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## UT8805E SCPI Programming Manual

# 1. Overview

## 1.1. Syntax Usage

The format of command syntax as follows.

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

Most commands (and some parameters) are combine uppercase and lowercase letters. The uppercase represents the abbreviation of command, which is short command. If you want to have better program readability, you can use long commands.

For example, the keyword VOLTage that mentioned above, you can input VOLT or VOLTage, the uppercase and the lowercase can combine to use freely. Therefore, VolTaGe, volt and Volt are all acceptable. Other formats (such as VOL and VOLTAG) may cause errors.

**Curly brackets { }** contains the parameter selection. The curly brackets are **not** send with the command string.

**Vertical line|** separates the parameter selection.

For example, the command {<range>|MIN|MAX|DEF} that mentioned above, you can assign a number range to "MIN", "MAX" or "DEF". The vertical line is **not** send with the command string.

**Angle brackets <>** indicates a value must be assigned to the the parameter in angle **bracket**.

For example, <range> in syntax that mentioned above, a value must be specified for this parameter (such as "VOLT:DC:RANG 10"). Or you can select one of the other options shown in the syntax (such as "VOLT:DC:RANG MIN"). The angle brackets are **not** send with the command string.

**Square brackets [ ]** contains the optional parameter. The square brackets are **not** send with the command string. If you did not specify the optional parameter, the instrument will use the default value.

## 1.2. MIN, MAX and DEF

"MIN" or "MAX" can replace the parameter for a lot of commands. In some cases, you can use "DEF" to replace.

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

The parameter <range> in this command, <range> does **not** necessarily have to choose a specific value, you can select MIN to set the range to minimum value, select MAX to set the range to maximum value or select DEF to set the range to default value.

## 1.3. Query Parameter Setting

If you want to query the current value of the parameter, you can add a question mark "?" at the end of the command.

For example, set the trigger count to 10 measurements

TRIG:COUN 10

Then, query the count value currently in effect by sending the following command

TRIG:COUN?

In the query command, you can also use MIN, MAX or DEF to fetch the limit value or the default value.

TRIG:COUN? MIN

TRIG:COUN? MAX

## 1.4. IEEE-488.2 General Command

IEEE-488.2 standard defines a set of common commands that perform functions such as reset, self-check and status operations. Common commands are always start with an asterisk (\*), 3 characters, and can include one or more parameters. The command keyword is separate from the first parameter by a space. Semicolon ";" can separate multiple parameters, such as

\*RST; \*CLS; \*ESE 32; \*OPC?

## 1.5. SCPI

SCPI defines the several data formats used for program information and response information.

### 1.5.1. NumericParameter

The commands that requires the use of numerical value, it supports all common decimal **representation**, including optional symbols, decimal points and scientific **notation**. And it can also accept the particular value of the numeric parameter, such as MIN, MAX and DEF. In addition, you can also add the unit after the numeric parameter (such as M, k, m or u). If the command only accepts some certain particular value, the instrument will automatically match an available particular value for the input numeric parameter.

The following command requires to set the range for the numeric parameter.

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

**Notes:** Since SCPI is case-insensitive, some letters will be confused, such as "M" (or "m"). For the sake of simplicity, the instrument will recognize "mV" (or "MV") as millivolt, "MHZ" (or "mhz") recognize as **Mega Hertz** and recognize "MΩ" (or "mΩ") as **Mega Ohm**. You can also use the prefix "MA" to represent megampere, such as "MAV" represents megavolt.

### 1.5.2. DiscreteParameter

The discrete parameter is used to set the limited parameter (such as IMMEDIATE, EXTERNAL or BUS). Just like the command keyword, they can also have short and long formats. The discrete parameter can use the combination of the uppercase and lowercase letters. Query respond is always return all capital letters in short format.

The following example requires the discrete parameter for temperature unit.

UNIT:TEMPerature {C|F|K}

### 1.5.3. BooleanParameter

The Boolean parameter represents a binary condition, true or false. For a false condition, the instrument accepts "OFF" or "0". For a true condition, the instrument accepts "ON" or "1".

The instrument is always return "0" or "1" when query the Boolean setting.

The following example requires to use the Boolean parameter.

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

## 1.6. ABORt

**Command description:** Terminating a measurement in process, returning the instrument to “idle trigger” state.

Parameter    Typical return

null                null

Terminating a measurement in process

TRIG:SOUR IMM //Set the trigger source to immediately trigger

TRIG:COUN 10 //Set the trigger times to 10

INIT //Set the trigger state to “waiting to trigger”

ABOR //terminate the measurement

Use this command to terminate the current operation when the instrument is waiting to trigger or performing a long measurement.

## 1.7. FETCh?

**Command description:** Wait for the latest measurement to complete and return all available measured data.

Parameter    Typical return

null

-5.75122019E-04, -5.77518360E-04,  
-5.73923848E-04, -5.76020647E-04

Set the trigger source to immediately trigger, INIT command sets the instrument to the “waiting to trigger” state. In the state, the measurement will be triggered immediately and return the measured results to measurement memory.

FETCh? command will send the measured results from the measurement memory to the output buffer of the instrument.

TRIG:SOUR IMM //Set the trigger source to immediately trigger

TRIG:COUN 10 //Set the trigger times to 10

INIT //Set the trigger state to “waiting to trigger”

FETC? //Read the measured value generated by this measurement

FETCh? command does **not** erase the measured results from the reading memory. After send READ? command, you can send FETCh? query command a lot of time to query the same data.

The reading memory of UT8805 can save the maximum 1,0000 of measurement value. If the reading memory overflows, the new measurement value will overlay the old measurement value. The newest measurement value will always be retained. Null errors will be made, but set Reading Mem Ovfl bit (bit 14) in the condition register of the suspect data register.

It's worth noting that the following command will empty the measurement results, resulting in FETCh? return value changes

INITiate

MEASure:<function>?

READ?

## 1.8. INITiate[:IMMediate]

**Command description:** Set the trigger system to the “waiting to trigger” state. After received INITiate command, the measurement will immediately start when the trigger condition is met. This command can also clear the measured results of the previous group from the reading memory.

Parameter    Typical return

null            null

After set the trigger state to “waiting to trigger”, the trigger signal can be effectively received.

TRIG:SOUR BUS //Set the trigger source to bus trigger

TRIG:COUN 10 //Set the trigger times to 10

INIT //Set the trigger state to “waiting to trigger”

\*TRG //Send the trigger signal

FETCh? //Read the measurement memory after the measurement is completed

Use INITiate command to save the measured results in reading memory (It should coordinate with FETCh? command to send the reading to the buffer of the instrument.) It's faster than sending measurement results to the instrument's output buffer by using READ?

INITiate command is also an “overlapped” command. This means that you can only send other command that nullt affecting the measurement results after executing INITiate command.

The reading memory of UT8805 can save the maximum 1,0000 of measurement value. If the reading memory overflows, the new measurement value will overlay the old measurement value. The newest measurement value will always be retained. Null errors will be made, but set Reading Mem Ovfl bit (bit 14) in the condition register of the suspect data register.

If you want to search the measurement results from the reading memory, please use FETCh? command. Use DATA:REMove? or R? command to read or erase all the measured results or the part of the measured results. Use ABORt command can return to the “idle trigger” state.

## 1.9. OUTPut:TRIGger:SLOPe {POSitive|NEGative} OUTPut:TRIGger:SLOPe?

**Command description:** Select the slope of voltmeter complete output signal on the VM Comp BNC connector on the rear panel.

Parameter            Typical return

{POSitive|NEGative}, NEGative defaults to null

Configuring DC voltage measurement and measure it twice. After each measurement is complete, the signal on VM Comp connector on rear panel will output a positive pulse.

CONF:VOLT:DC 10

SAMP:COUN 2

OUTP:TRIG:SLOP POS

INIT

After the instrument restore to the factory setting, this parameter will be set to the default value.

## 1.10. READ?

**Command description:** Read and erase the measured results from the reading memory, up to the specified <max\_readings>. This command reads data starting with the earliest measured results.

Parameter Typical return

null

-1.23006735E-03,-1.30991641E-03,-1.32756530E-03,

-1.32002814E-03

Transmitting the measured results from the reading memory

TRIG:COUN 4

SAMP:COUN 1

READ?

FETCh? command does not erase the measured results from the reading memory. After send READ? command, you can send FETCh? query command a lot of time to query the same data.

The reading memory of UT8805 can save the maximum 1,0000 of measurement value. If the reading memory overflows, the new measurement value will overlay the old measurement value. The newest measurement value will always be retained. Null errors will be made, but set Reading Mem Ovfl bit (bit 14) in the condition register of the suspect data register.

It's worth noting that the following command will empty the measurement results, resulting in READ? return value changes

INITiate

MEASure:<function>?

READ?

## 1.11. SAMPLE:COUNT {<count>|MIN|MAX|DEF}SAMPLE:COUNT? [{MIN|MAX|DEF}]

**Command description:** To specifies the quantity of samples to be collected by the instrument in a single trigger.

Parameter Typical return

1(default) to 100,000 1

Set the sampling times of single trigger to 10, and only one pulse will be observed when the oscilloscope is connected to VM Comp BNC on rear panel.

SAMP:COUN 10 //Set the sampling times to 10

TRIG:COUN 1 //Set the trigger times to 1

TRIG:SOUR EXT;SLOP NEG //Set the trigger source to external trigger and set the trigger signal to the falling edge

OUTP:TRIG:SLOP POS //Set the trigger signal to the rising edge

READ? //Start to measurement and read

You can use the sample count command with the trigger count command (TRIGger:COUNT), before return to “idle trigger” state, the trigger count command can set the trigger count that the instrument will received. The total of returned measurement is the product of the sample count and the trigger count.

The reading memory of UT8805 can save the maximum 1,0000 of measurement value. If the reading memory overflows, the new measurement value will overlay the old measurement value. The newest measurement value will always be retained. Null errors will be made, but set Reading Mem Ovfl bit (bit 14) in the condition register of the suspect data register.

After reset the instrument to the factory setting, this parameter will be set to the default value.

## 1.12. UNIT:TEMPerature {C|F|K} UNIT:TEMPerature?

**Command description:** Select the unit for temperature measurement (°C, °F or Kelvin)

Parameter      Typical return

{C|F|K}, the default is °C

Set °F to the unit of return measurement value

UNIT:TEMP F //Set °F for temperature measurement

MEAS:TEMP? //Read a group of temperature measured value after the temperature restore to the default setting

After reset the instrument to the factory setting, this parameter will be set to the default value.

## 1.13. \*UNREMOTE

**Command description:** Return to the local mode from the remote mode, unlock the keys on front panel

Parameter      Typical return

null              null

## 2. CALCulate Subsystem

### 2.1. CALCulate:CLEar[:IMMediate]

**Command description:** Clear all the limited conditions, histogram data, statistical information and measurement results.

Parameter    Typical return

null            null

CALC:CLE:IMM

The items that need to be cleared by this command will be cleared synchronously after this command is called. Therefore, all histogram data, statistical information and the limit data is restarted at the same time as the measurement restart.

### 2.2. CALCulate:LIMit Subsystem

This subsystem is used to assign the limit value of the measurement.

#### Example

The following examples are the limit test in DC voltage measurement mode. In the example, set the lower limit to 2.4V, the upper limit to 3.6V. If the measured results exceeds 3.6V, it will set 12 bit (the upper limit fails) in the suspect status register; if the measured results is lower than 2.4V, it will set 11 bit (the lower limit fails) in the suspicious status register.

\*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]

**Command description:** Clear the hint of the currently executed limited on front panel and clear the 11 bit ("the lower limit fails") and 12 bit ("the upper limit fails") in the suspicious data register. The corresponding event register bits are not affected. The condition register can monitor the status of the instrument without interruption. The condition register bits are updated in real time; they are neither locked nor buffered. The event registers are read-only registers that latch events from the condition registers. When an event bit is set, the subsequent events corresponding to that bit will be ignored.

Parameter    Typical return



null            null

Clear all measured results of the limit test

CALC:LIM:CLE:IMM

This command does not clear the measured results saved in the reading memory.

When the measurement function changes or execute any command as follows, the instrument eliminates the hint of over the limit on front panel and clear the 11 bit and 12 bit in the suspicious data register.

CALCulate:LIMit:STATe ON

INITiate

MEASure:<function>?

READ?

CALCulate:LIMit:CLEar

If you want to clear the statistical results, the limit, histogram data and the measurement data, use the command CALCulate:CLEar[:IMMediate].

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

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

**Command description:** Set the lower limit/upper limit in the limit mode

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

Refer to example

Assign the lower limit, the upper limit or both. Do not set the lower limit higher than the upper limit, if the lower limit is higher than the upper limit, then the upper limit will be force to set the same with the lower limit.

Limit crossing: If the measured results is less than the assigned lower limit, set 11 bit in the suspicious data register ("the lower limit fails"). If the measured results is greater than the assigned upper limit, set 12 bit in the suspicious data register ("the upper limit fails"). CONFIGure command can reset the two limits to 0.

After reset the instrument to the factory setting, this parameter will be set to the default value.

### 2.2.3. CALCulate:LIMit[:STATe]{ON|OFF|0} CALCulate:LIMit[:STATe]?

**Command description:** Enable or disable the limit test

Parameter    Typical return

{ON|OFF|0}, default to 0 (OFF) or 1 (ON).

Refer to example

When the measurement function changes or execute any command as follows, the instrument eliminates the hint of over the limit on front panel and clear the 11 bit and 12 bit in the suspicious data register.

CALCulate:LIMit:STATe ON

INITiate

MEASure:<function>?

READ?

CALCulate:LIMit:CLEar

After reset the instrument to the factory setting, this parameter will be set to the default value.

## 2.3. CALCulate:TRANSform:HISTogram Subsystem

HISTogram subsystem is to set display in histogram.

### 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 100 histograms of the automatic calibration, the measured results of DCV mode. It returns the calculated histogram, which including the lower range and the upper range, the total measurement count and the distributed data of each histogram.

CONF:VOLT:DC 20

SAMP:COUN 100

CALC:TRAN:HIST:RANG:AUTO ON

CALC:TRAN:HIST:POIN 100

CALC:TRAN:HIST:STAT ON

INIT

\*WAI

CALC:TRAN:HIST:ALL?

Typical command: -9.19862179E-02,-3.19788034E-04, +100, <102 groups histograms data >

Notes: The above respond returns 102 groups data, the data of the first group is the data that lower than the lower range, the data of the last group is the data that greater than the upper range.

### 2.3.1.CALCulate:TRANSform:HISTogram:ALL?CALCulate:TRANSform:HISTogram:DATA?

**Command description:** Query returns the upper range value and lower range, measurement count and the collected histogram data since the last time the histogram data was cleared, which separate by a comma in ALL format. DATA format only return the histogram data.

Parameter    Typical return

(null)        refer to example

Refer to example

The histogram data including the following case, in order

The measured result count is lower than the lower range

The measured result count of each histogram is not lower than the lower range

The measured result count is greater than the upper range value

The range value returns the real number in the format of +1.00000000E+00. The measured result count and the histogram data returns the positive integer in the format of +100.

### 2.3.2. CALCulate:TRANSform:HISTogram:CLEar[:IMMediate]

**Command description:** Clear the histogram data. If the the histogram range has enabled (CALCulate:TRANSform:HISTogram:RANGe:AUTO ON), then re-activate it.

Parameter Typical return

(null) (null)

Clear the histogram data

CALC:TRAN:HIST:CLE

This command does not clear the measured results saved in the reading memory.

If you want to clear the statistical results, the limit, histogram data and the measurement data, use the command CALCulate:CLEar[:IMMediate].

### 2.3.3. CALCulate:TRANSform:HISTogram:COUNt?

**Command description:** Return the collected measured result count since the last time the histogram data was cleared.

Parameter Typical return

(null) +96

Return the measured result count of the histogram

CALC:TRAN:HIST:COUN?

### 2.3.4. CALCulate:TRANSform:HISTogram:POINts {<value>|MIN|MAX|DEF}

CALCulate:TRANSform:HISTogram:POINts?

**Command description:** Set the number of histogram between the lower range and the upper range of the histogram. There are always have two additional histogram: one for measure the range is below than the lower range, one for measure the range is higher than the upper range.

Parameter Typical return

{10|20|40|100|200|400|MIN|MAX|DEF}, the default is 100 +100

Refer to example

Use the command CALCulate:TRANSform:HISTogram:RANGe:{LOWer|UPPer} to assign the lower range and the upper range. If the command CALCulate:TRANSform:HISTogram:RANGe:AUTO is opened, the lower limit range and the upper limit range will automatic calculated.

After reset the instrument to the factory setting, this parameter will be set to the default value.

### 2.3.5. CALCulate:TRANSform:HISTogram:AUTO:ONCE

**Command description:** The histogram measurement is automatically scaled once.

### 2.3.6. CALCulate:TRANSform:HISTogram:RANGe:{LOWer|UPPer} {<value>|MIN|MAX|DEF}

CALCulate:TRANSform:HISTogram:RANGe:{LOWer|UPPer}?

**Command description:** Set the lower limit and the upper limit of the histogram. Set the lower limit or the upper limit (CALCulate:TRANSform:HISTogram:RANGe:{LOWer|UPPer}) will disable the automatic select the lower limit and the upper limit

(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

Refer to example

If the automatic range selection is enabled (CALCulate:TRANSform:HISTogram:RANGe:AUTO ON), query returns the calculated range value. If the histogram data is not exist, it returns 9.91E37 (not figure).

If the command CALCulate:TRANSform:HISTogram:RANGe:AUTO is enabled, it will automatic calculate the lower limit and the upper limit.

After the instrument restore to the factory setting (\*RST) or the instrument is preset (SYSTem:PRESet), this parameter will be set to the default value.

### 2.3.7. CALCulate:TRANSform:HISTogram[:STATe]{ON|OFF[0]}

CALCulate:TRANSform:HISTogram[:STATe]?

**Command description:** Enable or disable the histogram calculation.

Parameter    Typical return

{ON|1|OFF|0}, default to 0 (OFF) or 1 (ON).

Refer to example

## 2.4. CALCulate:SCALe Subsystem

This subsystem is used to demarcate the measured results of ACV and DCV.

### 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}]

**Command description:** Save the relative value in the multimeter's return-to-zero logic and dB-related registers, which function corresponds to dB function in CALCulate:SCALe: .When the dB function is enabled, after the result of the measurement is converted to dBm, the value will be subtracted from each voltage measurement result.

**Note:** This command is only suitable for ACV and DCV measurement function.

Parameter Typical return

-200.0 dBm to +200.0 dBm, the default is 0 +5.00000000E+02

Enable dB demarcation with -10 dB reference

CALC:SCAL:DB:REF -10.0

CALC:SCAL:FUNC DB

CALC:SCAL:STAT ON

The specified reference value will disable the automatic reference selection (CALCulate:SCALE:REfERENCE:AUTO OFF)

dB relative parameter is related to the dBm reference set by the command CALCulate:SCALE:DBM:REfERENCE

When mathematical function or measurement function is changed, with the automatic reference selection enabled, the instrument will set the parameter value to 0.0.

#### 2.4.2. CALCulate:SCALE: DBM:REfERENCE {<reference>|MIN|MAX|DEF}

CALCulate:SCALE: DBM:REfERENCE? [{MIN|MAX}]

**Command description:** Select the reference resistance, convert the voltage measurement result to dBm. This reference value will affect the calibration function of dBm and dB.

**Note:** This command is only suitable for ACV and DCV measurement function.

Parameter Typical return

50, 75, 93, 110, 124, 125, 135, 150, 250, 300, 500, 600 (default value), 800, 900, 1000, 1200 or 8000Ω  
+6.00000000E+02

Use the reference resistance 600 Ω to enable dBm demarcation

CALC:SCAL:DBM:REF 600

CALC:SCAL:FUNC DBM

CALC:SCAL:STAT ON

After the instrument restore to the factory setting and when the mathematical function or measurement function is changed, the instrument will set the reference value to the default value.

#### 2.4.3. CALCulate:SCALE:FUNctiON {DB|DBM}

CALCulate:SCALE:FUNctiON?

**Command description:** Select the calibration function to perform different operations.

DB executes the relative dB calculation. The result is the difference value between the input signal and the saved DB relative value (CALCulate:SCALE:DB:REfERENCE), both the two values are convert to dBm (dB = the measured results with dBm unit – the relative value with dBm).

DBM executes dBm calculation. The result is the logarithmic expression and based on the power calculation of reference resistance (CALCulate:SCALE:DBM:REfERENCE), compared with 1 mW, (dBm =  $10 \times \log_{10}(\text{the measured results}^2 / \text{reference resistance} / 1\text{mW})$ ).

**Note:** This command is only suitable for ACV and DCV measurement function.

Parameter Typical return

{DB|DBM} DBor DBM

Enable DBM calibration function for reference for next measurement

CALC:SCAL:FUNC DBM

CALC:SCAL:STAT ON

For dB function, The reference values are automatically selected using the first measurement results of the reference values converted to dBm (please refer to CALCulate:SCALE:REFERENCE:AUTO) or it can assigned by the command CALCulate:SCALE:DB:REFERENCE.

The result of the calibration function must within the range  $-1.0\text{E}+24$  to  $-1.0\text{E}-24$ , or  $+1.0\text{E}-24$  to  $1.0\text{E}+24$ . Any results that exceeds the range will replace to  $-9.9\text{E}37$  (minus infinity), 0 or  $9.9\text{E}37$  (positive infinity). After reset the instrument to the factory setting, this parameter will be set to the default value.

#### 2.4.4. CALCulate:SCALE:REFERENCE:AUTO {ON|1|OFF|0}

##### CALCulate:SCALE:REFERENCE:AUTO?

**Command description:** Enable or disable the automatic reference calibration for dB function.

**Note:** This command is only suitable for ACV and DCV measurement function.

Parameter      Typical return

{ON|1|OFF|0}, default to 0 (OFF) or 1 (ON).

Use the automatic reference to enable DB function and use the first measurement value to be 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 in process will be the reference for the follow-up measurement and the automatic reference selection will be disabled.

For dB function, the first measured value converts to dBm and set CALCulate:SCALE:DB:REFERENCE to be the result.

OFF: CALCulate:SCALE:DB:REFERENCE to assign the reference of DB calibration.

When the calibration function is enabled, the instrument will also enable the automatic reference selection (CALCulate:SCALE:STATE ON).

After reset the instrument to the factory setting, this parameter will be set to the default value.

#### 2.4.5. CALCulate:SCALE[:STATE] {ON|1|OFF|0}

##### CALCulate:SCALE[:STATE]?

**Command description:** Enable or disable the calibration function.

**Note:** This command is only suitable for ACV and DCV measurement function.

Parameter      Typical return

{ON|1|OFF|0}, default to 0 (OFF) or 1 (ON).

Use the automatic reference to enable DB function and use the first measurement value to be the reference value.

CALC:SCAL:DBM:REF 50

CALC:SCAL:FUNC DB

CALC:SCAL:REF:AUTO ON

CALC:SCAL:STAT ON

READ?

When the calibration function is enabled, the automatic null selection will also be enabled (CALCulate:SCALE:REFERENCE:AUTO).

When the measurement function is changed, the instrument will turn off this setting.

## 2.5. CALCulate:AVERage Subsystem

This subsystem is used to calculate the measurement statistical information.

### 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|OFF|0}

CALCulate:AVERage[:STATe]?

**Command description:** Enable or disable the statistical calculation.

Parameter      Typical return  
 {ON|OFF|0}, default to 0 (OFF) or 1 (ON).

Return to the statistical results of 100 frequency measurements.

CONF:FREQ  
 SAMP:COUN 100  
 CALC:AVER:STAT ON  
 INIT  
 CALC:AVER:ALL?

Typical command:

-4.10466677E-04, +3.13684184E-04, +1.75743178E-02, -6.74799085E-04

When the measurement function is changed, or execute any one of these commands, clear the statistical data.

CALCulate:AVERage:STATe ON  
 CALCulate:AVERage:CLEar  
 INITiate  
 MEASure:<function>?  
 READ?

When the measurement function is changed, the instrument will turn off this setting.

#### 2.5.2. CALCulate:AVERage:ALL?

CALCulate:AVERage:AVERage?  
 CALCulate:AVERage:COUNt?  
 CALCulate:AVERage:MAXimum?  
 CALCulate:AVERage:MINimum?

**CALCulate:AVERage:PTPeak?****CALCulate:AVERage:SDEVIation?**

**Command description:** CALCulate:AVERage:ALL? query returns the arithmetic mean value, standard difference value, the maximum and the minimum value of all the measurement since the last clear the statistics. CALCulate:AVERage:ALL? not return count and the statistical value of peak-to-peak. The six queries listed above return a single value.

Parameter      Typical return

(null)            (refer to the following)

Return to the statistical results of 100 frequency measurements.

CONF:FREQ

SAMP:COUN 100

CALC:AVER:STAT ON

INIT

CALC:AVER:ALL?

Typical command:

-4.10466677E-04, +3.13684184E-04, +1.75743178E-02, -6.74799085E-04

Clear the statistical data when the measurement function changes or executing any one of the following commands.

CALCulate:AVERage:STATe ON

CALCulate:AVERage:CLEar

INITiate

MEASure:<function>?

READ?

Except COUNT all value are return with the format of +1.00000000E+01. COUNT command returns a positive integer with symbol: +129.

When use dBor dBm to calibrating, CALC:AVER:AVER and CALC:AVER:SDEV query returns +9.91000000E+37(not figure).

**2.5.3. CALCulate:AVERage:CLEar[:IMMediate]**

**Command description:** Clear all calculated statistical data: the minimum value, the maximum value, the average value, peak-to-peak, count and the standard difference value.

Parameter      Typical return

(null)            (null)

Clear the saved statistical data:

CALC:AVER:CLE

This command does not clear the measured results save in the reading memory.

Clear the statistical data when the measurement function changes or executing any one of the following commands.

CALCulate:AVERage:STATe ON

CALCulate:AVERage:CLEar

INITiate

MEASure:<function>?

READ?

If you want to clear the statistical results, the limit, histogram data and the measurement data, use the command CALCulate:CLEar[:IMMediate].



### 3. CONFigure Subsystem

CONFigure command is the easiest way to configure the measurement. These commands will restore the instrument to the default measurement settings. However, these commands does not automatically start the measurement. So you can modify the measurement attributes before starting the measurement.

**Note:** Use the command INITiate or READ? to start the measurement.

#### Command summary

CONFigure?

CONFigure:CONTinuity

CONFigure:CURRent:{AC|DC}

CONFigure:DIODe

CONFigure:{FREQuency|PERiod}

CONFigure:{RESistance|FRESistance}

CONFigure:TEMPerature

CONFigure:CAPacitance

#### Default setting of CONFigure command

CONFigure command can select function, range and sampling rate by one command. Other parameters are all set to the default setting (as follows). If the range and the sampling rate are not set, it will also be restore to the default value.

Measurement parameter	Default setting
-----------------------	-----------------

Automatic zero resetting	OFF
--------------------------	-----

Range	AUTO
-------	------

Trigger sample number	one sample
-----------------------	------------

Trigger number	one trigger
----------------	-------------

Trigger delay	Automatic delay
---------------	-----------------

Trigger source	immediately
----------------	-------------

Trigger slope	NEGative
---------------	----------

Mathematical function	forbidden
-----------------------	-----------

#### Use CONFigure

The following example uses the command CONFigure and READ? to perform external trigger measurement. CONFigure command is to configure DC voltage measurement, but not set the instrument to the "waiting to trigger" state.

READ? command is to set the instrument to the "waiting to trigger" state. When Ext Trig on rear panel input a pulse signal (the default is low), the instrument will automatically to start the measurement, save the measured result in the reading memory and send the measured results to the output buffer of the instrument.

The default range (automatic range) and the default sampling rate (slow rate) for the measurement.

```
CONF:VOLT:DC
```

```
TRIG:SOUR EXT
```

```
READ?
```

Typical command: -5.21391630E-04

The following examples are similar to the previous examples, but use the command INITiate and FETCh? replace the command READ? and INITiate.

INITiate command is to set the instrument to the “waiting to trigger” state. When Ext Trig on rear panel input a pulse signal (the default is low), the instrument will generate to start the measurement and send the measured results to the reading memory. FETCh? command is to send the measured results from the reading memory to the output buffer of the instrument.

CONF:VOLT:DC

TRIG:SOUR EXT

INIT

FETCh?

Typical command: -5.21205366E-04

Use the command INITiate to save the measured results in the reading memory is quicker than use the command READ? to send the measured results to the output buffer of the instrument (It assume that you send the command FETCh? after you complete the setup.) INITiate command is also a “repeat” command, that's means you can send other commands that not affect the measured results after executing the command INITiate. Before starting the reading, it can help you to check the data availability, otherwise, it may cause timeout. Please note that the command FETCh? will be wait until all measurements completed. UT8805 can save the maximum of measured results 10,000.

The following example is to configure the instrument to perform 2 lines resistance measurement. To trigger the instrument to use the command INITiate to perform one measurement and save the measured results in the reading memory. Select 10kΩ.

CONF:RES 10000

INIT

FETCh?

Typical command: +5.21209585E+04

### 3.1. CONFigure?

**Command description:** Return a character string to indicate the current function and range. It always returns the function name with short format (CURR:AC,FREQ).

Parameter    Typical return

(null) "VOLT +2.00000000E-01"

Return to the current function and the range.

CONF?

### 3.2. CONFigure:CONTinuity

**Command description:** Set all measurement parameter and trigger parameter in the continuity mode to the default value.

Parameter    Typical return

(null)        (null)

Configure the instrument to the continuity mode, and then use the external trigger with positive slope (rising edge) to perform the measurement and reading the measured results.

```
CONF:CONT
TRIG:SOUR EXT
SLOP POS
READ?
```

For the continuity test (2 lines resistance measurement), the range is fixed at 1kΩ.

For the measurement that less than or equal to the continuity threshold (the threshold can be set by the command [:SENSe]:CONTinuity:THReshold:VALue), the instrument beeps (if the beeper is enabled) and the actual measured results of resistance measurement displays on the screen.

From the threshold to 1.2 kΩ, the instrument shows the actual measured results of resistance measurement and no beep. If the measured results exceeds 1.2 kΩ, the instrument shows "OPEN" (overload) and no beep.

The command FETCh?, READ? and MEASure:CONTinuity? query returns the measured resistance regardless of the size of its value.

Use the command READ? or INITiate to start the measurement.

### 3.3. CONFigure:CURRent:{AC|DC}

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

**Command description:** Set all measurement parameter and trigger parameter in AC/DC current measurement mode to the default value. In addition, the command can assign the scale by input the parameter.

Parameter

<range>: {200uA|2mA|20mA|200mA|2A|10A|AUTO}, the default is AUTO (automatic range).

200uA and 2mA scale can only be set in DC current mode. The minimum scale is 20mA in AC mode.

Typical return (null)

Use 2A to configure AC current measurement. Performing two measurements and take a reading.

```
CONF:CURR:AC 2
SAMP:COUN 2
READ?
```

Typical command: +4.32133675E-04, +4.18424606E-04

You can input AUTO parameter or not input any parameter but select the automatic range, or you can select a fixed range by manual.

Automatic range will automatically select the range according to the input signal for the measurement. If you want to perform the measurement quickly, you can select the range by manual (automatic range will take some time).

If the input signal is greater than the measurement value of the specified range, the instrument's panel displays Overload character and return "+9.90000000E+37" from remote port.

Use the command READ? or INITiate to start measurement.

### 3.4. CONFigure:DIODE

**Command description:** Set all measurement parameter and trigger parameter in diode mode to the default value.

Parameter Typical return

(null) (null)

Configure the diode measurement and read the measured results.

CONF:DIOD

READ?

Typical command: +1.32130000E-01

The range is fixed when perform the diode measurement, the range is 2VDC.

The command FETCh?, READ? and MEASure:DIODE? query returns the measured voltage regardless of the size of its value.

Use the command READ? or INITiate to start measurement.

### 3.5. CONFigure:{FREQuency|PERiod}

**Command description:** Set all measurement parameter and trigger parameter in frequency/period mode to the default value.

Parameter Typical return

(null) (null)

Configure the frequency measurement and read the measured results.

CONF:FREQ

READ?

Typical command: +7.79645018E+01

For the selected voltage range, if the input signal is too large, the instrument's panel displays Overload character and return "+9.90000000E+37" from remote port. Automatic range can be enabled for the input voltage.

### 3.6. CONFigure:{RESistance|FRESistance}

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

**Command description:** Set all measurement parameter and trigger parameter in 2 lines/4 lines resistance measurement mode to the default value. In addition, the command can assign the scale by input the parameter.

Parameter

<range>: {200 Ω|2 kΩ|20 kΩ|200 kΩ|2 MΩ|10 MΩ|100 MΩ}, the default is AUTO(automatic range).

Typical return (null)

Use 200 Ω to configure the 4 lines resistance measurement. Performing two measurements and take a reading.

CONF:FRES 200

SAMP:COUN 2

READ?

Typical command: +6.71881065E+01, +6.83543086E+01

You can input AUTO parameter or not input any parameter but select the automatic range, or you can select a fixed range by manual.

Automatic range will automatically select the range according to the input signal for the measurement. If you want to perform the measurement quickly, you can select the range by manual (automatic range will takes some time).

If the input signal is greater than the measurement value of the specified range, the instrument's panel displays Overload character and return "+9.90000000E+37" from remote port.

Use the command READ? or INITiate to start measurement.

### 3.7. CONFigure:TEMPerature

[{FRTD|RTD|FTHermistor|THERmistor|TCouple}[, {<type>|Default}]]

**Command description:** Set all measurement parameter and trigger parameter in continuity mode to the default value.

Parameter Typical return

<probe\_type>: the default is RTD.

<type>: PT100 (It's the only choice for RTD) or {E|J|K|N|IR|T} (thermocouple) configure the RTD measurement and read the measured results.

CONF:TEMP RTD,PT100 READ?

Typical command: -2.00000000E+02

If you want to change the temperature unit, use the command UNIT:TEMPerature.

If the input signal is greater than the measurement value of the specified range, the instrument's panel displays Overload character and return "+9.90000000E+37" from remote port.

Use the READ? or INITiate to start measurement.

### 3.8. CONFigure[:VOLTage]:{AC|DC}

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

**Command description:** Set all measurement parameter and trigger parameter to the default value and then performing AC or DC voltage measurement. In addition, the command can assign the scale by input the parameter.

Parameter

<range>: {200 mV|2 V|20 V|200 V|1000 V(DC)/750V(AC)}, the default is (automatic range).

Typical return (null)

Use 200 V to configure the AC voltage measurement. Performing two measurements and take a reading.

CONF:VOLT:AC 200

SAMP:COUN 2

READ?

Typical command: +2.43186951E-02, +2.56896019E-02

You can input AUTO parameter or not input any parameter but select the automatic range, or you can select a fixed range by manual.

Automatic range will automatically select the range according to the input signal for the measurement. If you want to perform the measurement quickly, you can select the range by manual (automatic range will takes some time).

If the input signal is greater than the measurement value of the specified range, the instrument's panel displays Overload character and return "+9.90000000E+37" from remote port.

Use the READ? or INITiate to start measurement.

### 3.9. CONFigure:CAPacitance

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

**Command description:** Set all measurement parameter and trigger parameter to the default value and then performing the capacitance measurement. In addition, the command can assign the scale by input the parameter.

Parameter

<range>: {2nF|20nF|200nF|2uF|20uF|200uF|10000uF}, the default is (automatic range).

Typical return (null)

Use 2μF to configure the capacitance measurement. Performing two measurements and take a reading.

CONF:CAP 2uF

SAMP:COUN 2

READ?

Typical command: +7.26141264E-10, +7.26109188E-10

You can input AUTO parameter or not input any parameter but select the automatic range, or you can select a fixed range by manual.

Automatic range will automatically select the range according to the input signal for the measurement. If you want to perform the measurement quickly, you can select the range by manual (automatic range will takes some time).

If the input signal is greater than the measurement value of the specified range, the instrument's panel displays Overload character and return "+9.90000000E+37" from remote port.

Use the READ? or INITiate to start measurement.

## 4. DATA Subsystem

This subsystem is used to configure or delete the data from the reading memory. When the measurement configuration changes or execute the following command, the instrument will delete all measured results from the reading memory.

INITiate

MEASure:<function>?

READ?

### Command summary

DATA:LAST?

DATA:POINts?

DATA:REMove?

### 4.1. DATA:LAST?

**Command description:** Return the latest measured results. You can execute this query at any time, even during the series of measurements.

Parameter    Typical return

(null)

A measured result with the unit. If there are no data can be use, it returns 9.9E37 with the unit (not figure).

For example: -4.79221344E-04 VDC

Return the last measurement

DATA:LAST?

### 4.2. DATA: POINts?

**Command description:** Return the total meaasurements in the reading memory. You can execute this query at any time, even during the series of measurements.

Parameter    Typical return

(null)    +20

Return the measurement count in the reading memory.

DATA:POIN?

The reading memory of UT8805 can save the maximum 1,0000 of measurement value.

### 4.3. DATA:REMove? <num\_readings> [,WAIT]

**Command description:** Read and erase the <num\_readings> measured results from the reading memory. If the <num\_readings> measured results are not available, it query returns an error, unless it assign WAIT parameter, in this condition, the query will wait until the <num\_readings> measured results can be use.

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 reading from the reading memory.

DATA:REMove? 5

Use the command R? and DATA:REMove? to delete the measured results from the reading memory in regularly. While the measurement results usually cause the reading memory to overflow.

## 5. MEASure Subsystem

MEASure command is the easiest way to fetch the measurement value, because it always takes the default measurement parameters. You can use a command to set the measurement mode and scale, but cannot change the default value of other parameter. The execution results will return directly.

**Notes:** one MEASure command is equal to send CONFigure in functionally, and enter READ? immediately. The difference is that you need attache the parameter set follow with MEASure command to the behind of the CONFigure command.

### 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 setting of MEASure command

MEASure command is use one command to select function, range and sampling rate. Other parameters are all set to the default value (the same below). If the range and the sampling rate are not set, it will also be restore to the default value.

Measurement parameter      Default setting

Automatic zero resetting      OFF

Range      AUTO

Trigger sample number      one sample

Trigger number      one trigger

Trigger delay      Automatic delay

Trigger source      immediately

Trigger slope      NEGative

Mathematical function      forbidden

### Use MEASure?

The following example configures the DC voltage measurement, internal trigger generates the instrument to performing the measurement and reading the measured results. The default range (automatic range) for measurement.

MEAS:VOLT:DC?

Typical command: -4.96380404E-02

The following example configures the instrument to performing 2 lines resistance measurement, generating the instrument to performing the measurement and reading the measured results. Select the range 1 kΩ

MEAS:RES? 2000



Typical command: +9.84668434E+02

## 5.1. MEASure:CONTinuity?

**Command description:** Performing one measurement after set all measurement parameter and trigger parameter in the continuity mode to the default value. The measured results will return directly.

Parameter Typical return

(null) +9.84739065E+02

Configure the instrument to performing the continuity measurement and reading the measured results.

MEAS:CONT?

For the continuity test (2 lines resistance measurement), the range is fixed at 1kΩ.

For the measurement that less than or equal to the continuity threshold (the threshold can set by the command [:SENSe]:CONTinuity:THReshold:VALue), the instrument beeps (if the beeper is enabled) and the actual measured results of resistance measurement displays on the screen.

From the threshold to 1.2 kΩ, the instrument shows the actual measured results of resistance measurement and no beep. If the measured results exceeds 1.2 kΩ, the instrument shows "OPEN" (overload) and no beep.

The command FETCH?, READ? and MEASure:CONTinuity? query returns the measured resistance regardless of the size of its value.

## 5.2. MEASure:CURREnt:{AC|DC}?

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

**Command description:** Generating the measurement immediately after set all measurement parameter and trigger parameter in AC/DC current mode to the default value. And return the measured results directly after the sampling is completed. In addition, the command can assign the scale by input the parameter.

Parameter Typical return

<range>: {200uA|2mA|20mA|200mA|2A|10A|AUTO}, the default is AUTO(automatic range).

200uA and 2mA scale can only be set in DC current mode. The minimum scale is 20mA in AC mode.

(null)

Use 2A to configure AC current measurement. Performing two measurements and take a reading.

CONF:CURREnt:AC 2

SAMP:COUN 2

READ?

Typical command: +4.32133675E-04, +4.18424606E-04

You can input AUTO parameter or not input any parameter but select the automatic range, or you can select a fixed range by manual.

Automatic range will automatically select the range according to the input signal for the measurement. If you want to perform the measurement quickly, you can select the range by manual (automatic range will takes some time).

If the input signal is greater than the measurement value of the specified range, the instrument's panel displays Overload character and return "+9.90000000E+37" from remote port.

Use the READ? or INITiate to start measurement.

### 5.3. MEASure:DIODe?

**Command description:** Generating the measurement immediately after set all measurement parameter and trigger parameter in continuity mode to the default value. And return the measured results directly after the sampling is completed.

Parameter Typical return

(null) +9.84733701E-01

Configure and read the default measured results of diode.

MEAS:DIOD?

The range is fixed when performing the diode measurement. The range is 2VDC.

The command FETCh?, READ? and MEASure:DIODe? query returns the measured voltage regardless of the size of its value.

### 5.4. MEASure:{FREQuency|PERiod}?

**Command description:** Generating the measurement immediately after set all measurement parameter and trigger parameter in frequency/period mode to the default value. And return the measured results directly after the sampling is completed.

Parameter Typical return

(null) +7.19480528E+01

Configure and read the default measured results of frequency.

MEAS:FREQ?

For the selected voltage range, if the input signal is too large, the instrument's panel displays Overload character and return "+9.90000000E+37" from remote port. Automatic range can be enabled for the input voltage.

### 5.5. MEASure:{RESistance|FRESistance}?

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

**Command description:** Generating the measurement immediately after set all measurement parameter and trigger parameter in 2 lines/4 lines resistance measurement mode to the default value. And return the measured results directly after the sampling is completed. In addition, the command can assign the scale by input the parameter.

Parameter

<range>: {200  $\Omega$ |2 k $\Omega$ |20 k $\Omega$ |200 k $\Omega$ |2 M $\Omega$ |10 M $\Omega$ |100 M $\Omega$ }, the default is AUTO (automatic range).

Typical return (null)

Use 200  $\Omega$  to configure 4 lines resistance measurement. Performing two measurements and take a reading.

MEAS:FRES? 200

Typical command: +6.71881065E+01

You can input AUTO parameter or not input any parameter but select the automatic range, or you can select a fixed range by manual.

Automatic range will automatically select the range according to the input signal for the measurement. If you want to perform the measurement quickly, you can select the range by manual (automatic range will takes some time). If the input signal is greater than the measurement value of the specified range, the instrument's panel displays Overload character and return "+9.90000000E+37" from remote port.

## 5.6. MEASure:TEMPerature?

[{RTD|THER|DEFault} [{<type>|DEFault}]]

**Command description:** Generating the measurement immediately after set all measurement parameter and trigger parameter in continuity measurement mode to the default value. And return the measured results directly after the sampling is completed.

Parameter

<probe\_type>: {RTD|THER}, the default is THER. By default, this command can only select the built-in sensor by the manufacturer, and does not support the user-defined sensors.

Typical return (null)

<type>: PT100 (It's the only choice for RTD) or {BITS90|EITS90|JITS90|KITS90|NITS90|RITS90|SITS90|TITS90} (the sensor for THER) to configuring the RTD measurement and reading the measured results.

MEAS:TEMP? RTD,PT100

Typical command: -2.00000000E+02

If you want to change the temperature unit, use the command UNIT:TEMPerature.

If the input signal is greater than the measurement value of the specified range, the instrument's panel displays Overload character and return "+9.90000000E+37" from remote port.

## 5.7. MEASure[:VOLTage]:{AC|DC}?

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

**Command description:** Generating the measurement immediately after set all measurement parameter and trigger parameter to the default value. And return the measured results directly after the sampling is completed. In addition, the command can assign the scale by input the parameter.

Parameter

<range>: {200 mV|2 V|20 V|200 V|1000 V(DC)/750V(AC)}, the default is AUTO (automatic range).

Typical return (null)

Use 200 V to configuring the AC voltage measurement and take a reading.

MEAS:VOLT:AC? 200

Typical command: +2.43186951E-02, +2.56896019E-02

You can input AUTO parameter or not input any parameter but select the automatic range, or you can select a fixed range by manual.

Automatic range will automatically select the range according to the input signal for the measurement. If you want to perform the measurement quickly, you can select the range by manual (automatic range will takes some time).

If the input signal is greater than the measurement value of the specified range, the instrument's panel displays Overload character and return "+9.90000000E+37" from remote port.

## 5.8. MEASure:CAPacitance

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

**Command description:** Set all measurement parameter and trigger parameter to the default value. And performing the capacitance measurement. In addition, the command can assign the scale by input the parameter.

Parameter Typical return

<range>: {2nF|20nF|200nF|2uF|20uF|200uF|10000uF}, the default is AUTO (automatic range).

(null)

Use 2μF to configure the capacitance measurement. Performing two measurements and take a reading.

MEAS:CAP? 2uF

READ?

Typical command: +7.26141264E-10

You can input AUTO parameter or not input any parameter but select the automatic range, or you can select a fixed range by manual.

Automatic range will automatically select the range according to the input signal for the measurement. If you want to perform the measurement quickly, you can select the range by manual (automatic range will takes some time).

If the input signal is greater than the measurement value of the specified range, the instrument's panel displays Overload character and return "+9.90000000E+37" from remote port.

## 6. SENSE subsystem

SENSE subsystem is used to configure the measurement. The basic SENSE command is [SENSE:]FUNCTION[:ON], it selects the measurement function. Other SENSE command is related to the particular measurement type.

Current

Frequency and period

Resistance

Temperature

Voltage

### 6.1. [SENSE:]FUNCTION[:ON]"<function>"

[SENSE:]FUNCTION[:ON]?

**Command description:** Select the measurement mode (retain the measurement attribute of all function)

Parameter    Typical return

CONTinuity

CURRent:AC

CURRent[:DC]

DIODe

FREQuency

FRESistance

PERiod

RESistance

TEMPerature

VOLTage:AC

VOLTage[:DC]

CAPacitance

The default is VOLTage[:DC].

## 6.2. [SENSe:]CURRent Subsystem

This subsystem is used to set the current measurement of AC and DC.

### 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:{AC|DC}:TERMinals

[SENSe:]CURRent[:DC]:NPLC

### 6.2.1. [SENSe:]CURRent:{AC|DC}:NULL[:STATe]{ON|OFF|0}

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

**Command description:** Enable or disable return to zero function.

**Notes:** This parameter is not share with AC and DC measurement. This parameter is independent between AC and DC measurement.

Parameter    Typical return

{ON|OFF|0}, default to 0 (OFF) or 1 (ON).

Use return to zero function to subtract 100mA from the measurement value to configure the AC current measurement. Performing two measurements and send the measured results to output buffer of the instrument.

CONF:CURR:AC

CURR:AC:NULL:VALue 100mA

CURR:AC:NULL:STAT ON

SAMP:COUN 2

READ?

Typical command: -9.92150377E-02,-9.98499843E-02

Enable the calibration function and automatic zero resetting will also be enabled.

[SENSe:]CURREnt:{AC|DC}:NULL:VALue:AUTO ON).

If you want to set a fixed zero value, use the command:

[SENSe:]CURREnt:{AC|DC}:NULL:VALue

After the instrument is restore to the factory setting or CONFigure function, the instrument will disable return to zero function.

### 6.2.2. [SENSe:]CURREnt:{AC|DC}:NULL:VALue {<value>|MIN|MAX|DEF}

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

**Command description:** Set the zero value.

**Notes:** This parameter is not share with AC and DC measurement. This parameter is independent between AC and DC measurement.

Parameter    Typical return

-12 to 12A, the default is 0 +1.00000000E-01

Use return to zero function to subtract 100mA from the measurement value to configure the AC current measurement. Performing two measurements and send the measured results to output buffer of the instrument.

CONF:CURREnt:AC

CURREnt:AC:NULL:VALue 100mA

CURREnt:AC:NULL:STAT ON

SAMP:COUN 2

READ?

Typical command: -9.92150377E-02,-9.98499843E-02

The specified zero value will disable the automatic zero selection function ([SENSe:]CURREnt:{AC|DC}:NULL:VALue:AUTO OFF).

If you want to use zero value, it should turn on zero switch at first ([SENSe:]CURREnt:{AC|DC}:NULL:STAT ON).

After the instrument restore to the factory setting or CONFigure function, this parameter will be set to the default value.

### 6.2.3. [SENSe:]CURREnt:{AC|DC}:NULL:VALue:AUTO {ON|1|OFF|0}

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

**Command description:** Enable or disable the automatic zero selection.

**Notes:** This parameter is not share with AC and DC measurement. This parameter is independent between AC and DC measurement.

Parameter    Typical return

{ON|1|OFF|0}, default to 0 (OFF) or 1 (ON).

Use the zero value select by automatic selection to performing the measurement.

CURREnt:AC:NULL:VAL:AUTO ON

READ?

Typical command: -4.67956379E-08, +2.33978190E-08

When the automatic reference selection switch is turned on, the first measurement value is used as the zero value for the follow-up measurements. Set [SENSe:]CURREnt:{AC|DC}:NULL:VALue to be this value. And the automatic reference selection will be disabled.

After disable the automatic reference selection (OFF), try to use this command to assign the zero value by manual.

[SENSe:]CURREnt:{AC|DC}:NULL:VALue.

Enable the calibration function and automatic zero selection will also be enabled. ([SENSe:]CURREnt:{AC|DC}:NULL:STATe ON).

After the instrument restore to the factory setting or CONFigure function, this parameter will be set to the default value.

#### 6.2.4. [SENSe:]CURREnt:{AC|DC}:RANGe {<range>|MIN|MAX|DEF}

[SENSe:]CURREnt:{AC|DC}:RANGe?

**Command description:** Select the measurement range by manual.

**Notes:** This parameter is not share with AC and DC measurement. This parameter is independent between AC and DC measurement.

Parameter      Typical return

<range>: {200uA|2mA|20mA|200mA|2A|10A|AUTO}, the default is AUTO(automatic range). 200uA and 2mA scale can only be set in DC current mode. The minimum scale is 20mA in AC mode, use 2A to configure AC current measurement. Performing two measurements and take a reading.

CONF:CURREnt:AC

CURREnt:AC:RANG 2

SAMP:COUN 2

READ?

Typical command: +3.53049833E-04, +3.54828343E-04

Select a fixed range ([SENSe:]<function>:RANGe) and disable the automatic range.

If the input signal is greater than the measurement value of the specified range, the instrument's panel displays Overload character and return "+9.90000000E+37" from remote port.

#### 6.2.5. [SENSe:]CURREnt:{AC|DC}:RANGe:AUTO {OFF|ON}

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

**Command description:** Disable or enable the automatic range.

**Notes:** This parameter is not share with AC and DC measurement. This parameter is independent between AC and DC measurement.

Parameter      Typical return

{ON|1|OFF|0}, default to 0 (OFF) or 1 (ON).

Configure AC current measurement and exeute the automatic range immediately. Performing two measurements and take a reading.

CONF:CURREnt:AC

CURREnt:AC:RANG:AUTO ON

SAMP:COUN 2

READ?

Typical command: +5.79294185E-06, +5.79294185E-06

In automatic range, the instrument will select the range according to the input signal.

After reset the instrument to the factory setting, this parameter will be set to the default value.

6.2.6. [SENSe:]CURREnt: {AC|DC}:NPLC {Slow|Medium|Fast}  
[SENSe:]CURREnt:{AC|DC}:NPLC?

**Command description:** Set the sampling rate to low, medium or fast.

6.2.7.[SENSe:]CURREnt: {AC|DC}:TERMinals{Small|Big}  
[SENSe:]CURREnt:{AC|DC}:TERMinals?

**Command description:** Configure AC or DC current measurement to measure the power supply on 200mA or 10A terminals.

Parameter    Typical return

{Small|Big} default value: Small 200mA or 10A

Configure AC current measurement to measure 10A terminal. Performing two measurements and take a reading.

CONF:CURREnt:AC

CURREnt:AC:TERM B

SAMP:COUN 2

READ?

Typical command: +7.81929394E+00, 7.82013671E+00

## 6.3. [SENSe:][FREQuency|PERiod] Subsystem

This subsystem is used to set the measurement of frequency and period.

### Command summary

[SENSe:][FREQuency|PERiod]:NULL[:STATe]

[SENSe:][FREQuency|PERiod]:NULL:VALue

[SENSe:][FREQuency|PERiod]:NULL:VALue:AUTO

[SENSe:][FREQuency|PERiod]:VOLTage:RANGe

[SENSe:][FREQuency|PERiod]:VOLTage:RANGe:AUTO

6.3.1. [SENSe:][FREQuency|PERiod]:NULL[:STATe]{ON|OFF|0}  
[SENSe:][FREQuency|PERiod]:NULL[:STATe]?

**Command description:** Enable or disable return to zero function.

**Note:** This parameter is shared with the measurement of frequency and period.

Parameter    Typical return

{ON|OFF|0}, default to 0 (OFF) or 1 (ON).

Use return to zero function to subtract 1kHz from the measured value to configure the frequency measurement. Performing two measurements and take a reading.

CONF:FREQ

FREQ:NULL:VAL 1kHz

FREQ:NULL:STAT ON

SAMP:COUN 2

READ?



Typical command: +1.15953012E+02, +1.07954466E+02

Enable the calibration function and automatic zero resetting will also be enabled.

[SENSe:][FREQuency|PERiod]:NULL:VALue:AUTO ON).

If you want to set a fixed zero value, use the command:

[SENSe:][FREQuency|PERiod]:NULL:VALue.

After the instrument is restore to the factory setting or CONFIgure function, the instrument will disable return to zero function.

### 6.3.2. [SENSe:][FREQuency|PERiod]:NULL:VALue {<value>|MIN|MAX|DEF} [SENSe:][FREQuency|PERiod]:NULL:VALue?

**Command description:** Set the zero value.

**Note:** This parameter is shared with the measurement of frequency and period.

Parameter    Typical return

-1.2E6 to +1.2E6, the default is 0 +1.00000000E-02

Use return to zero function to subtract 1kHz from the measured value to configure the frequency measurement. Performing two measurements and take a reading.

CONF:FREQ

FREQ:NULL:VAL 1kHz

FREQ:NULL:STAT ON

SAMP:COUN 2

READ?

Typical return: +1.15953012E+02, 1.07954466E+02

The specified zero value will disable the automatic zero selection function ([SENSe:][FREQuency|PERiod]:NULL:VALue:AUTO OFF).

If you want to use zero value, it should turn on zero switch at first ([SENSe:][FREQuency|PERiod]:NULL:STATe ON).

After the instrument restore to the factory setting or CONFIgure function, this parameter will be set to the default value.

### 6.3.3. [SENSe:][FREQuency|PERiod]:NULL:VALue:AUTO {ON|1|OFF|0} [SENSe:][FREQuency|PERiod]:NULL:VALue:AUTO?

**Command description:** Enable or disable the automatic zero selection.

**Note:** This parameter is shared with the measurement of frequency and period.

Parameter    Typical return

{ON|1|OFF|0}, default to 0 (OFF) or 1 (ON).

Use the zero value by automatic selection to performing the measurement.

FREQ:NULL:VAL:AUTO ON

READ?

Typical command: +1.15953012E+02, +1.07954466E+02

When the automatic reference selection switch is turned on, the first measurement value is used as the zero value for the follow-up measurements. Set [SENSe:][FREQuency|PERiod]:NULL:VALue to be this value. And the automatic reference selection will be disabled.

When return to zero function is enabled, the instrument will enable the automatic zero selection ([SENSe:][FREQuency|PERiod]:NULL:STATe ON).

After the instrument restore to the factory setting or CONFigure function, this parameter will be set to the default value.

#### 6.3.4. [SENSe:][FREQuency|PERiod]:VOLTage:RANGe {<range>|MIN|MAX|DEF} [SENSe:][FREQuency|PERiod]:VOLTage:RANGe?

**Command description:** Select the voltage range in the frequency/period measurement mode by manual.

**Note:** This parameter is shared with the measurement of frequency and period.

Parameter    Typical return

<range>: {200 mV|2 V|20 V|200 V|750V}, the default is 20V +2.00000000E+01

Use 20 VAC to configure the frequency measurement. Performing two measurements and take a reading.

CONF:FREQ

FREQ:VOLT:RANG 20

SAMP:COUN 2

READ?

Select a fixed range ([SENSe:]<function>:RANGe) and disable the automatic range.

If the input signal is greater than the measurement value of the specified range, the instrument's panel displays Overload character and return "+9.90000000E+37" from remote port.

After the instrument restore to the factory setting or CONFigure function, this parameter will be set to the default value.

#### 6.3.5. [SENSe:][FREQuency|PERiod]:VOLTage:RANGe:AUTO {ON|1|OFF|0} [SENSe:][FREQuency|PERiod]:VOLTage:RANGe:AUTO?

**Command description:** Disable or enable the automatic voltage range function in the frequency/period measurement mode.

**Note:** This parameter is shared with the measurement of frequency and period.

Parameter    Typical return

{ON|1|OFF|0}, default to 0 (OFF) or 1 (ON).

Configure the frequency measurement and execute automatic AC voltage range immediately. Performing two measurements and take a reading.

CONF:FREQ

FREQ:VOLT:RANG:AUTO ON

SAMP:COUN 2

READ?

In automatic range, the instrument will select the range according to the input signal.

Select a fixed range ([SENSe:]<function>:RANGe) disable automatic range.

## 6.4. [SENSe:][RESistance|FRESistance] Subsystem

This subsystem is to configure the resistance measurement of 2 lines and 4 lines.

### 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
```

#### 6.4.1. [SENSe: ][(RESistance|FRESistance):NPLC {Slow|Medium|Fast} [SENSe: ][(RESistance|FRESistance):NPLC?

**Command description:** Set the sampling rate to low, medium or fast.

#### 6.4.2. [SENSe: ][(RESistance|FRESistance):NULL[:STATe] {ON|1|OFF|0} [SENSe: ][(RESistance|FRESistance):NULL[:STATe]?

**Command description:** Enable or disable return to zero function.

Parameter      Typical return

{ON|1|OFF|0}, default to 0 (OFF) or 1 (ON).

Configure the resistance measurement of 2 lines, use return to zero function to set the wire resistance with a reference value of 100 mΩ. Performing two measurements and take a reading.

```
CONF:RES
```

```
RES:NULL:VAL 0.1
```

```
RES:NULL:STAT ON
```

```
SAMP:COUN 2
```

```
READ?
```

Enable the calibration function and automatic zero selection will also be enabled.

```
([SENSe: ][(RESistance|FRESistance):NULL:VALue:AUTO ON)
```

If you want to set a fixed zero value, use the command:

```
[SENSe: ][(RESistance|FRESistance):NULL:VALue.
```

After the instrument restore to the factory setting or CONFIGure function, the instrument will disable return to zero function.

#### 6.4.3. [SENSe: ][(RESistance|FRESistance):NULL:VALue {<value>|MIN|MAX|DEF} [SENSe: ][(RESistance|FRESistance):NULL:VALue?

**Command description:** Set the zero value.

Parameter      Typical return

-120 MΩ to +120 MΩ, the default is 0 +1.00000000E+02

Configure the resistance measurement of 2 lines, use return to zero function to set the wire resistance with a reference value of 100 mΩ. Performing two measurements and take a reading.

```
CONF:RES
```

```
RES:NULL:VAL 0.1
```

```
RES:NULL:STAT ON
```

```
SAMP:COUN 2
```

```
READ?
```

Typical command: +1.04530000E+02, +1.04570000E+02

The specified zero value will disable the automatic zero selection function  
([SENSe: ][(RESistance|FRESistance):NULL:VALue:AUTO OFF)

If you want to use zero value, it should turn on zero switch at first  
 ([SENSe:][RESistance|FRESistance]:NULL:STaTe ON)

After the instrument restore to the factory setting or CONFigure function, this parameter will be set to the default value.

#### 6.4.4. [SENSe:][RESistance|FRESistance]:NULL:VALue:AUTO {ON|1|OFF|0} [SENSe:][RESistance|FRESistance]:NULL:VALue:AUTO?

**Command description:** Enable or disable the automatic zero selection.

Parameter Typical return

{ON|1|OFF|0}, default to 0 (OFF) or 1 (ON).

Use the zero value select by automatic selection to performing the measurement.

RES:NULL:VAL:AUTO ON

READ?

Typical command: +1.23765203E+02, +1.16564762E+02

When the automatic reference selection switch is turned on, the first measurement value is used as the zero value for the follow-up measurements. Set [SENSe:][RESistance|FRESistance]:NULL:VALue to be this value. And the automatic reference selection will be disabled.

Enable the calibration function and automatic zero selection will also be enabled.

([SENSe:][RESistance|FRESistance]:NULL:STaTe ON)

After the instrument restore to the factory setting or CONFigure function, this parameter will be set to the default value.

#### 6.4.5. [SENSe:][RESistance|FRESistance]:RANGe {<range>|MIN|MAX|DEF} [SENSe:][RESistance|FRESistance]:RANGe?

**Command description:** Select the range of two lines/four lines in resistance measurement by manual.

Parameter Typical return

<range>: {200  $\Omega$ |2 k $\Omega$ |20 k $\Omega$ |200 k $\Omega$ |2 M $\Omega$ |10 M $\Omega$ |100 M $\Omega$ }, the default is 2k $\Omega$  +2.00000000E+03

Use 2 k $\Omega$  range to configure the resistance measurement of two lines. Performing two measurements and take a reading.

CONF:RES

RES:RANG 2000

SAMP:COUN 2

READ?

Select a fixed range ([SENSe:]<function>:RANGe) and disable the automatic range.

If the input signal is greater than the measurement value of the specified range, the instrument's panel displays Overload character and return "+9.90000000E+37" from remote port.

#### 6.4.6. [SENSe:][RESistance|FRESistance]:RANGe:AUTO {OFF|ON} [SENSe:][RESistance|FRESistance]:RANGe:AUTO?

**Command description:** Disable or enable the automatic range of two lines/four lines in resistance measurement.

Parameter Typical return

{ON|1|OFF|0}, default to 0 (OFF) or 1 (ON).

Configure the resistance measurement of two lines. Performing two measurements and take a reading.

CONF:RES

RES:RANG:AUTO ON

SAMP:COUN 2

READ?

In automatic range, the instrument will select the range according to the input signal.

Select a fixed range ([SENSe: ]<function>:RANGe) and disable the automatic range.

After reset the instrument to the factory setting, this parameter will be set to the default value.

## 6.5. [SENSe:]TEMPerature Subsystem

This subsystem is used to configure the temperature measurement.

### Command summary

[SENSe:]TEMPerature:NULL[:STATe]

[SENSe:]TEMPerature:NULL:VALue

[SENSe:]TEMPerature:NULL:VALue:AUTO

[SENSe:]TEMPerature:NPLC

[SENSe:]TEMPerature:TRANsducer:TYPE

[SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction

[SENSe:]TEMPerature:TRANsducer:TCouple:TYPE

[SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction:OFFSet:ADJust

[SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction:TYPE

### 6.5.1. [SENSe:]TEMPerature:NULL[:STATe]{ON|OFF|0}

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

**Command description:** Enable or disable return to zero function.

Parameter      Typical return

{ON|OFF|0}, default to 0 (OFF) or 1 (ON).

Use return to zero function to subtract 25° to configure the temperature measurement.

TEMP:NULL:STAT ON;VAL 25

Enable the calibration function and automatic zero selection will also be enabled.

([SENSe:]TEMPerature:NULL:VALue:AUTO ON)

If you want to set a fixed zero value, use the command: [SENSe:]TEMPerature:NULL:VALue

After the instrument is restore to the factory setting or CONFIGure function, the instrument will disable return to zero function.

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

[SENSe:]TEMPerature:NULL:VALue?

**Command description:** Save a zero value for temperature measurement.

Parameter      Typical return

-1.0E15 to +1.0E15, the default is 0 +0.00000000E+00

Use return to zero function to subtract 25° to configure the temperature measurement.

TEMP:NULL:VALue 25

TEMP:NULL:STAT ON

Assign the zero value will disable the automatic zero selection ([SENSe:]TEMPerature:NULL:VALue:AUTO OFF).

If you want to use zero value, it should turn on zero switch at first ([SENSe:]TEMPerature:NULL:STATe ON)  
After the instrument restore to the factory setting or CONFigure function, this parameter will be set to the default value.

### 6.5.3. [SENSe:]TEMPerature:NULL:VALue:AUTO {ON|OFF|0}

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

**Command description:** Enable or disable the automatic zero selection.

Parameter Typical return

{ON|OFF|0}, default to 0 (OFF) or 1 (ON)

Use the zero value select by automatic selection to performing the measurement.

TEMP:NULL:VAL:AUTO ON

When the automatic reference selection switch is turned on, the first measurement value is used as the zero value for the follow-up measurements. Set [SENSe:]TEMPerature:NULL:VALue to be this value. And the automatic reference selection will be disabled.

Enable the calibration function and automatic zero selection will also be enabled.  
([SENSe:]TEMPerature:NULL:STATe ON)

After the instrument restore to the factory setting or CONFigure function, this parameter will be set to the default value.

### 6.5.4.

[SENSe:]TEMPerature:TRANsducer:TYPE {FRTD|RTD|FTHermistor|THERmistor|TCouple}

[SENSe:]TEMPerature:TRANsducer:TYPE?

Select the probe type for temperature measurement. The instrument supports the probe is 2 lines and 4 lines RTD, 2 lines and 4 lines thermistor, A and E, J, K, N, R or T thermocouple.

Parameter Typical return

{FRTD|RTD|FTHermistor|THERmistor|TCouple}. Default value: FRTD

Use R0 with 100.1  $\Omega$  to configure 2 lines RTD measurement. Performing two measurements and take a reading.

FUNC "TEMP"

TEMP:TRAN:TYPE RTD

TEMP:TRAN:FRTD:RES 100.1

SAMP:COUN 2

READ?

Typical command: +2.54530000E+01, +2.54570000E+01

### 6.5.5.

[SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction {<temperature>|MIN|MAX|DEF}]

[SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction?

Set the fixed junction temperature with the unit of degree centigrade for thermocouple.

Parameter      Typical return

-20 °C to +80 °C, default: 0 °C

Configure K type thermocouple measurement, select the fixed reference and set the reference junction temperature to +20 °C. Performing two measurements and take a reading.

CONF:TEMP TC,K

TEMP:TRAN:TC:RJUN:TYPE FIX

TEMP:TRAN:TC:RJUN 20.0

SAMP:COUN 2

READ?

Typical command: +3.31785468E+00, +3.61554515E+00

#### 6.5.6.

[SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction:OFFSet:ADJust {<temperature>|MIN|MAX|DEF}

[SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction:OFFSet:ADJust?

This command is used to temperature fine tuning to correct the error between the internal temperature measurement of the pre-DMM connection and the actual temperature of the measurement terminal.

Parameter      Typical return

-20 °C to +20 °C, default: 0 °C.

Use internal reference for thermocouple temperature measurement. It assume that the external temperature is 5 °C lower than the internal temperature of the instrument and turn turn this temperature down by 5 °C, then take the measurement, and read the measurement results.

CONF:TEMP TC,K

TEMP:TRAN:TC:RJUN:TYPE INT

TEMP:TRAN:TC:RJUN:OFFS:ADJ -5

READ?

Typical command: +3.31785468E+00

#### 6.5.7.

[SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction:TYPE {INTernal|FIXed}

[SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction:TYPE?

Thermocouple temperature measurement requires that the reference junction temperature must be assigned. For reference junction temperature, you can use the internal measured value or the fixed reference junction temperature. This command is select the reference junction temperature to performing thermocouple temperature measurement.

Parameter      Typical return

{FIXed|INTernal}, the default is INT.

Configure K type thermocouple measurement, select the fixed reference and set the reference junction temperature to +20 °C. Performing two measurements and take a reading.

CONF:TEMP TC,K

TEMP:TRAN:TC:RJUN:TYPE FIX

TEMP:TRAN:TC:RJUN 20.0

SAMP:COUN 2

READ?

Typical command: +3.31785468E+00, +3.61554515E+00

Important notes: Since the internal reference temperature is the temperature of the previous connection, use the selected internal reference junction will produce unknow errors and cannot specify the performance, so this operation is not recommended.

Measurement accuracy depends on thermocouple connection and reference junction type. If you want to get the most accurate measured results, please use fixed temperature reference (the known junction temperature must be retained).

#### 6.5.8.

[SENSe:]TEMPerature:TRANsducer:TCouple:TYPE {E|J|K|N|RT}

[SENSe:]TEMPerature:TRANsducer:TCouple:TYPE?

Select thermocouple type for thermocouple measurement.

Parameter      Typical return

{E|J|K|N|RT}, the default is J

Configure K type thermocouple measurement, select the fixed reference and set the reference junction temperature to +20 °C. Performing two measurements and take a reading.

CONF:TEMP TC,K

TEMP:TRAN:TC:RJUN:TYPE FIX

TEMP:TRAN:TC:RJUN 20.0

SAMP:COUN 2

READ?

Typical command: +3.31785468E+00, +3.61554515E+00

## 6.6. [SENSe:]VOLTage Subsystem

This subsystem is used to configure DC/AC voltage measurement.

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

6.6.1. [SENSe:]VOLTage:{AC|DC}:NULL[:STATe]{ON|OFF|0}

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

**Command description:** Enable or disable return to zero function.

**Notes:** This parameter is not share with AC and DC measurement. This parameter is independent between AC and DC measurement.

Parameter      Typical return

{ON|OFF|0}, defaults to 0 (OFF) or 1 (ON).



Use the zero function to subtract 100mV from the measured results to configure AC voltage measurement. Performing two measurements and send the measured results to output buffer of the instrument.

CONF:VOLT:AC

VOLTage:AC:NULL:VALue 100mV

VOLT:AC:NULL:STAT ON

SAMP:COUN 2

READ?

Typical command: +1.03625390E+00, +1.03641200E+00

Enable the calibration function and automatic zero selection will also be enabled.

([SENSe:]VOLTage:{AC|DC}:NULL:VALue:AUTO ON)

If you want to set a fixed zero value, use the command: [SENSe:]VOLTage:{AC|DC}:NULL:VALue

After the instrument is restore to the factory setting or CONFIGure function, the instrument will disable return to zero function.

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

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

**Command description:** Set the zero value.

**Notes:** This parameter is not share with AC and DC measurement. This parameter is independent between AC and DC measurement.

Parameter Typical return

-1200 to +1,200 V, the default is 0 +1.00000000E+01

Use the zero function to subtract 100mV from the measured results to configure AC voltage measurement. Performing two measurements and send the measured results to output buffer of the instrument.

CONF:VOLT:AC

VOLTage:AC:NULL:VALue 100mV

VOLT:AC:NULL:STAT ON

SAMP:COUN 2

READ?

Typical command: +1.03625390E+00, +1.03641200E+00

Assign the zero value will disable the automatic zero selection ([SENSe:]VOLTage:{AC|DC}:NULL:VALue:AUTO OFF).

If you want to use zero value, it should turn on zero switch at first ([SENSe:]VOLTage:{AC|DC}:NULL:STATe ON)

After the instrument restore to the factory setting or CONFIGure function, this parameter will be set to the default value.

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

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

**Command description:** Enable or disable the automatic zero selection.

**Notes:** This parameter is not share with AC and DC measurement. This parameter is independent between AC and DC measurement.

Parameter Typical return

{ON|1|OFF|0}, defaults to 0 (OFF) or 1 (ON).

Use the zero value select by automatic selection to performing the measurement.

VOLT:AC:NULL:VAL:AUTO ON  
 READ?

Typical command: +0.00000000E+00, +0.01230000E+00

When the automatic reference selection switch is turned on, the first measurement value is used as the zero value for the follow-up measurements. Set [SENSe:]VOLTage:{AC|DC}:NULL:VALue to be this value. And the automatic reference selection will be disabled.

Enable the calibration function and automatic zero selection will also be enabled.

([SENSe:]VOLTage:{AC|DC}:NULL:STATe ON)

After reset the instrument to the factory setting, this parameter will be set to the default value.

#### 6.6.4. [SENSe:]VOLTage:{AC|DC}:RANGe {<range>|MIN|MAX|DEF} [SENSe:]VOLTage:{AC|DC}:RANGe?

**Command description:** Select the measurement range by manual.

**Notes:** This parameter is not share with AC and DC measurement. This parameter is independent between AC and DC measurement.

Parameter Typical return

<range>: {200 mV|2 V|20 V|200 V|1000 V(DC)/750V(AC)}

The default of AC is 20V.

The default of DC is 1000V.

Use 2 V to configure AC voltage measurement. Performing two measurements and take a reading.

CONF:VOLT:AC

VOLT:AC:RANG 2

SAMP:COUN 2

READ?

Typical command: +8.21650028E-03, +8.17775726E-03

Select the fixed range ([SENSe:]<function>:RANGe) will disable the automatic range.

If the input signal is greater than the measurement value of the specified range, the instrument's panel displays Overload character and return "+9.90000000E+37" from remote port.

After reset the instrument to the factory setting, this parameter will be set to the default value.

#### 6.6.5. [SENSe:]VOLTage:{AC|DC}:RANGe:AUTO {ON|1|OFF|0} [SENSe:]VOLTage:{AC|DC}:RANGe:AUTO?

**Command description:** Disable or enable the automatic range.

**Notes:** This parameter is not share with AC and DC measurement. This parameter is independent between AC and DC measurement.

Parameter Typical return

{ON|1|OFF|0}, defaults to 0 (OFF) or 1 (ON).

Configure AC voltage measurement to automatic range. Performing two measurements and take a reading.

CONF:VOLT:AC

VOLT:AC:RANG:AUTO ON

SAMP:COUN 2

READ?

Typical command: +8.36187601E-03, +8.34387541E-03

In automatic range, the instrument will select the range according to the input signal.  
After reset the instrument to the factory setting, this parameter will be set to the default value.

#### 6.6.6. [SENSe:]VOLTage:{AC|DC}:NPLC {Slow|Medium|Fast} [SENSe:]VOLTage:{AC|DC}:NPLC?

**Command description:** Set the sampling rate to low, medium or fast.

#### 6.6.7. [SENSe:]VOLTage[:DC]:IMPedance:AUTO [SENSe:]VOLTage[:DC]:IMPedance:AUTO?

For DC voltage measurement, disable or enable the automatic input impedance mode.

Parameter Typical return

{ON|1|OFF|0}, default value: OFF. 0 (OFF) or 1 (ON)

Use a input impedance of 10 MΩ to performing all DC voltage measurements.

VOLT:IMP:AUTO OFF

**OFF:** For all range, the input impedance of DC voltage measurement is fixed at 10 MΩ to reduce the noise pick to the minimum.

**ON:** The input impedance of DC voltage measurement DC is change with the range. For 200 mV, 2 V and 20 V , set it to "HI-Z" (>10 GΩ) to reduce the impact when the measurement loading erros. Maintain 200 V and 1000 V at the input impedance of 10MΩ.

## 6.7. [SENSe:]CAPacitance Subsystem

This subsystem is used to configure the capacitance measurement.

### Command summary

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

#### 6.7.1. [SENSe:]CAPacitance:NULL[:STATe] {ON|1|OFF|0} [SENSe:]CAPacitance:NULL[:STATe]?

**Command description:** Enable or disable return to zero function.

Parameter Typical return

{ON|1|OFF|0}, defaults to 0 (OFF) or 1 (ON).

Use the zero function to subtract 100nF from the measured results to configure the capacitance measurement. Performing two measurements and send the measured results to output buffer of the instrument.

CONF:CAP

CAP:NULL:VALue 100nF

CAP:NULL:STAT ON

SAMP:COUN 2

READ?

Typical command: +4.79899595E-10, +4.79906446E-10

Enable the calibration function and automatic zero selection will also be enabled.

([SENSe:]Capacitance:{AC|DC}:NULL:VALue:AUTO ON)

If you want to set a fixed zero value, use the command: [SENSe:]Capacitance:{AC|DC}:NULL:VALue

After the instrument is restore to the factory setting or CONFIgure function, the instrument will disable return to zero function.

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

[SENSe:]CAPacitance:NULL:VALue?

**Command description:** Set the zero value.

Parameter Typical return

-12 to +12 mF, the default is 0 +1.20000000E-02

Use the zero function to subtract 100nF from the measured results to configure the capacitance measurement. Performing two measurements and send the measured results to output buffer of the instrument.

CONF:CAP

CAP:NULL:VALue 100nF

CAP:NULL:STAT ON

SAMP:COUN 2

READ?

Typical command: +4.79899595E-10, +4.79906446E-10

Assign the zero value will disable the automatic zero selection ([SENSe:]Capacitance:NULL:VALue:AUTO OFF).

If you want to use zero value, it should turn on zero switch at first ([SENSe:]Capacitance:NULL:STATe ON)

After the instrument restore to the factory setting or CONFIgure function, this parameter will be set to the default value.

### 6.7.3. [SENSe:]CAPacitance:NULL:VALue:AUTO {ON|1|OFF|0}

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

**Command description:** Enable or disable the automatic zero selection.

Parameter Typical return

{ON|1|OFF|0}, defaults to 0 (OFF) or 1 (ON).

Use the zero value select by automatic selection to performing the measurement.

CAP:NULL:VAL:AUTO ON

READ?

Typical command: +0.00000000E+00, 1.02300000E-01

When the automatic reference selection switch is turned on, the first measurement value is used as the zero value for the follow-up measurements. Set [SENSe:]Capacitance:NULL:VALue to be this value. And the automatic reference selection will be disabled.

Enable the calibration function and automatic zero selection will also be enabled.

([SENSe:]Capacitance:NULL:STATe ON)

After the instrument restore to the factory setting or CONFIgure function, this parameter will be set to the

default value.

#### 6.7.4. [SENSe:]CAPacitance:RANGe {<range>|MIN|MAX|DEF} [SENSe:]CAPacitance:RANGe?

**Command description:** Select the measurement range by manual.

Parameter Typical return

<range>: {2nF|20nF|200nF|2uF|20uF|200uF|2mF|AUTO}, the default is 2uF(+2.00000000E-06)

Use 2uF to configure the capacitance measurement. Performing two measurements and take a reading.

CONF:CAP

CAP:RANG 2E-6

SAMP:COUN 2

READ?

Typical command: +7.28283777E-10, +7.28268544E-10

Select the fixed range ([SENSe:]<function>:RANGe) will disable the automatic range.

If the input signal is greater than the measurement value of the specified range, the instrument's panel displays Overload character and return "+9.90000000E+37" from remote port.

After reset the instrument to the factory setting, this parameter will be set to the default value.

#### 6.7.5. [SENSe:]CAPacitance:RANGe:AUTO {OFF|ON} [SENSe:]CAPacitance:RANGe:AUTO?

**Command description:** Disable or enable the automatic range.

Parameter Typical return

{ON|OFF|0}, defaults to 0 (OFF) or 1 (ON).

Configure AC current measurement and execute automatic range immediately. Performing two measurements and take a reading.

CONF:VOLT:AC

VOLT:AC:RANG:AUTO ON

SAMP:COUN 2

READ?

Typical command: +8.36187601E-03, +8.34387541E-03

In automatic range, the instrument will select the range according to the input signal.

After reset the instrument to the factory setting, this parameter will be set to the default value.

## 6.8. [SENSe:]CONTInuity Subsystem

This subsystem is used to configure the continuity measurement.

Command summary

[SENSe:]CONTInuity:THReshold:VALue

#### 6.8.1. [SENSe:]CONTInuity:THReshold:VALue {<value>|MIN|MAX|DEF} [SENSe:]CONTInuity:THReshold:VALue?

**Command description:** Disable or enable the automatic range.

Parameter Typical return

0~2000  $\Omega$ , the default is 0 +2.00000000E+03

Set the threshold resistance to 2000.

CONT:THR:VAL 2000

## 7. SYSTem Subsystem

This SYSTem subsystem includes general command and remote port command.

### 7.1. General Command

#### 7.1.1. SYSTem:ERRor[:NEXT]?

Read and delete an error from error queue.

Parameter    Typical return

(null)    -113,"Undefined header"

Read and delete the first error from error queue.

SYST:ERR? the format of error message as follows (error character string contains the maximum of 255 characters).

<Error code >, <Error character string>

<Error code> = one positive integer or negative integer

<Error character string > = ASCII within quotation mark, it contains the maximum of 255 characters

#### 7.1.2. SYSTem:BEEPer:STATe {ON|1|OFF|0}

SYSTem:BEEPer:STATe?

**Command description:** Disable or enable the beeper when the continuity measurement, diode measurement, probe maintain measurement or the current panel or remote port occurs error.

Parameter    Typical return

{ON|1|OFF|0}, default to 0 (OFF) or 1 (ON)

Disable the beeper.

SYST:BEEP:STAT OFF

This command doest no affect the key sound on front panel.

This setting is nonvolatile; this setting will not be change by power-up cycle or the factory setting.

## 8. TRIGger Subsystem

TRIGger subsystem is used to configure the control trigger.

### Command summary

TRIGger:COUNT

TRIGger:DELaY

TRIGger:DELaY:AUTO

TRIGger:SLOPe

TRIGger:SOURce

### 8.1. TRIGger:COUNT {<count>|MIN|MAX|DEF}

#### TRIGger:COUNT?

**Command description:** Select the received trigger count of the instrument in one measurement.

Parameter            Typical return

1 to 2147483647, the default is 1 +1.00000000E+00

Return the measured voltage results of 10 groups 5 measurements.

CONF:VOLT:DC

SAMP:COUN 5

TRIG:COUN 10

READ?

Typical command: -1.85425399E-04, ... ( 50 measurements)

You can assign the trigger count to use with one sample count (SAMPle:COUNT). Sample count is to set the sampling count of each trigger. In this condition, the number of returned measured is multiply sample count by trigger count.

The reading memory of UT8805 can save the maximum 1,0000 of measurement value. If the reading memory overflows, the new measurement value will overlay the old measurement value. The newest measurement value will always be retained. Null errors will be made, but set Reading Mem Ovfl bit (bit 14) in the condition register of the suspect data register.

After reset the instrument to the factory setting, this parameter will be set to the default value.

### 8.2. TRIGger:DELaY {<seconds>|MIN|MAX|DEF}

#### TRIGger:DELaY?

**Command description:** Set the delay between trigger signal and the first measurement.

Parameter            Typical return

1 to 3600 seconds, the default is 1 second +1.00000000E-06

Return the measured DC voltage results of five times. Each measurement was preceded by a 2-second delay.

CONF:VOLT:DC 10

SAMP:COUN 5

TRIG:DEL 2

READ?

Typical command:

+3.07761360E-03,-1.16041169E-03, +5.60585356E-06, +1.21460160E-04,+2.85898531E-04

By default, TRIGger:DElay:AUTO is enabled. The instrument will automatically determine the delay according to the function, range and integral time (refer to automatic trigger delay). But you should set a delay longer than automatic delay for long cable, high capacitance or high impedance signals.

If you use this command to assign a trigger delay, then this setting will be used to all function and range.

If you configure more than one measurement for each trigger of the instrument (SAMPLE:COUNT >1), after the trigger, a delay will insert between two adjacent measurements

After reset the instrument to the factory setting, the instrument will select automatic trigger delay.

### 8.3. TRIGger:DElay:AUTO {ON|1|OFF|0}

#### TRIGger:DElay:AUTO?

**Command description:** Disable or enable the automatic trigger delay.

Parameter      Typical return

{ON|1|OFF|0}, default to 0 (OFF) or 1 (ON).

Return the measured DC voltage results of five times. Each measurement was preceded by a automatic delay.

CONF:VOLT:DC 10

SAMP:COUN 5

TRIG:DEL:AUTO 1

READ?

Typical command:

+3.07761360E-03,-1.16041169E-03, +5.60585356E-06, +1.21460160E-04, +2.85898531E-04

Use the command TRIGger:DElay to disable the automatic delay and select a particular trigger delay.

After reset the instrument to the factory setting, this parameter will be set to the default value.

### 8.4. TRIGger:SLOPe {POSitive|NEGative}

#### TRIGger:SLOPe?

**Command description:** Select whether the rising edge (POS) or falling edge (NEG) input by Ext Trig BNC on rear panel of the instrument to be the trigger signal.

Parameter      Typical return

{POSitive|NEGative}, the default is NEGative POS or NEG.

Return the measured DC voltage results of 10 groups five times, it uses positive external trigger to start every measurement groups.

CONF:VOLT:DC

SAMP:COUN 5

TRIG:COUN 10



TRIG:SOUR EXT;SLOP POS

READ?

Typical command: -1.85425399E-04, ... ( 50 measurements)

After reset the instrument to the factory setting, this parameter will be set to the default value.

## 8.5. TRIGger:SOURce {IMMediate|EXTernal|BUS} TRIGger:SOURce?

**Command description:** Select the trigger source for the measurement.

Trigger source      Typical return

IMMediate trigger signal is always exist. Set the instrument to "wait to trigger" state and send the trigger signal immediately.

BUS    once the multimeter is in "wait to trigger" state, \*TRG will generate the instrument by remote port.

EXTernal

The instrument receives the hardware TRIGger applied to the rear panel Ext Trig input and takes the specified number of measurements (SAMPle:COUNT) each time the OUTPut:TRIGger:SLOPe receives a TTL pulse. If the instrument receives an external trigger before it is ready, the instrument buffers a trigger.

Parameter                      Typical return

{IMMediate|EXTernal|BUS}, the default is IMMediate IMM, EXT or BUS.

Return the measured DC voltage results of 10 groups five times, it uses positive external trigger to start every measurement groups.

CONF:VOLT:DC

SAMP:COUN 5

TRIG:COUN 10

TRIG:SOUR EXT;SLOP POS

READ?

Typical command: -1.85425399E-04, ... ( 50 measurements)

After select the trigger source, you should send the command INITiateor READ? to set the instrument to "wait to trigger" state. A trigger is received from the selected trigger source only if the instrument is in the "wait to trigger" state.

After reset the instrument to the factory setting, this parameter will be set to the default value.