer curing RTD sensor list: TEMP:MDEF:RTD:TRAN:LIST? Typical Response：PT100	

2.9.24

[SENSe:]TEMPerature:{UDEFine|MDEFine}:{THER|RTD}:TRANsducer <transducer>

Set the current effective sensor.

Parameter	Typical Return
PT100(RTD)/{BITS90|EITS90|JITS90|KITS90|NITS90|RITS90|SITS90|TITS90}(THER)	(none)
Set the THER KITS90 as the current sensor： TEMP:MDEF:THER:TRAN KITS90	

- The information can be obtained through the [SENSe:]TEMPerature:{UDEFine|MDEFine}:{THER|RTD}:TRANsducer:LIST?
- This command will respond to the default sensor(KITS90) after a Factory Reset.

2.9.25

[SENSe:]TEMPerature:{UDEFine|MDEFine}:{THER|RTD}:TRANsducer: POINt?

Inquiry definition of information sensor.

Parameter	Typical Return
PT100(RTD)/{BITS90|EITS90|JITS90|KITS90|NITS90|RITS90|SITS90|TITS90}(THER)	1|-6.45800|-270.0000,2|-6.44100|-260.0000… The return value to serial number voltage value | | temperature (point) of the format arrangement, comma-separated between different points.
Inquiry detailed information of THER KITS90 definition TEMP:MDEF:THER:TRAN:POIN? KITS90	

[SENSe:]VOLTage Subsystem

This subsystem configures AC voltage measurements and DC voltage measurements.

Command Summary

[SENSe:]VOLTage:{AC|DC}:NULL[:STATe]
[SENSe:]VOLTage:{AC|DC}:NULL:VALue
[SENSe:]VOLTage:{AC|DC}:NULL:VALue:AUTO
[SENSe:]VOLTage:{AC|DC}:RANGe
[SENSe:]VOLTage:{AC|DC}:RANGe:AUTO
[SENSe:]VOLTage[:DC]:NPLC
[SENSe:]VOLTage[:DC]:IMPedance

2.9.26 [SENSe:]VOLTage:{AC|DC}:NULL[:STATe] {ON|1|OFF|0}

[SENSe:] VOLTage:{AC|DC}:NULL[:STATe]?

Enables or disables the null function for AC or DC voltage measurements.
Note:This parameter is not shared between AC and DC measurements. The parameters are independent for ACand DC measurements.

Parameter	Typical Return
{ON|1|OFF|0}，default OFF	0(OFF)or1(ON)
Configure AC voltage measurements, using the null function to subtract 100 mV from the measurements. Make and read two measurements: CONF:VOLT:AC VOLT:AC:NULL:STAT ON;VAL 100mV SAMP:COUN 2 READ? Typical Response： +1.03625390E+00,+1.03641200E+00	

- Enabling the scaling function also enables automatic null value selection ([SENSe:]VOLTage: {AC|DC}:NULL:VALue:AUTO ON).
- To set a fixed null value, use this command: [SENSe:]VOLTage:{AC|DC}:NULL:VALue.
- The instrument disables the null function after a Factory Reset or CONFigure function.

2.9.27 [SENSe:]VOLTage:{AC|DC}:NULL:VALue {<value>|MIN|MAX|DEF}

[SENSe:]VOLTage:{AC|DC}:NULL:VALue? [{MIN|MAX|DEF}]

Stores a null value for voltage measurements.
Note: This parameter is not shared between AC and DC measurements. The parameters are independent for AC and DC measurements.

Parameter	Typical Return
-1200 to +1,200 V，default 0	+1.00000000E+01
Configure AC voltage measurements, using the null function to subtract 100 mV from the measurements. Make and read two measurements: CONF:VOLT:AC VOLT:AC:NULL:STAT ON;VAL 100mV SAMP:COUN 2 READ? Typical Response： +1.03625390E+00,+1.03641200E+00	

- Specifying a null value disables automatic null value selection ([SENSe:]VOLTage:{AC|DC}:NULL:VALue:AUTO OFF).
- To use the null value, the null state must be on ([SENSe:]VOLTage:{AC|DC}:NULL:STATe ON).
- This parameter is set to its default value after a Factory Reset or CONFigure function.

2.9.28 [SENSe:]VOLTage:{AC|DC}:NULL:VALue:AUTO {ON|1|OFF|0}

[SENSe:]VOLTage:{AC|DC}:NULL:VALue:AUTO?

Enables or disables automatic null value selection for AC voltage or DC voltage and ratio measurements.

Note:This parameter is not shared between AC and DC measurements. The parameters are independent for AC and DC measurements.

Parameter	Typical Return
{ON|1|OFF|0}，default ON	0OFF)or1(ON)
Make a second set of measurements using automatic null value selection:VOLT:AC:NULL:VAL:AUTO ON READ? Typical Response： +0.00000000E+00,+0.01230000E+00	

- When automatic reference selection is ON, the first measurement made is used as the null value for all subsequent measurements.
  [SENSe:]VOLTage:{AC|DC}:NULL:VALue will be set to this value. Automatic null value selection will be disabled.
- When automatic null value selection is disabled (OFF), the null value is specified by this command:[SENSe:]VOLTage:{AC|DC}:NULL:VALue.
- The instrument enables automatic null value selection when the null function is enabled ([SENSe:]VOLTage: {AC|DC}:NULL:STATe ON).
- This parameter is set to its default value after a Factory Reset or CONFigure function.

2.9.29 [SENSe:]VOLTage:{AC|DC}:RANGe {<range>|MIN|MAX|DEF}

[SENSe:]VOLTage:{AC|DC}:RANGe? [{MIN|MAX|DEF}]

Manually choose measurement range
Note:This parameter is not shared between AC and DC measurements. The parameters are independent for AC and DC measurements.

Parameter	Typical Return
<range>：{600 mV|6 V|60 V|600 V|1000 V(DC)/750V(AC)} AC default:60V. DC default:1000V.	+6.00000000E+00
Configure AC voltage measurements using the 6 V range. Make and read two measurements: CONF:VOLT:AC VOLT:AC:RANG 6 SAMP:COUN 2 READ? Typical Response： +8.21650028E-03,+8.17775726E-03	

- Selecting a fixed range ([SENSe:]<*function*>:RANGe) disables autoranging.
- If the input signal is greater than can be measured on the specified manual range, the instrument displays the word Overload on front panel and returns "9.9E37" from the remote interface.
- The instrument is set to the default range, with autoranging enabled ([SENSe:]VOLTage:{AC|DC}:RANGe:AUTO ON), after a Factory Reset.

2.9.30 [SENSe:]VOLTage:{AC|DC}:RANGe:AUTO {OFF|ON|ONCE}

[SENSe:]VOLTage:{AC|DC}:RANGe:AUTO?

Disables or enables autoranging for AC and DC voltage measurements and for DC ratio measurements.
Note:This parameter is not shared between AC and DC measurements. The parameters are independent for AC and DC measurements.

Parameter	Typical Return
{ON|1|OFF|0}，default ON	0(OFF)or1(ON)
Configure DC voltage measurements and perform an immediate autorange. Make and read two measurements:CONF:VOLT:AC VOLT:AC:RANG:AUTO ONCE SAMP:COUN 2 READ? Typical Response： +8.36187601E-03,+8.34387541E-03	

- Under the condition of opening in automatic adjustment range, the instrument is based on the input signal selection range.
- This parameter is set to its default value after a Factory Reset.

2.9.31 [SENSe:]VOLTage[:DC]:NPLC {<PLC>|MIN|MAX|DEF}

[SENSe:]VOLTage[:DC]:NPLC? [{MIN|MAX|DEF}]

Sets the integration time in number of power line cycles (PLC) for DC voltage and ratio measurements. Integration time is the period that the instrument's analog-to-digital (A/D) converter samples the input signal for a measurement. A longer integration time gives better measurement resolution but slower measurement speed.

Parameter	Typical Return
{0.3|1|10}，default 10 On the front panel, 0.3|1|10 corresponds to the Speed menu under fast|middle|slow	+1.00000000E+01
Configure DC voltage measurements using a 10 PLC integration time. CONF:VOLT:DC VOLT:DC:NPLC 10	

- This parameter is set to its default value after a Factory Reset.

2.9.32 [SENSe:]VOLTage[:DC]:IMPedance <impedance>

[SENSe:]VOLTage[:DC]:IMPedance?

Select the input impedance of DC voltage measurement mode.

Parameter	Typical Return
{10M|10G}，default open	10M
Select 10M as the input impedance: VOLT:DC:IMP 10M	

- This parameter is only valid in the 600mV and 6V gear to.
- This parameter is set to its default value after a Factory Reset.

[SENSe:]CAPacitance Subsystem

This subsystem configures capacitance measurement.

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Command Summary

[SENSe:]CAPacitance:NULL[:STATe]
[SENSe:]CAPacitance:NULL:VALue
[SENSe:]CAPacitance:NULL:VALue:AUTO
[SENSe:]CAPacitance:RANGe
[SENSe:]CAPacitance:RANGe:AUTO

2.9.33 [SENSe:]CAPacitance:NULL[:STATe] {ON|1|OFF|0}

[SENSe:]CAPacitance:NULL[:STATe]?

Enable or disable the zero function.

Parameter	Typical Return
{ON|1|OFF|0}，default ON	0(OFF)or1(ON)
Use zero functions from the measured value minus 100 nf to configure the capacitance measurement. Make and read two measurements, sent the results to the output buffer of the instrument. CONF:CAP CAP:NULL:STAT ON;VAL 100nF SAMP:COUN 2 READ? Typical Response: +4.79899595E-10,+4.79906446E-10	

- Enable the scaling function will also enable automatic zero value choice. ([SENSe:]Capacitance:{AC|DC}:NULL:VALue:AUTO ON).
- To set a fixedr eturn null,use this command: [SENSe:]Capacitance:{AC|DC}:NULL:VALue.
- This parameter is set to its default value after a Factory Reset.

2.9.34 [SENSe:]CAPacitance:NULL:VALue {<value>|MIN|MAX|DEF}

[SENSe:]CAPacitance:NULL:VALue? [{MIN|MAX|DEF}]

Stores a null value for capacitance measurements.

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Parameter	Typical Return
-12 to +12 mF，default 0.	+1.20000000E-02
Use zero function from the measured value minus 100 nf to configure the ac current measurements. Make and read two measurements, sent the results to the output buffer of the instrument. CONF:CAP CAP:NULL:STAT ON;VAL 100nF SAMP:COUN 2 READ? Typical Response： +4.79899595E-10,+4.79906446E-10	

- Specifies the return to zero will disable automatic selection to zero ([SENSe:]Capacitance:NULL:VALue:AUTO OFF).
- To use the null value, the null state must be on ([SENSe:]Capacitance:NULL:STATe ON).
- This parameter is set to its default value after a Factory Reset.

2.9.35 [SENSe:]CAPacitance:NULL:VALue:AUTO {ON|1|OFF|0}

[SENSe:]CAPacitance:NULL:VALue:AUTO?

Enable or disable the automatic zero value choice.

Parameter	Typical Return
{ON|1|OFF|0}，default ON	0(OFF)or1(ON)
Using the automatic selection of zero value to measure. CAP:NULL:VAL:AUTO ON READ? Typical Response： +0.00000000E+00,+1.02300000E-01	

- When automatic reference selection is ON, the first measurement made is used as the null value for all subsequent measurements. [SENSe:]Capacitance:NULL:VALue will be set to this value. Automatic null value selection will be disabled.
- When automatic null value selection is disabled (OFF), the null value is specified by this command:[SENSe:]Capacitance:NULL:VALue.
- The instrument enables automatic null value selection when the null function is enabled ([SENSe:]Capacitance:NULL:STATe ON).
- This parameter is set to its default value after a Factory Reset or CONFigure function.

2.9.36 [SENSe:]CAPacitance:RANGe {<range>|MIN|MAX|DEF}

[SENSe:]CAPacitance:RANGe? [{MIN|MAX|DEF}]

Manually choose measurement range.

Parameter	Typical Return
<range>：{2nF|20nF|200nF|2uF|20uF|200uF|10000uF|AUTO} Default 2uF.	+2.00000000E-06
Using the 2uFfileconfigurationcapacitance to measure. Make and read two measurements. CONF:CAP CAP:RANG 2E-6 SAMP:COUN 2 READ? Typical Response： +7.28283777E-10,+7.28268544E-10	

- Choose the fixed range ([SENSe:]<function>:RANGe) ,disable the automatic adjustment range.
- If the input signal is greater than can be measured on the specified manual range, the instrument displays the word Overload on front panel and returns "9.9E37" from the remote interface.
- This parameter is set to its default value after a Factory Reset or CONFigure function.

2.9.37 [SENSe:]CAPacitance:RANGe:AUTO {OFF|ON|ONCE}

[SENSe:]CAPacitance:RANGe:AUTO?

Enable or disable automatic adjustment range.

Parameter	Typical Return
{ON|1|OFF|0}，default ON	0(OFF)or1ON)
Configure AC current measurement and executed immediately. Make and read two measurements. CONF:VOLT:AC VOLT:AC:RANG:AUTO ONCE SAMP:COUN 2 READ? Typical Response： +8.36187601E-03,+8.34387541E-03	

- The situation in the automatic adjustment range enabled, the input signal range based on the instrument.
- This parameter is set to its default value after a Factory Reset or CONFigure function.

[SENSe:]CONTinuity

This subsystem configures continuity measurement.

Command Summary
[SENSe:]CONTinuity:THReshold:VALue

2.9.38 [SENSe:]CONTinuity:THReshold:VALue {<value>|MIN|MAX|DEF}

[SENSe:]CONTinuity:THReshold:VALue?

Sets the value for threshold resistance

Parameter	Typical Return
0~2000 Ω，default 0	+2.00000000E+03
Sets the threshold resistance to 2000 CONT:THR:VAL 2000	

◆ This parameter is set to its default value after a Factory Reset or CONFigure function.

2.10 SYSTem Subsystem

2.10.1 SYSTem:BEEPer:STATe {ON|1|OFF|0}

SYSTem:BEEPer:STATe?

Disables or enables the beep heard during continuity, diode, or Probe Hold measurements, or when an error is generated from the front panel or remote interface.

Parameter	Typical Return
{ON|1|OFF|0}，default ON	0(OFF)or1(ON)
Disable keyboard click: SYST:BEEP:STAT OFF	

- This command affect the beeper heard associated with diode and continuity tests, errors and so on.
- This parameter is set to its default value after a Factory Reset.

2.10.2 SYSTem:COMMunicate:LAN:IPADdress "<address>"

SYSTem:COMMunicate:LAN:IPADdress? [{CURRent|STATic}]

Assigns a static Internet Protocol (IP) address for the instrument.

Parameter	Typical Return
Command： "nnn.nnn.nnn.nnn" Query： {CURRent|STATic}，default CURRent Default：169.254.3.5	“192.168.1.101”
Set a static IP address: SYST:COMM:LAN:IPAD "10.11.13.212"	

- This setting is non-volatile; it is not changed after a Factory Reset.

2.10.3 SYSTem:COMMunicate:LAN:SMASk "<mask>"

SYSTem:COMMunicate:LAN:SMASk? [{CURRent|STATic}]]

Assigns a subnet mask for the instrument to use in determining whether a client IP address is on the same local subnet.

Parameter	Typical Return
Command： "nnn.nnn.nnn.nnn",default"255.255.0.0" Query： {CURRent|STATic}，default CURRent	“255.255.255.0”
Set the subnet mask: SYST:COMM:LAN:SMAS "255.255.255.0"	

- A value of "0.0.0.0" or "255.255.255.255" indicates that subnet is not being used.
- **CURRent:** returns address currently being used by the instrument.
- **STATic:** returns static address from non-volatile memory.
- This setting is non-volatile; it is not changed after a Factory Reset.

2.11 TRIGger Subsystem

The TRIGger subsystem configures the triggering that controls measurement acquisition.

Command Summary
TRIGger:COUNt
TRIGger:DELay
TRIGger:DELay:AUTO
TRIGger:SLOPe
TRIGger:SOURce

2.11.1 TRIGger:COUNt {<count>|MIN|MAX|DEF|INFinity}

TRIGger:COUNt? [{MIN|MAX|DEF}]

Selects the number of triggers that will be accepted by the instrument before returning to the "idle" trigger state.

Parameter	Typical Return
1 to 1,000,000 or continuous (INFinity). Default 1	+1.00000000E+00 For a continuous trigger (INFinity), the query returns "9.9E37".
Return ten sets of five DC voltage measurements, CONF:VOLT:DC SAMP:COUN 5 TRIG:COUN 10 READ? Typical Response: -1.85425399E-04, … (50 measurements)	

- You can use the specified trigger count in conjunction with a sample count (SAMPle:COUNt), which sets the number of samples to be made per trigger. In this case, the number of measurements returned will be the sample count multiplied by the trigger count.
- You can store up to 10,000 measurements in the reading memory of the SDM3055. If reading memory overflows, new measurements will overwrite the oldest measurements stored; the most recent measurements are always preserved. No error is generated, but the Reading Mem Ovfl bit (bit 14) is set in the Questionable Data Register's condition register (see Status System Introduction).
- This parameter is set to its default value after a Factory Reset.

2.11.2 TRIGger:DELay {<seconds>|MIN|MAX|DEF}

TRIGger:DELay? [{MIN|MAX|DEF}]

Sets the delay between the trigger signal and the first measurement.

Parameter	Typical Return
0 to ~1000 seconds (~1 µs steps), default 1 s	+1.00000000E-06
Return five DC voltage measurements. There is a 2 second delay before each measurement. CONF:VOLT:DC 10 SAMP:COUN 5 TRIG:DEL 2 READ? Typical Response： +3.07761360E-03,-1.16041169E-03,+5.60585356E-06,+1.21460160E-04,+2.85898531E-04	

- Due to internal quantization, the actual delay that you set may be slightly different than your specified value. The increment is approximately 1 µs. Use the query to determine the exact delay. For example, if you send TRIG:DEL 500 ms and then TRIG:DEL? the actual delay may be +5.00000753E-01.
- By default, TRIGger:DELay:AUTO is ON. The instrument automatically determines the delay based on function, range and integration time (see Automatic Trigger Delays). However, you may need to set a delay longer than the automatic delay for long cables, high capacitance or high impedance signals.
- If you specify a trigger delay with this command, that delay is used for *all* functions (*except* CONTinuity and DIODe) and ranges. The CONTinuity and DIODe tests ignore the trigger delay setting.
- If you have configured the instrument for more than one measurement per trigger (SAMPle:COUNt >1), the delay is inserted after the trigger and between consecutive measurements.
- The instrument selects automatic trigger delay after a Factory Reset.

2.11.3 TRIGger:DELay:AUTO {ON|1|OFF|0}

TRIGger:DELay:AUTO?

Disables or enables automatic trigger delay.

Parameter	Typical Return
{ON|1|OFF|0}，default ON	0(OFF)or1(ON)
Return 5 DC voltage measurements, with an automatic delay between each measurement. CONF:VOLT:DC 10 SAMP:COUN 5 TRIG:DEL:AUTO 1 READ? Typical Response： +3.07761360E-03,-1.16041169E-03,+5.60585356E-06,+1.21460160E-04,+2.85898531E-04	

- Selecting a specific trigger delay using TRIGger:DELay disables the automatic trigger delay.
- This parameter is set to its default value after a Factory Reset.

2.11.4 TRIGger:SLOPe {POSitive|NEGative}

TRIGger:SLOPe?

Selects whether the instrument uses the rising edge (POS) or the falling edge (NEG) of the trigger signal on the rear panel *Ext Trig* BNC connector.

Parameter	Typical Return
{POSitive|NEGative} ， default NEGative	POS or NEG
Return ten sets of five DC voltage measurements, using a positive-going external trigger to start each measurement set: CONF:VOLT:DC SAMP:COUN 5 TRIG:COUN 10 TRIG:SOUR EXT;SLOP POS READ? Typical Response: -1.85425399E-04, …(50 measurements)	

- This parameter is set to its default value after a Factory Reset.

2.11.5 TRIGger:SOURce {IMMediate|EXTernal|BUS}

TRIGger:SOURce?

Selects the trigger source for measurements

Source	Description
IMMediate	The trigger signal is always present. When you place the instrument in the "wait-for-trigger" state, the trigger is issued immediately..
BUS	The instrument is triggered by *TRG over the remote interface once the DMM is in the "wait-for-trigger" state.
EXTernal	The instrument accepts hardware triggers applied to the rear-panel **Ext Trig** input and takes the specified number of measurements (SAMPle:COUNt), each time a TTL pulse specified by OUTPut:TRIGger:SLOPe is received. If the instrument receives an external trigger before it is ready, it will buffer one trigger.

Parameter	Typical Return
{IMMediate|EXTernal|BUS} ，default IMMediate	IMM、EXT or BUS
Return ten sets of five DC voltage measurements, using a positive-going external trigger to start each measurement set: CONF:VOLT:DC SAMP:COUN 5 TRIG:COUN 10 TRIG:SOUR EXT;SLOP POS READ? Typical Response: -1.85425399E-04, … (50 measurements)	

- After selecting the trigger source, you must place the instrument in the "wait-for-trigger" state by sending INITiate or READ? A trigger will not be accepted from the selected trigger source until the instrument is in the "wait-for-trigger" state.
- This parameter is set to its default value after a Factory Reset.