Programming Manual

5490C Series

5½ and 6½ Digit Multimeters

bkprecision.com
CONFigure Subsystem

The CONFigure command is the easiest way to configure measurements. Like the MEASure? query, these commands use the default measurement configuration values. However, these commands do not automatically start measuring, so you can modify the measurement properties before starting the measurement.

### 1.1 Default measurement configuration for the CONFigure command

<table>
<thead>
<tr>
<th>Measurement parameters</th>
<th>Default Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC input filter (bandwidth)</td>
<td>20 Hz (medium speed filter)</td>
</tr>
<tr>
<td>Auto Zero</td>
<td>If the resolution setting causes NPLC to be less than 1, it will be turn OFF; if the resolution setting causes NPLC to be greater than or equal to 1, it will be turn ON.</td>
</tr>
<tr>
<td>Range</td>
<td>AUTO (including voltage range for frequency and period measurement)</td>
</tr>
<tr>
<td>Number of samples per trigger</td>
<td>1 sample</td>
</tr>
<tr>
<td>Trigger number</td>
<td>1 trigger</td>
</tr>
<tr>
<td>Trigger delay</td>
<td>Auto delay</td>
</tr>
<tr>
<td>Trigger source</td>
<td>Immediately</td>
</tr>
<tr>
<td>Trigger slope</td>
<td>NEGative</td>
</tr>
<tr>
<td>Mathematical function</td>
<td>Forbidden. Other parameters have not changed.</td>
</tr>
<tr>
<td>Empty state of each function</td>
<td>Forbidden</td>
</tr>
</tbody>
</table>

### 1.2 CONFigure?

- **Description**: Returns a string indicating the current function, range, and resolution.
- **Query Syntax**: CONFigure?
- **Query Example**: conf?
  
  DCI, 1.00000000E-04, 1.00000000E-09

### 1.3 CONFigure:VOLTage:DC

- **Description**: Configure the instrument for DC voltage measurement, setting all measurement parameters and trigger parameters to their default values.
- **Command Syntax**: CONFigure[:VOLTage]:DC <range>
- **Parameters**:
  
  <range>: 100m, 1, 10, 100, 1000, AUTO, MIN, MAX

  Default:AUTO

- **Example**: CONF:VOLT:DC 100

### 1.4 CONFigure:VOLTage:AC

- **Description**: Configure the instrument for AC voltage measurement, setting all measurement parameters and trigger parameters to default values.
- **Command Syntax**: CONFigure[:VOLTage]:AC <range>
- **Parameters**:
  
  <range>: 100m, 1, 10, 100, 750, AUTO Default:AUTO
**1.5 CONFigure:CURRent:DC**

*Description*  Configure the instrument for DC current measurement, setting all measurement parameters and trigger parameters to default values

*Command Syntax*  CONFigure:CURRent:DC <range>

*Parameters*  <range>: 100 uA, 1 mA, 10 mA, 100 mA, 1 A, 3 A, 10 A. Default:AUTO

*Example*  CONF:CURR:DC 100m

**1.6 CONFigure:CURRent:AC**

*Description*  Configure the instrument for AC current measurement, setting all measurement parameters and trigger parameters to default values

*Command Syntax*  CONFigure:CURRent:AC <range>

*Parameters*  <range>: 100 uA, 1 mA, 10 mA, 100 mA, 1 A, 3 A, 10 A. Default:AUTO

*Example*  CONF:CURR:AC 100m

**1.7 CONFigure:CONTinuity**

*Description*  Configure the instrument for continuity measurement, setting all measurement parameters and trigger parameters to default values

*Command Syntax*  CONFigure:CONTinity

*Example*  CONF:CONT

**1.8 CONFigure:DIODe**

*Description*  Configure the instrument for diode measurement, setting all measurement parameters and trigger parameters to default values

*Command Syntax*  CONFigure:DIODe

*Example*  CONF:DIOD

**1.9 CONFigure:RESistance**

*Description*  Configure the instrument for two-wire resistance measurement, setting all measurement parameters and trigger parameters to default values

*Command Syntax*  CONFigure:RESistance <range>

*Parameters*  <range>: 10, 100, 1k, 10k, 100k, 1M, 10M, 100M Default:AUTO

*Example*  CONF:RES 10M
1.10 CONFigure:FRESistance

Description  Configure the instrument for four-wire resistance measurement, setting all measurement parameters and trigger parameters to default values

Command Syntax  CONFigure:FRESistance <range>

Parameters  <range>: 10, 100, 1k, 10k, 100k, 1M, 10M, 100M Default:AUTO

Example  CONF:FRES 10M

1.11 CONFigure:FREQuency

Description  Configure the instrument for frequency measurement, set all measurement parameters and trigger parameters to default values

Command Syntax  CONFigure:FREQuency [<range>-MIN-MAX-DEF]

Parameters  <range>: 100m, 1, 10, 100, 750 Default:AUTO

Example  CONF:FREQ 10

1.12 CONFigure:PERiod

Description  Configure the instrument for periodic measurements, setting all measurement parameters and trigger parameters to default values

Command Syntax  CONFigure:PERiod [<range>-MIN-MAX-DEF]

Parameters  <range>: 100m, 1, 10, 100, 750 Default:AUTO

Example  CONF:PER 10MA

1.13 CONFigure:TEMPerature

Description  Configure the instrument for temperature measurement and set all measurement parameters and trigger parameters to default values

Command Syntax  CONFigure:TEMPerature [FRTD-RTD-FTHermistor-THERmistor]

Parameters  <probe_type>:FRTD, RTD, FTHermistor, THERmistor

Example  CONF:TEMP RTD

1.14 CONFigure:CAPacitance

Description  Configure the instrument for capacitance measurement, setting all measurement parameters and trigger parameters to default values

Command Syntax  CONFigure:CAPacitance <range>

Parameters  <range>: 1n, 10n, 100n, 1u, 10u, 100u, 1m, 10m Default:AUTO

Example  CONF:CAP 10u
With MEASure? queries, you can use a single command to select functions and ranges. All other parameters are set to default values (see Table 7.3.1).

The example below configures the DC voltage measurement, internally triggering the instrument to take measurements, and reading the measurement results. The default range (automatic adjustment range) and resolution (10 PLC) are used for measurement.

**Query Syntax**  
MEAS:VOLT:DC?

**Typical Response**  
+4.23450000E-03

The example below configures the instrument for 2-wire resistance measurements, triggers the instrument to take measurements and reads the measurements. Select the 1 kΩ range.

**MEAS:RES? 1000**

**Typical Response**  
+3.27150000E+02

### 2.1 MEASure:VOLTage:AC-DC?

**Description**  
Configure the instrument for AC or DC voltage measurement and immediately trigger the measurement to send the measurement to the user. All other measurement parameters and trigger parameters are set to default values.

**Command Syntax**  
MEASure:VOLTage:AC? or MEASure:VOLTage:DC? <range>

**Parameters**

**AC**: <range>: 100m, 1, 10, 100, 750. Default:AUTO

**DC**: <range>: 100m, 1, 10, 100, 1000. Default:AUTO

**Example**  
MEAS:VOLT:DC? 100

**Typical Response**  
+8.53210000E+1

### 2.2 MEASure:CURRent:AC-DC?

**Description**  
Configure the instrument for AC or DC current measurement and immediately trigger the measurement to send the measurement to the user. All other measurement parameters and trigger parameters are set to default values.

**Syntax**  
MEASure:CURRent:AC? or MEASure:CURRent:DC? <range>

**Parameters**

<range>: 100u, 1m, 10m, 100m, 1, 3, 10. Default:AUTO

**Example**  
MEAS:CURR:DC? 10

**Typical Response**  
+8.53210000E+01

### 2.3 MEASure:CONTinuity?

**Description**  
Configure the instrument to perform a continuity measurement and immediately trigger the measurement to send the measurement to the user. All other measurement parameters and trigger parameters are set to default values.

**Syntax**  
MEASure:CONTinuity?
Example MEAS:CONT?

Typical Response +8.5321000E+00

### 2.4 MEASure:DIODe?

**Description** Configure the instrument to perform a diode measurement and immediately trigger the measurement and send the measurement to the user. All other measurement parameters and trigger parameters are set to default values.

**Syntax** MEASure:DIODe?

**Example** MEAS:DIODe?

**Typical Response** +8.5321000E+00

### 2.5 MEASure:RESistance-FRESistance?

**Description** Configure the instrument to perform a 2-wire resistance (RESistance) or 4-wire resistance (FRESistance) measurement and immediately trigger the measurement to send the measurement results to the user. All other measurement parameters and trigger parameters are set to default values.

**Syntax** MEASure:RESistance? or MEASure:FRESistance? <range>

**Parameters** <range>: 10, 100, 1k, 10k, 100k, 1M, 10M, 100M. Default:AUTO

**Example** MEAS:FRES? 100

**Typical Response** +8.5321000E+01

### 2.6 MEASure:FREQuency-PERiod?

**Description** Configure the instrument to perform frequency or period measurements and immediately trigger the measurement to send the measurement to the user. All other measurement parameters and trigger parameters are set to default values.

**Syntax** MEASure:FREQuency or MEASure:PERiod? <range>

**Parameters** <range>: 100m, 1, 10, 100, 750. Default:AUTO

**Example** MEAS:FREQ? 10

**Typical Response** +1.4527800E-04

### 2.7 MEASure:TEMPerature?

**Description** Configure the instrument to perform temperature measurement and immediately trigger the measurement to send the measurement to the user. All other measurement parameters and trigger parameters are set to default values.

**Syntax** MEASure:TEMPerature? <probe>

**Parameters** <probe>: FRTD, RTD, FTHermistor, THERmistor.

**Example** MEAS:TEMP? RTD

**Typical Response** +8.5321000E+1
### 2.8 MEASURE:CAPACITANCE?

**Description**  Configure the instrument to make a capacitance measurement and immediately trigger the measurement and send the measurement to the user. All other measurement parameters and trigger parameters are set to default values.

**Syntax**  MEASURE:CAPACITANCE? <range>

**Parameters**  <range>: 1n, 10n, 100n, 1u, 10u, 100u, 1m, 10m. Default: AUTO

**Example**  MEAS:CAP? 10u

**Typical Response**  +8.53210000E-06
### 3.1 ABORt

**Description** Terminates the measurement in progress and returns the instrument to the trigger idle state.

**Command Syntax** `ABORt`

**Example** Terminate the measurement in progress: `ABORt`

### 3.2 INITiate

**Description** Changes the state of the trigger system from idle to wait for trigger and then clears the previous set of measurement result from the reading memory. When the specified trigger condition is met after receiving the INIT command, measurement will begin.

You can store up to 10,000 measurements in the reading memory. If the reading memory overflows, the new measured value will overwrite the oldest measured value and the latest measured value will always be retained.

To retrieve measurements from the reading memory, use `FETCh?`.

**Command Syntax** `INITiate`

**Example** Return five DC voltage measurements and start the measurement using a software trigger:

```
CONF:VOLT:DC 10
TRIG:SOUR BUS
SAMP:COUN 5
INIT
*TRG
FETC?
```

### 3.3 FETCh?

**Description** Wait for the measurement to complete and send all measurements to the user.

The FETCh? query does not erase the measurement results from the reading memory. You can send the query multiple times to retrieve the same data.

When measuring configuration changes, or when executing any of the following commands, the instrument will clear all measurements from the reading memory: `INITiate`, `MEASure:<function>?`, `READ?`, `*RST`, `SYSTem:PRESet`.

**Syntax** `FETCh?`

**Example** Combine CONFigure and INITiate with FETCh?. The INITiate command places the instrument in the waiting for trigger state, triggers the measurement when the rear panel Ext Trig input is a pulse signal (low by default), and sends the measurement to the user. The FETCh? query copies the measurement from the reading memory to the instrument’s output buffer.

```
CONF:VOLT:DC 10, 0.003
TRIG:SOUR EXT
SAMP:COUN 4
INIT
FETC?
```

**Typical Response** `-4.98748741E-01, -4.335163427E-01, -4.33118686E-01, -3.48109378E-01`
**3.4 R?**

**Description**  Read and erase all measurements from the internal buffer memory. The command can be used if the triggered operation requires capturing more than 10000 pts of data. In this case, this command can be used to periodically read and clear the internal buffer memory before it fills to capacity of 10000 pts.

**Syntax**  
R?

**Example**  
Take the measurement from the reading memory:

**Typical Response**  
-4.98748741E-01, -4.335163427E-01, -4.33118686E-01, -3.48109378E-01

**Note**  
The READ? command may cause an error if the remote connection timeout is not longer than required for the instrument to finish triggering and taking the measurements into the memory. Thus, this command is recommended only for capturing smaller multiple points of data. The timing is also dependent on other factors such as integration (aperture time), the function selected for the measurement, the range, the bandwidth (when applicable), the gate time (when applicable), total number of sample counts (specified by SAMPLE:COUNt command) and total number of trigger counts (specified by TRIGger:COUNt command).

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**3.5 READ?**

**Description**  Start a new set of measurements, wait for all measurements to complete and transfer all available measurements. Sending READ? is similar to sending INITiate::FETCh?.

**Syntax**  
READ?

**Example**  
Take the measurement from the reading memory:

**Typical Response**  
-4.98748741E-01, -4.335163427E-01, -4.33118686E-01, -3.48109378E-01

**Note**  
The READ? command may cause an error if the remote connection timeout is not longer than required for the instrument to finish triggering and taking the measurements into the memory. Thus, this command is recommended only for capturing smaller multiple points of data. The timing is also dependent on other factors such as integration (aperture time), the function selected for the measurement, the range, the bandwidth (when applicable), the gate time (when applicable), total number of sample counts (specified by SAMPLE:COUNt command) and total number of trigger counts (specified by TRIGger:COUNt command).

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**3.6 TRIGger:COUNt**

**Description**  Set the number of triggers the instrument accepts. When the number of triggers reaches the set value, the instrument will return to the idle state and no longer trigger.

**Command Syntax**  
TRIGger:COUNt <count>-MIN-MAX-DEF

**Query Syntax**  
TRIGger:COUNt? [MIN-MAX-DEF]

**Parameters**  
<count>: 1 - 999999. Default: 1

**Example**  
Return ten sets of five DC voltage measurements and start each measurement group with an external trigger:

```
CONF:VOLT:DC
SAMP:COUN 5
TRIG:COUN 10
TRIG:SOUR EXT
READ?
```
Typical Response  +1.00520000E+01, ... (50 measurements)

### 3.7 TRIGGER:SOURce

**Description**  Select the trigger source for the measurement

IMMediate: The trigger signal is always present. A trigger signal is issued as soon as the instrument is placed in the "waiting for trigger" state.

BUS: When the DMM is in the "Wait Bus Trigger", the instrument is triggered by sending "*TRG" via the remote interface.

EXTernal: When the DMM is in the Wait External Trigger, the instrument is triggered by sending a TTL pulse to the Ext Trig interface on the rear panel.

**Command Syntax**  TRIGGER:SOURce IMMediate-EXTernal-BUS

**Query Syntax**  TRIGGER:SOURce?

**Parameters**  trigger source type

**Example**  Return ten sets of five DC voltage measurements and start each measurement group with an external trigger:

```plaintext
CONF:VOLT:DC
SAMP:COUN 5
TRIG:COUN 10
TRIG:SOUR EXT
READ?
```

Typical Response  +1.00520000E+01, ... (50 measurements)

### 3.8 TRIGGER:DELay

**Description**  Sets the waiting time for the instrument to receive the trigger signal to the middle of the start measurement.

If you have configured more than one measurement for each trigger of the instrument (SAMPle:COUNt >1), after the trigger, a delay is inserted between two adjacent measurements. Setting a specific trigger delay will disable the automatic trigger delay (TRIGGER:DELay:AUTO OFF).

**Command Syntax**  TRIGGER:DELay <seconds>-MIN-MAX-DEF

**Query Syntax**  TRIGGER:DELay? [MIN-MAX-DEF]

**Parameters**  required delay time

**Example**  Returns the result of five DC voltage measurements. There is a 2 second delay before each measurement.

```plaintext
CONF:VOLT:DC 10
SAMP:COUN 5
TRIG:DEL 2
READ?
```

Typical Response  +4.27230000E+00, +4.27150000E+00, +4.27190000E+00, +4.27170000E+00, +4.27200000E+00

### 3.9 TRIGGER:DELay:AUTO

**Description**  Disable or enable automatic trigger delay. If enabled, the instrument sets the delay based on function, range, and integration time or bandwidth.
By default, TRIGger:DELay:AUTO is ON.

**Command Syntax**  
TRIGger:DELay:AUTO ON, 1, OFF, 0

**Query Syntax**  
TRIGger:DELay:AUTO?

**Parameters**  
ON, 1, OFF, 0

**Example**  
Returns the result of five DC voltage measurements. There is an automatic delay between each measurement.

```
CONF:VOLT:DC 10
SAMP:COUN 5
READ?
```

**Typical Response**  
+4.27230000E+00, +4.27150000E+00, +4.27190000E+00, +4.27170000E+00, +4.27200000E+00

### 3.10 SAMPle:COUNt

**Description**  
Specifies the number of measurements (number of samples) taken each time the instrument is triggered.

You can use the specified sample count with a trigger count (TRIGger:COUNt). The total number of measurements returned before returning to the idle trigger state is the product of the sample count and the trigger count.

**Command Syntax**  
SAMPle:COUNt <count>-MIN-MAX-DEF

**Query Syntax**  
SAMPle:COUNt? [MIN-MAX-DEF]

**Parameters**  
<count>: 1 - 999999. Default: 1

**Example**  
Return ten sets of four-time resistance measurements and start each measurement group with an external trigger:

```
CONF:RES 1E6
SAMP:COUN 4
TRIG:COUN 10
TRIG:SOUR EXT
READ?
```

**Typical Response**  
+1.00520000E+06, ... (40 measurements)

### 3.11 WTG?

**Description**  
Queries the trigger status.

This command can be used during long periods of triggered measurement operation (i.e. high sample count). This command is used in conjunction with INITiate and FETCh? command so that rather than specifying a fixed timeout in the remote settings, this command can be used to query periodically the trigger status. FETCh? command can be sent after the trigger is back to idle state.

**Command Syntax**  
WTG?

**Query Syntax**  
WTG?

**Response**  
0 - Trigger is busy or not ready.

1 - Trigger is ready.
This subsystem configures AC voltage measurement, DC voltage measurement.

4.1 [SENSe:]VOLTage:AC:BANDwidth

**Description** Sets the AC filter cutoff frequency for AC voltage measurements.

The instrument uses three different AC filters that allow you to optimize low frequency accuracy or reduce AC settling time after changing the input signal amplitude. Based on the cutoff frequency specified by this command, the instrument selects a slow (3 Hz), medium (20 Hz) or fast (200 Hz) filter. Specify the lowest frequency you want to encounter. Lower frequencies result in longer settling times.

**Command Syntax**  
[SENSe:]VOLTage:AC:BANDwidth <filter>-MIN-MAX

**Query Syntax**  
[SENSe:]VOLTage:AC:BANDwidth? [MIN-MAX-DEF]

**Parameters**  
<filter>:3, 20, 200. Default: 20

**Example**  
VOLT:AC:BAND 200

4.2 [SENSe:]VOLTage:AC:SPEEd

**Description** Sets the measurement speed for AC voltage measurements.

The measurement speed is limited by the filter cutoff frequency. The 3Hz filter only supports slow (SLOW), the 20Hz filter supports slow (SLOW) and medium speed (MEdium), and the 200Hz filter supports slow (SLOW), medium speed (MEdium) and fast (FAST).

**Command Syntax**  
[SENSe:]VOLTage:AC:SPEEd <speed>-MIN-MAX

**Query Syntax**  
[SENSe:]VOLTage:AC:SPEEd? [MIN-MAX-DEF]

**Parameters**  
<speed>:SLOW-MEDium-FAST. Default:MEDium

**Example**  
VOLT:AC:SPEE SLOW

4.3 [SENSe:]VOLTage:AC:SECondary

**Description** Select the auxiliary measurement function for the AC voltage measurement.

Please use DATA2? to read auxiliary measurement results.

**Command Syntax**  
[SENSe:]VOLTage:AC:SECondary OFF-BEForemath-FREQuency

**Query Syntax**  
[SENSe:]VOLTage:AC:SECondary?

**Parameters**  
OFF-BEForemath-FREQuency

**Example**  
VOLT:AC:SEC FREQ

4.4 [SENSe:]VOLTage:AC-DC:RANGe

**Description** Select a fixed range for AC and DC voltage measurements
**Command Syntax**  
[SENSe:]VOLTage:AC:RANGe <range>-MIN-MAX or [SENSe:]VOLTage:DC:RANGe <range>-MIN-MAX

**Query Syntax**  

**Parameters**  
AC: <range>: 100m, 1, 10, 100, 750. Default: 10

DC: <range>: 100m, 1, 10, 100, 1000. Default: 1000

**Example**  
VOLT:AC:RANG 10

### 4.5 [SENSe:]VOLTage:AC-DC:RANGe:AUTO

**Description**  
Enable or disable autoranging for AC and DC voltage measurements.

The autoranging range can be adjusted down to less than 10% of the range and can be adjusted upwards to more than 120% of the range.

**Command Syntax**  
[SENSe:]VOLTage:AC:RANGe:AUTO ON-OFF or [SENSe:]VOLTage:DC:RANGe:AUTO ON-OFF

**Query Syntax**  
[SENSe:]VOLTage:AC:RANGe:AUTO? or [SENSe:]VOLTage:DC:RANGe:AUTO?

**Parameters**  
ON, 1, OFF, 0

**Example**  
VOLT:AC:RANG:AUTO ON

### 4.6 [SENSe:]VOLTage[:DC]:NPLC

**Description**  
Sets the integration time in terms of the number of power line cycles (PLC) for DC voltage measurement.

The integration time is the period during which the instrument’s analog-to-digital (A/D) converter measures the input signal samples. A longer integration time gives a higher measurement resolution, but the measurement speed is slower.

**Command Syntax**  
[SENSe:]VOLTage[:DC]:NPLC <plc>-MIN-MAX

**Query Syntax**  
[SENSe:]VOLTage[:DC]:NPLC? [MIN-MAX-DEF]

**Parameters**  
<plc>: 0.02, 0.2, 1, 10, 100

**Example**  
VOLT:NPLC 10

### 4.7 [SENSe:]VOLTage[:DC]:IMPedance:AUTO

**Description**  
Enable or disable the automatic input impedance mode for DC voltage measurement

**Command Syntax**  
[SENSe:]VOLTage[:DC]:IMPedance:AUTO ON-OFF

**Query Syntax**  
[SENSe:]VOLTage[:DC]:IMPedance:AUTO?

**Parameters**  
ON, 1, OFF, 0

**Example**  
VOLT:IMP:AUTO ON

### 4.8 [SENSe:]VOLTage[:DC]:ZERO:AUTO

**Description**  
Enable or disable the auto zero mode for the DC voltage.
ON: The DMM internally measures the offset after each measurement. This measurement is then subtracted from the previous reading. This prevents the offset voltage on the DMM input circuit from affecting the measurement accuracy.

OFF: The instrument uses the last measured zero return measurement and subtracts it from each measurement. It reads a new zero reading whenever you change the function, range or integration time.

**Command Syntax**

```plaintext
[SENSe:]VOLTage[:DC]:ZERO:AUTO ON-OFF
```

**Query Syntax**

```plaintext
[SENSe:]VOLTage[:DC]:ZERO:AUTO?
```

**Parameters**

ON, 1, OFF, 0

**Example**

VOLT:ZERO:AUTO ON

---

### 4.9 [SENSe:]VOLTage[:DC]:SEConDary

**Description**

Select the auxiliary measurement function for the DC voltage measurement.

Use DATA2? to read secondary/auxiliary measurement results.

**Command Syntax**

```plaintext
[SENSe:]VOLTage:AC:SECondary OFF-BEForemath
```

**Query Syntax**

```plaintext
[SENSe:]VOLTage:AC:SECondary?
```

**Parameters**

OFF-BEForemath

**Example**

VOLT:DC:SEC BEF
5.1 [SENSe:]CURRent:AC:BANDwidth

Description  Sets the AC filter cutoff frequency for AC current measurement.

The instrument uses three different AC filters that allow you to optimize low frequency accuracy or reduce AC settling time after changing the input signal amplitude. Based on the cutoff frequency specified by this command, the instrument selects a slow (3 Hz), medium (20 Hz) or fast (200 Hz) filter. Specify the lowest frequency you want to encounter. Lower frequencies result in longer settling times.

Command Syntax  [SENSe:]CURRent:AC:BANDwidth <filter>-MIN-MAX

Query Syntax  [SENSe:]CURRent:AC:BANDwidth? [MIN-MAX-DEF]

Parameters  <filter>: 3, 20, 200. Default: 20

Example  CURR:AC:BAND 200

5.2 [SENSe:]CURRent:AC:SPEEd

Description  Sets the measurement speed for AC current measurement.

The measurement speed is limited by the filter cutoff frequency. The 3Hz filter only supports slow (SLOW), the 20Hz filter supports slow (SLOW) and medium speed (MEDium), and the 200Hz filter supports slow (SLOW), medium speed (MEDium) and fast (FAST).

Command Syntax  [SENSe:]CURRent:AC:SPEEd <speed>-MIN-MAX

Query Syntax  [SENSe:]CURRent:AC:SPEEd? [MIN-MAX-DEF]

Parameters  <speed>: SLOW, MEDium, FAST. Default: MEDium

Example  CURR:AC:SPEE SLOW

5.3 [SENSe:]CURRent:AC:SECondary

Description  Select the auxiliary measurement function for AC current measurement.

Please use DATA2? to read auxiliary measurement results.

Command Syntax  [SENSe:]CURRent:AC:SECondary OFF-BEForemath-FREQuency

Query Syntax  [SENSe:]CURRent:AC:SECondary?

Parameters  OFF, BEForemath, FREQuency

Example  CURR:AC:SEC BEF

5.4 [SENSe:]CURRent:AC-DC:RANGe

Description  Select a fixed range for AC and DC current measurements. Select a fixed measurement range for AC or DC current measurement on the 3 A terminal. For digital multimeter with a 10A range, you cannot use this command to select a 10A range. Please use the directive 7.3.5.5
[SENSe:]CURRent Subsystem

**Command Syntax**

[SENSe:]CURRent:AC:RANGe <range>-MIN-MAX or [SENSe:]CURRent:DC:RANGe <range>-MIN-MAX

**Query Syntax**


**Parameters**

<range>: 100u, 1m, 10m, 100m, 1, 3. Default:AUTO

**Example**

CURRent:AC:RANG 100m

### 5.5 [SENSe:]CURRent:AC-DC:RANGe:AUTO

**Description**

Autoranging for AC and DC current measurements

The autoranging range can be adjusted down to less than 10% of the range and can be adjusted upwards to more than 120% of the range.

**Command Syntax**

[SENSe:]CURRent:AC:RANGe:AUTO ON-OFF or [SENSe:]CURRent:DC:RANGe:AUTO ON-OFF

**Query Syntax**

[SENSe:]CURRent:AC:RANGe:AUTO? or [SENSe:]CURRent:DC:RANGe:AUTO?

**Parameters**

ON, 1, OFF, 0

**Example**

CURR:AC:RANG:AUTO ON

### 5.6 [SENSe:]CURRent:AC-DC:TERMinals

**Description**

Enable or disable autoranging for AC and DC current measurements

The autoranging range can be adjusted down to less than 10% of the range and can be adjusted upwards to more than 120% of the range.

**Command Syntax**

[SENSe:]CURRent:AC:TERMinals 3-10 or [SENSe:]CURRent:DC:TERMinals 3-10

**Query Syntax**

[SENSe:]CURRent:AC:TERMinals? or [SENSe:]CURRent:DC:TERMinals?

**Parameters**

3, 10

**Example**

CURR:AC:TERM 10

### 5.7 [SENSe:]CURRent[:DC]:NPLC

**Description**

Sets the integration time in terms of the number of power line cycles (PLC) for DC current measurement. The integration time is the period during which the instrument’s analog-to-digital (A/D) converter measures the input signal samples. A longer integration time gives a higher measurement resolution, but the measurement speed is slower.

**Command Syntax**

[SENSe:]CURRent[:DC]:NPLC <plc>-MIN-MAX

**Query Syntax**

[SENSe:]CURRent[:DC]:NPLC? [MIN-MAX-DEF]

**Parameters**

<plc>: 0.02, 0.2, 1, 10, 100

**Example**

CURR:NPLC 1

### 5.8 [SENSe:]CURRent:DC:SECondary

**Description**

Select the auxiliary measurement function for the DC current measurement.
Please use DATA2? to read auxiliary measurement results.

**Command Syntax**  
[SENSe:]CURRent:DC:SECondary OFF-BEForemath

**Query Syntax**  
[SENSe:]CURRent:DC:SECondary?

**Parameters**  
OFF, BEforemath

**Example**  
CURR:DC:SEC BEF

### 5.9 [SENSe:]CURRent[:DC]:ZERO:AUTO

**Description**  
Enable or disable the auto zero mode for DC current.

ON: The DMM internally measures the offset after each measurement. This measurement is then subtracted from the previous reading. This prevents the offset voltage on the DMM input circuit from affecting the measurement accuracy.

OFF: The instrument uses the last measured zero return measurement and subtracts it from each measurement. It reads a new zero reading whenever you change the function, range or integration time.

**Command Syntax**  
[SENSe:]CURRent [:DC]:ZERO:AUTO ON-OFF

**Query Syntax**  
[SENSe:]CURRent [:DC]:ZERO:AUTO?

**Parameters**  
ON, 1, OFF, 0

**Example**  
CURR:ZERO:AUTO ON
6.1 [SENSe:]RESistance-FRESistance:RANGe

Description
Set a fixed range for 2-wire or 4-wire resistors

Command Syntax
[SENSe:]RESistance-FRESistance:RANGe <range>-MIN-MAX

Query Syntax
[SENSe:]RESistance-FRESistance:RANGe? [MIN-MAX-DEF]

Parameters
<range>: 10, 100, 1k, 10k, 100k, 1MA, 10MA, 100MA

Example
RES:RANG 10MA

6.2 [SENSe:]RESistance-FRESistance:RANGe:AUTO

Description
Enable or disable the autoranging for 2-wire or 4-wire resistance measurements

The autoranging range can be adjusted down to less than 10% of the range and can be adjusted upwards to more than 120% of the range.

Command Syntax
[SENSe:]RESistance:RANGe:AUTO ON-OFF or [SENSe:]FRESistance:RANGe:AUTO ON-OFF

Query Syntax
[SENSe:]RESistance:RANGe:AUTO? or [SENSe:]FRESistance:RANGe:AUTO?

Parameters
ON, 1, OFF, 0

Example
RES:RANG:AUTO ON

6.3 [SENSe:]RESistance-FRESistance:NPLC

Description
Sets the integration time in terms of the number of power line cycles (PLC) for 2-wire or 4-wire resistance measurements. The integration time is the period during which the instrument’s analog-to-digital (A/D) converter measures the input signal samples. A longer integration time gives a higher measurement resolution, but the measurement speed is slower.

Command Syntax
[SENSe:]RESistance:NPLC <plc>-MIN-MAX or [SENSe:]FRESistance:NPLC <plc>-MIN-MAX

Query Syntax
[SENSe:]RESistance:NPLC? [MIN-MAX-DEF] or [SENSe:]FRESistance:NPLC? [MIN-MAX-DEF]

Parameters
<plc>: 0.02, 0.2, 1, 10, 100

Example
RES:NPLC 1

6.4 [SENSe:]RESistance-FRESistance:SECondary

Description
Select the auxiliary measurement function for the resistance measurement. This parameter is shared between two-wire and four-wire resistors.

Please use DATA2? to read auxiliary measurement results.

Command Syntax
[SENSe:]RESistance:SECondary OFF-BEForemath or [SENSe:]FRESistance:SECondary OFF-BEForemath

Query Syntax
[SENSe:]RESistance:SECondary? or [SENSe:]FRESistance:SECondary?

Parameters
OFF-BEForemath
Example RES:SEC BEF

6.5 [SENSe:]RESistance:ZERO:AUTO

Description Enable or disable the auto zero mode for 2-wire resistors.

ON: The DMM internally measures the offset after each measurement. This measurement is then subtracted from the previous reading. This prevents the offset voltage on the DMM input circuit from affecting the measurement accuracy.
OFF: The instrument uses the last measured zero return measurement and subtracts it from each measurement. It reads a new zero reading whenever you change the function, range or integration time.

Command Syntax [SENSe:]RESistance:ZERO:AUTO ON-OFF

Query Syntax [SENSe:]RESistance ZERO:AUTO?

Parameters ON, 1, OFF, 0

Example RES:ZERO:AUTO ON
7.1 [SENSe:]FREQuency-PERiod:VOLTage:RANGe

Description
Select a fixed range for frequency and period measurements.
This parameter is shared between frequency and period.

Command Syntax
[SENSe:]FREQuency:VOLTage:RANGe <range>-MIN-MAX or [SENSe:]PERiod:VOLTage:RANGe <range>-MIN-MAX

Query Syntax

Parameters
<range>: 100m, 1, 10, 100, 750

Example
FREQ:RANG 10

7.2 [SENSe:]FREQuency-PERiod:VOLTage:RANGe:AUTO

Description
Enable or disable autoranging for frequency and period measurements.
This parameter is shared between frequency and period.
The autoranging range can be adjusted down to less than 10% of the range and can be adjusted upwards to more than 120% of the range.

Command Syntax
[SENSe:]FREQuency:VOLTage:RANGe:AUTO ON-OFF or [SENSe:]PERiod:VOLTage:RANGe:AUTO ON-OFF

Query Syntax
[SENSe:]FREQuency:VOLTage:RANGe:AUTO? or [SENSe:]PERiod:VOLTage:RANGe:AUTO?

Parameters
ON, 1, OFF, 0

Example
FREQ:RANG:AUTO ON

7.3 [SENSe:]FREQuency-PERiod:RANGe:LOWer

Description
Sets the AC bandwidth used to detect signals during frequency and period measurements.
This parameter is shared between frequency and period.
The instrument uses three different AC filters that allow you to optimize low frequency accuracy or reduce AC settling time after changing the input signal amplitude. Based on the cutoff frequency specified by this command, the instrument selects a slow (3 Hz), medium (20 Hz) or fast (200 Hz) filter. Specify the lowest frequency you want to encounter. Lower frequencies result in longer settling times.

Command Syntax
[SENSe:]FREQuency:RANGe:LOWer <filter>-MIN-MAX or [SENSe:]PERiod:RANGe:LOWer <filter>-MIN-MAX

Query Syntax

Parameters
<filter>: 3, 20, 200. Default: 20

Example
FREQ:RANG:LOW 200
7.4 [SENSe:]FREQuency-PERiod:APERture

**Description**  Set the aperture time (gated time) for frequency and period measurement.

This parameter is shared between frequency and period. The larger the aperture time, the higher the measurement accuracy and the lower the measurement speed.

**Command Syntax**  [SENSe:]FREQuency:APERture <seconds>-MIN-MAX or [SENSe:]PERiod:APERture <seconds>-MIN-MAX

**Query Syntax**  [SENSe:]FREQuency:APERture? [MIN-MAX-DEF] or [SENSe:]PERiod:APERture? [MIN-MAX-DEF]

**Parameters**  <seconds>: 10m, 100m, 1

**Example**  FREQ:APER 100m

7.5 [SENSe:]FREQuency:SECondary

**Description**  Select the auxiliary measurement function for the frequency measurement.

Please use DATA2? to read auxiliary measurement results.

**Command Syntax**  [SENSe:]FREQuency:SECondary OFF-BEForemath-ACV-PERiod

**Query Syntax**  [SENSe:]FREQuency:SECondary?

**Parameters**  OFF, BEForemath, ACV, PERiod

**Example**  FREQ BEF

7.6 [SENSe:]PERiod:SECondary

**Description**  Select the auxiliary measurement function for the period measurement.

Please use DATA2? to read auxiliary measurement results.

**Command Syntax**  [SENSe:]PERiod:SECondary OFF-BEForemath-ACV-FREQuency

**Query Syntax**  [SENSe:]PERiod:SECondary?

**Parameters**  OFF-BEForemath-ACV-FREQuency

**Example**  PER BEF
8.1 [SENSe:]TEMPerture:NPLC

**Description**
Sets the integration time in terms of the number of power line cycles (PLC) for temperature measurement.

The integration time is the period during which the instrument’s analog-to-digital (A/D) converter measures the input signal samples. A longer integration time gives a higher measurement resolution, but the measurement speed is slower.

**Command Syntax**
[SENSe:]TEMPerture:NPLC <plc>-MIN-MAX

**Query Syntax**
[SENSe:]TEMPerture:NPLC? [MIN-MAX-DEF]

**Parameters**
<plc>: 0.02, 0.2, 1, 10, 100

**Example**
TEMP:NPLC 10

8.2 [SENSe:]TEMPerture:TRANsducer:FRTD-RTD:RESistance

**Description**
Select the nominal resistance (R0) for 2-wire and 4-wire RTD measurements. R0 is an RTD nominal resistance at 0 °C.

**Command Syntax**
[SENSe:]TEMPerture:TRANsducer:FRTD-RTD:RESistance <reference>-MIN-MAX

**Query Syntax**
[SENSe:]TEMPerture:TRANsducer:FRTD-RTD:RESistance? [MIN-MAX-DEF]

**Parameters**
<reference>: set resistance value

**Example**
TEMP:TRAN:RTD:RES 10

8.3 [SENSe:]TEMPerture:TRANsducer:TYPE

**Description**
Select a probe type sensor for temperature measurement. Supported probes are 2-wire and 4-wire RTD, 2-wire and 4-wire thermistors

**Command Syntax**
[SENSe:]TEMPerture:TRANsducer:TYPE FRTD-RTD-FTHermistor-THERmistor

**Query Syntax**
[SENSe:]TEMPerture:TRANsducer:TYPE?

**Parameters**
FRTD, RTD, FTHermistor, THERmistor

**Example**
TEMP:TRAN:TYPE RTD

8.4 [SENSe:]TEMPerture:SECondary

**Description**
Select an auxiliary measurement function for the temperature measurement.

Please use DATA2? to read auxiliary measurement results.

**Command Syntax**
[SENSe:]TEMPerture:SECondary OFF-BEForemath-RESistor

**Query Syntax**
[SENSe:]TEMPerture:SECondary?

**Parameters**
OFF, BEForemath, RESistor
Example  TEMP BEF

8.5 [SENSe:]TEMPerture:ZERO:AUTO

Description  Enable or disable the auto zero mode for temperature measurement.

ON: The DMM internally measures the offset after each measurement. This measurement is then subtracted from the previous reading. This prevents the offset voltage on the DMM input circuit from affecting the measurement accuracy.

OFF: The instrument uses the last measured zero return measurement and subtracts it from each measurement. It reads a new zero reading whenever you change the function, range or integration time.

Command Syntax  [SENSe:]TEMPerture:ZERO:AUTO ON-OFF

Query Syntax  [SENSe:]TEMPerture:ZERO:AUTO?

Parameters  ON, 1, OFF, 0

Example  TEMP:ZERO:AUTO ON

8.6 UNIT:TEMPerture

Description  Sets the unit used for temperature measurement (C, F or Kelvin)

Command Syntax  UNIT:TEMPerture C-F-K

UNIT:TEMPerture?

Parameters  C, F, K

Example  UNIT:TEMP F
9.1 [SENSe:]CAPacitance:RANGe

**Description**  
Select a fixed range for capacitance measurement.

**Command Syntax**  
[SENSe:]CAPacitance:RANGe <range>-MIN-MAX

**Query Syntax**  
[SENSe:]CAPacitance:RANGe? [MIN-MAX-DEF]

**Parameters**  
<range>: 1n, 10n, 100n, 1u, 10u, 100u, 1m, 10m

**Example**  
CAP:RANG 100n

9.2 [SENSe:]CAPacitance:RANGe:AUTO

**Description**  
Enable or disable autoranging for capacitance measurements

The autoranging range can be adjusted down to less than 10% of the range and can be adjusted upwards to more than 120% of the range.

**Command Syntax**  
[SENSe:]CAPacitance:RANGe:AUTO ON-OFF

**Query Syntax**  
[SENSe:]CAPacitance:RANGe:AUTO?

**Parameters**  
ON, 1, OFF, 0

**Example**  
CAP:RANG:AUTO ON

9.3 [SENSe:]CAPacitance:SECondary

**Description**  
Select an auxiliary measurement function for the capacitance measurement.
Please use DATA2? to read auxiliary measurement results.

**Command Syntax**  
[SENSe:]CAPacitance:SECondary OFF-BEForemath

**Query Syntax**  
[SENSe:]CAPacitance:SECondary?

**Parameters**  
OFF, BEForemath

**Example**  
CAP BEF
SYSTem Subsystem - I/O Configuration

10.1 SYSTem:COMMunicate:RS232:BAUDrate

<table>
<thead>
<tr>
<th>Description</th>
<th>Set the serial port baud rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command Syntax</td>
<td>SYSTem:COMMunicate:RS232:BAUDrate 4800, 9600, 19200, 38400, 57600, 115200</td>
</tr>
<tr>
<td>Query Syntax</td>
<td>SYSTem:COMMunicate:RS232:BAUDrate?</td>
</tr>
<tr>
<td>Parameters</td>
<td>Supported baud rate: 4800, 9600, 19200, 38400, 57600, 115200</td>
</tr>
<tr>
<td>Example</td>
<td>SYS:COMM:RS232:BAUD 9600</td>
</tr>
</tbody>
</table>

10.2 SYSTem:COMMunicate:RS232:DATAbits

<table>
<thead>
<tr>
<th>Description</th>
<th>Set serial data bits.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command Syntax</td>
<td>SYSTem:COMMunicate:RS232:DATAbits 7-8</td>
</tr>
<tr>
<td>Query Syntax</td>
<td>SYSTem:COMMunicate:RS232:DATAbits?</td>
</tr>
<tr>
<td>Parameters</td>
<td>Supported data bits: 7-8</td>
</tr>
<tr>
<td>Example</td>
<td>SYS:COMM:RS232:DATA 8</td>
</tr>
</tbody>
</table>

10.3 SYSTem:COMMunicate:RS232:PARity

<table>
<thead>
<tr>
<th>Description</th>
<th>Set the serial port parity bit.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command Syntax</td>
<td>SYSTem:COMMunicate:RS232:PARity EVEN-ODD-MARK-SPACE-NULI</td>
</tr>
<tr>
<td>Query Syntax</td>
<td>SYSTem:COMMunicate:RS232:PARity?</td>
</tr>
<tr>
<td>Parameters</td>
<td>Check method: EVEN, ODD, MARK, SPACE, NULL</td>
</tr>
<tr>
<td>Example</td>
<td>SYS:COMM:RS232:PAR NULL</td>
</tr>
</tbody>
</table>

10.4 SYSTem:COMMunicate:RS232:STOPbits

<table>
<thead>
<tr>
<th>Description</th>
<th>Set the serial port stop bit.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Query Syntax</td>
<td>SYSTem:COMMunicate:RS232:STOPbits?</td>
</tr>
<tr>
<td>Parameters</td>
<td>Serial port stop bit: 1-2</td>
</tr>
<tr>
<td>Example</td>
<td>SYS:COMM:RS232:STOP 1</td>
</tr>
</tbody>
</table>

10.5 SYSTem:COMMunicate:LAN:DNS1-2

<table>
<thead>
<tr>
<th>Description</th>
<th>Set the DNS server address.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command Syntax</td>
<td>SYSTem:COMMunicate:LAN:DNS1-2 &lt;address&gt;</td>
</tr>
</tbody>
</table>
Query Syntax  SYStem:COMMunicate:LAN:DNS1-2?
Parameters  Address
Example  SYST:COMM:LAN:DNS1 192.168.1.4

10.6 SYSTem:COMMunicate:LAN:GATeway

Description  Set the default route for the instrument.
Command Syntax  SYStem:COMMunicate:LAN:GATeway <address>
Query Syntax  SYStem:COMMunicate:LAN:GATeway?
Parameters  Address
Example  SYST:COMM:LAN:GAT 192.168.1.5

10.7 SYSTem:COMMunicate:LAN:HOSTname

Description  Set the host name of the instrument.
Command Syntax  SYStem:COMMunicate:LAN:HOSTname <name>
Query Syntax  SYStem:COMMunicate:LAN:HOSTname?
Parameters  Defined hostname
Example  SYST:COMM:LAN:HOST “LAB1-DMM”

10.8 SYSTem:COMMunicate:LAN:IPADdress

Description  Set the IP address.
Command Syntax  SYStem:COMMunicate:LAN:IPADdress <address>
Query Syntax  SYStem:COMMunicate:LAN:IPADdress?
Parameters  IP address
Example  SYST:COMM:LAN:IPAD 192.168.1.242

10.9 SYSTem:COMMunicate:LAN:PORT

Description  Set the port number of the network port TCP communication.
Command Syntax  SYStem:COMMunicate:LAN:PORT <port>
Query Syntax  SYStem:COMMunicate:LAN:PORT?
Parameters  port number
Example  SYST:COMM:LAN:PORT 45454

10.10 SYSTem:COMMunicate:LAN:SMASk

Description  Set the subnet mask.
**Command Syntax**  
SYSTem:COMMunicate:LAN:SMASk <smask>

**Query Syntax**  
SYSTem:COMMunicate:LAN:SMASk?

**Parameters**  
Subnet mask

**Example**  
SYST:COMM:LAN:SMAS 255.255.255.0
11.1 SYStem:BEEPer[:IMMediate]

**Description**  Issue a single beep

**Command Syntax**  SYStem:BEEPer[:IMMediate]

**Example**  SYST:BEEP

11.2 SYStem:BEEPer:STATe

**Description**  Disable or enable the buzzer sounding during continuity, diode or probe hold measurements, or when an error occurs on the current panel or remote interface.

**Command Syntax**  SYStem:BEEPer:STATe ON, 1, OFF, 0

**Query Syntax**  SYStem:BEEPer:STAT?

**Parameters**  ON, 1, OFF, 0

**Example**  SYST:BEEP:STAT OFF

11.3 SYStem:CLICk:STATe

**Description**  When the front panel button or softkey is pressed, the button beep can be disabled or enabled.

**Command Syntax**  SYStem:CLICk:STAT ON, 1, OFF, 0

**Query Syntax**  SYStem:CLICk:STAT?

**Parameters**  ON, 1, OFF, 0

**Example**  SYST:CLIC:STAT OFF

11.4 SYStem:DATE

**Description**  Sets the date of the instrument’s real-time clock. Set the time with SYStem:TIME. The unix 32-bit timestamp is used, and the maximum time cannot exceed 2038.

**Command Syntax**  SYStem:DATE <year>,<month>,<day>

**Query Syntax**  SYStem:DATE?

**Parameters**  
- **<year>**: 1970-2038
- **<month>**: 1-12
- **<day>**: 1 - the maximum number of days in the current month

**Example**  SYST:DATE 2018, 5, 29

11.5 SYStem:TIME

**Description**  Sets the time of the instrument’s real-time clock. Set the date with SYStem:DATE.
**Command Syntax**

SYSTem:TIME <hour>, <minute>, <second>

**Query Syntax**

SYSTem:TIME?

**Parameters**

- **<hour>**: 0-23
- **<minute>**: 0-59
- **<second>**: 0-59

**Example**

SYST:TIME 13, 59, 10

---

### 11.6 SYSTem:VERSion?

**Description**

Query the current software version.

**Syntax**

SYSTem:VERSion?

**Example**

SYST:VER?

Typical return: 1.10
DATA2 subsystem

This subsystem is used to read auxiliary measurement results.

**Description**  Retrieve auxiliary measurement results

**Syntax**  DATA2?

**Example**

```
CONF:VOLT:DC 10
VOLT:DC:SEC BEF
READ?
Typical return: 1.70897747E-03
DATA2?
Typical return: 1.70897747E-03
```
This subsystem is used to set and control the null operation of the instrument.

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
<th>Command Syntax</th>
<th>Query Syntax</th>
<th>Parameters</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC voltage</td>
<td></td>
<td>VOLT:AC NULL:STATe ON, 1, OFF, 0</td>
<td>NULL:STATe?</td>
<td>ON, 1, OFF, 0</td>
<td>VOLT:DC.NULL:STAT ON</td>
</tr>
<tr>
<td>AC voltage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC Current</td>
<td></td>
<td>CURRent:DC NULL:VALue ON, 1, OFF, 0</td>
<td>NULL:VALue?</td>
<td>ON, 1, OFF, 0</td>
<td></td>
</tr>
<tr>
<td>AC Current</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-wire resistance</td>
<td></td>
<td>RESistance NULL:VAL:AUTO ON, 1, OFF, 0</td>
<td>NULL:VAL:AUTO</td>
<td>ON, 1, OFF, 0</td>
<td></td>
</tr>
<tr>
<td>4-wire resistance</td>
<td></td>
<td>FRESistance NULL:VAL:AUTO ON, 1, OFF, 0</td>
<td>NULL:VAL:AUTO</td>
<td>ON, 1, OFF, 0</td>
<td></td>
</tr>
<tr>
<td>Frequency</td>
<td></td>
<td>FREQuency NULL:STATe ON, 1, OFF, 0</td>
<td>NULL:STATe?</td>
<td>ON, 1, OFF, 0</td>
<td></td>
</tr>
<tr>
<td>Period</td>
<td></td>
<td>Period</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td></td>
<td>TEMPerature NULL:VAL:AUTO ON, 1, OFF, 0</td>
<td>NULL:VAL:AUTO</td>
<td>ON, 1, OFF, 0</td>
<td></td>
</tr>
<tr>
<td>Capacitance</td>
<td></td>
<td>CAPacitance NULL:VAL:AUTO ON, 1, OFF, 0</td>
<td>NULL:VAL:AUTO</td>
<td>ON, 1, OFF, 0</td>
<td></td>
</tr>
</tbody>
</table>
<function>:NULL:VALUE has been set to this value. Automatic null selection will be disabled.

**Command Syntax**  
<function>:NULL:VALUE:AUTO ON, 1, OFF, 0

**Query Syntax**  
<function>:NULL:VALUE:AUTO?

**Parameters**  
ON, 1, OFF, 0

**Example**  
VOLT:DC:NULL:VALUE:AUTO ON
CALCulate:SCALE subsystem

This subsystem is mainly used to set and control the mathematical operations of the instrument.

### 14.1 CALCulate:SCALE:DB:REFerence

**Description**
Stores the 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 is subtracted from each voltage measurement after the measurement result is converted to dBm.

**Command Syntax**
CALCulate:SCALE:DB:REFerence <reference>

**Query Syntax**
CALCulate:SCALE:DB:REFerence?

**Parameters**

**Example**
CALC:SCAL:DB:REF -10.0

### 14.2 CALCulate:SCALE:DBM:REFerence

**Description**
Select the reference resistor to convert the voltage measurement to dBm. This reference affects the dBm and dB calibration function.

**Command Syntax**
CALCulate:SCALE:DBM:REFerence <reference>

**Query Syntax**
CALCulate:SCALE:DBM:REFerence?

**Parameters**

**Example**
CALC:SCAL:DBM:REF 300

### 14.3 CALCulate:SCALE:FUNCtion

**Description**
Select the operation to be performed by the calibration function.

The DB performs a relative dB calculation. The result is the difference between the input signal and the stored DB relative reference value (CALCulate:SCALE:DB:REFerence), both values are converted to dBm \( (\text{dB} = \text{measurement in dBm} - \text{relative value in dBm}) \). dB calibration is only available for ACV and DCV measurements.

The DBM performs a dBm calculation. The result is a logarithmic expression based on the power passed to the reference resistor (CALCulate:SCALE:DBM:REFerence) and relative to 1 mW. \( (\text{dBm} = 10 \times \log (\frac{\text{measurement result}}{\text{reference resistance}} / 1 \text{ mW})) \). The dBm calibration is only available for ACV and DCV measurements.

The PCT performs a percentage change operation. The result is a percentage change in the measurement results in the reference value: \( \text{Result} = \frac{(\text{measurement result} - \text{reference value})}{\text{reference value}} \times 100 \)

The SCALe performs Mx+B operations. The result is the measurement result multiplied by the gain value M (CALCulate:SCALE:GAIN) + offset value B (CALCulate:SCALE:OFFSet). The Mx+B calibration applies to all measurement functions except ratio, continuity and diode.

**Command Syntax**
CALCulate:SCALE:FUNCtion DB-DBM-PCT-SCALe

**Query Syntax**
CALCulate:SCALE:FUNCtion?

**Parameters**
Selected operation:DB, DBM, PCT, SCALe
14.4 CALCulate:SCALe:GAIN

**Description**: Sets the gain value M of the calibration function in CALCulate:SCALe:FUNCtion.

**Command Syntax**: `CALCulate:SCALe:GAIN <gain>`

**Query Syntax**: `CALCulate:SCALe:GAIN?`

**Parameters**: gain

**Example**: `CALC:SCAL:GAIN 100`

14.5 CALCulate:SCALe:OFFSet

**Description**: Sets the offset value B of the calibration function in CALCulate:SCALe:FUNCtion.

**Command Syntax**: `CALCulate:SCALe:OFFSet <offset>`

**Query Syntax**: `CALCulate:SCALe:OFFSet?`

**Parameters**: offset

**Example**: `CALC:SCAL:OFFSet 5`

14.6 CALCulate:SCALe:REFerence

**Description**: Sets the reference value for the PCT function in CALCulate:SCALe:FUNCtion.

**Command Syntax**: `CALCulate:SCALe:REFerence <reference>`

**Query Syntax**: `CALCulate:SCALe:REFerence?`

**Parameters**: reference

**Example**: `CALC:SCAL:REF 100`

14.7 CALCulate:SCALe:REFerence:AUTO

**Description**: Enable or disable the automatic reference selection for the dB calibration function.

**Command Syntax**: `CALCulate:SCALe:REFerence:AUTO ON, 1, OFF, 0`

**Query Syntax**: `CALCulate:SCALe:REFerence:AUTO?`

**Parameters**: ON, 1, OFF, 0

**Example**: `CALC:SCAL:REF:AUTO ON`

14.8 CALCulate:SCALe[:STATe]

**Description**: Enable or disable the calibration function.

**Command Syntax**: `CALCulate:SCALe[:STATe] ON, 1, OFF, 0`

**Query Syntax**: `CALCulate:SCALe[:STATe]?`

**Parameters**: ON, 1, OFF, 0

**Example**: `CALC:SCAL:STAT ON`
CALCulate:LIMit subsystem

This subsystem takes limit tests for the measurement results.

### 15.1 CALCulate:LIMit:LOWer[:DATA]

**Description**  Set the lower limit of the limit test

**Command Syntax**  CALCulate:LIMit:LOWer[:DATA] <value>

**Query Syntax**  CALCulate:LIMit:LOWer[:DATA]?

**Parameters**  <value> set lower limit

**Example**  CALC:LIM:LOW -50

### 15.2 CALCulate:LIMit:UPPer[:DATA]

**Description**  Set the upper limit of the limit test

**Command Syntax**  CALCulate:LIMit:UPPer[:DATA] <value>

**Query Syntax**  CALCulate:LIMit:UPPer[:DATA]?

**Parameters**  <value> set upper limit

**Example**  CALC:LIM:UPP 50

### 15.3 CALCulate:LIMit[:STATe]

**Description**  Enable or disable the limit test

**Command Syntax**  CALCulate:LIMit [:STATe] ON, 1, OFF, 0

**Query Syntax**  CALCulate:LIMit[:STATe]?

**Parameters**  ON, 1, OFF, 0

**Example**  CALC:LIM ON

### 15.4 CALCulate:LIMit:CLEar[:IMMediate]

**Description**  Clear limit test results

**Command Syntax**  CALCulate:LIMit:CLEar[:IMMediate]

**Example**  CALC:LIM:CLE
This subsystem calculates measurement statistics. Measurement statistics require triggering measurements with more than one sample (use SAMPle:COUNt command to configure) to be useful, as the calculation is based on the sets of data captured per each trigger.

### 16.1 CALCulate:AVERage:ALL?

**Description** Queries the measurement statistics data of the average (mean), standard deviation, minimum, and maximum values (in order).

**Query Syntax** `CALCulate:AVERage:ALL?`

**Typical response** `+1.234235, +1.000000, +1.000000, +1.2348289` (format: `<mean>, <standard deviation>, <minimum>, <maximum>`)
16.7 CALCulate:AVERage:SDEViation?

**Description**
Queries the measurement statistics standard deviation.

**Query Syntax**
CALCulate:AVERage:SDEViation?

**Typical response**
+1.01238548

16.8 CALCulate:AVERage[:STATe]

**Description**
Enable or disable statistical calculations

**Command Syntax**
CALCulate:AVERage[:STATe] ON, 1, OFF, 0

**Query Syntax**
CALCulate:AVERage[:STATe]?

**Parameters**
ON, 1, OFF, 0

**Example**
CALC:AVER ON

16.9 CALCulate:AVERage:CLEar[:IMMediate]

**Description**
Clear all calculated statistics data: minimum, maximum, average, peak-to-peak, count, and standard deviation.

**Command Syntax**
CALCulate:AVERage:CLEar[:IMMediate]

**Example**
CALC:AVER:CLE