



XDM6000 Series Digital Multimeter Programming Manual

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1 SCPI command

1.1 SCPI Introduction

SCPI (Standard Commands for Programmable Instruments) is an ASCII-based instrument programming language for testing and measuring instruments. The SCPI command employs a hierarchical structure, also known as a tree system. Related commands are grouped into common nodes or roots, thus forming a subsystem. This is illustrated below with partial SENSE subsystem commands.

SENSe:

VOLTage:

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

DC:RANGe? [MINimum|MAXimum|DEFault]

SENSe is the root level keyword of the command, VOLTage is the second level keyword, and DC is the third level keyword. Colons (:) separate successive keywords.

1.2 Grammatical Conventions

The command syntax format is as follows:

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

Most commands (and individual parameters) are a mixture of uppercase and lowercase letters. Capital letters indicate the abbreviation of the command, that is, the short command. If you want to get better program readability, you can use long-form commands.

For example, the keyword VOLTage in the previous article. You can enter VOLT or VOLTage, combining uppercase and lowercase letters at will. Therefore, VoLTaGe, Volt, and Volt are all acceptable. Other formats, such as VOL and VOLTAG, will produce errors.

- Curly braces ({}) contain the parameter selection. Curly braces are not sent with the command string.
- Vertical line (|) separates the parameter selection. For example, {<range>|MIN|MAX|DEF} in the above command indicates that you can specify a numeric range parameter or "MIN", "MAX", or "DEF". The bar chart is not sent with the command string.

- Angle brackets (< >) indicate that you must assign a value to the argument within the brackets. For example, the above syntax statement indicates the <range> parameter in angle brackets. Do not send angle brackets with the command string. You must specify a value for this parameter (for example, "VOLT:DC:RANG 10") unless you select one of the other options displayed in the syntax (for example, "VOLT:DC:RANG MIN").
- Optional parameters are placed in parentheses ([]). Square brackets are not sent with the command string. If you do not specify numerical values for the optional parameters, the instrument uses the default values.

1.3 Command Delimiter

Colons (:) separate successive keywords. A space must be inserted to separate the argument from the command keyword. If a command requires multiple arguments, separate the adjacent arguments with a comma: CONF:VOLT:DC 10,0.003

A semicolon (;) separates two commands in the same subsystem and minimizes input. For example, the following string:

```
TRIG:SOUR EXT;COUNT 10
```

Equivalent to the following two commands:

```
TRIG:SOUR EXT
```

```
TRIG:COUNT 10
```

Colon and semicolon (::) commands to switch different subsystems. For example, in the following example, if you don't use colons and semicolons, you will produce an error:

```
TRIG:COUN MIN;;SAMP:COUN MIN
```

1.4 Using MIN, MAX, and DEF parameters

You can use "MIN" or "MAX" to replace the parameters of many commands. You can also use the "DEF" replacement in some cases. For example, refer to the following example:

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

Instead of selecting a specific value for the < range > parameter, this command uses the MIN parameter to set the range to the minimum value, the MAX parameter to the maximum value, or the DEF parameter to the default value.

1.5 Query Parameter Settings

To query the current values of most parameters, you can add a question mark (?) at the end of the command, for example, the following example sets the trigger count to 10 measurements:

```
TRIG:COUN 10
```

Then, query the currently valid count value by sending the following command:

```
TRIG:COUN?
```

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

```
TRIG:COUN? MIN
```

```
TRIG:COUN? MAX
```

1.6 Command Terminator

The command string sent to the instrument may have to end with a <newline> (<NL>) character (ASCII decimal digit 10). An <Enter> followed by a <NL> is also feasible. Command string termination always resets the current SCPI command path to the root level.

1.7 SCPI Parameter Type

The SCPI language defines several data formats used by program information and response information.

1.7.1 Numerical Parameters

Commands that require the use of numerical parameters, supporting all commonly used decimal digit notations, including optional symbols, decimal points, and scientific notation. Special values for numeric parameters such as MIN, MAX, and DEF can also be accepted. In addition, units (e.g., m, k, M, or u) can be added after numerical parameters. If the command accepts only certain specific values, the instrument will automatically match an available specific value for the entered numeric parameter. The following command requires setting gears for numerical parameters:

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

Note: Since the SCPI parser is case insensitive, there will be some confusion of the letter "M" (or "m"). For convenience, the instrument recognizes "mV" (or "MV") as millivolts, but "MHZ" (or "mhz") as megahertz. Similarly, "MΩ" (or "mΩ") is considered to be megΩ. You can use the prefix "MA" for megabytes. For example, "MAV" is considered a megavolt.

1.7.2 Discrete Parameters

Discrete parameters are used to set a limited number of parameter values (such as IMMEDIATE, EXTERNAL, or BUS). Just like command keywords, they can also have short and long formats. It is possible to use a mix of uppercase and lowercase letters. The query response always returns a short form all in uppercase letters. The following example requires discrete parameters for temperature units:

```
TRIGger:SOURce {IMMEDIATE|EXTERNAL|BUS}
```

1.7.3 Boolean Parameters

The Boolean argument represents a true or false binary condition. For false conditions, the instrument will accept "OFF" or "0". For true conditions, the instrument will accept "ON" or "1". The instrument always returns "ON" or "1" when querying Boolean settings. The following example requires a Boolean parameter:

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

1.7.4 ASCII String Parameters

String parameters can contain virtually all ASCII character sets. Strings must begin and end with paired quotation marks; You can use single or double quotation marks. Quotation separators can also be used as part of a string, simply typed twice and None adding any characters in between. The following command uses a string parameter:

```
DISPlay:TEXT <quoted string>
```

For example, the following example displays the message "WAITING..." on the front panel of the instrument (None quotation marks).

```
DISP:TEXT "WAITING..."
```

You can also use the following example to display the same information in single quotes.

```
DISP:TEXT 'WAITING...'
```

1.8 Equipment Clearance

Device Clear is an IEEE-488 low-level bus message that can be used to return the instrument to a responsive state. Different programming languages and IEEE-488 interface cards provide the use of this function through their unique commands. The status registers, error queues, and all configuration states remain unchanged when device purge messages are received.

Device Purge does the following:

- If it is being measured, it is terminated.
- The instrument returns to the trigger "idle" state.
- Clear the input and output buffers of the instrument.
- The instrument is ready to accept a new command string.
- The overlapping command (if any) has been terminated None an "operation complete" indication (for INIT).

1.9 IEEE-488.2 Common Commands

The IEEE-488.2 standard defines a set of commonly used commands that can perform functions such as reset, self-test, and state operation. Common commands always start with an asterisk (*), are 3 characters long, and can include one or more arguments. The command keyword is separated from the first argument by a space. Use a semicolon (;) to separate multiple commands as follows:

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

1.9.1 *CLS

Command Description: Clear Status command. Clear event registers in all register banks. Clear the error queue.

Parameter	None
Typical return	None
Clear event register bits and error queue: *CLS	

1.9.2 *ESE<enable_value>

***ESE?**

Command Description: Configure and query standard event register enable bit status.

Parameter	The decimal sum of register bits. Defaults to 0.
Typical return	0

Configure 100 DC voltage measurement and generate an SRQ when measurement is complete:

```
*CLS
*ESE 1
*SRE 32
CONF:VOLT:DC
SAMP:COUN 100
INIT
*OPC
```

- The query standard event enable register returns a decimal value equal to the sum of the binary weighted values of all bits set in the register.
- *CLS clears the event register, not the enable register.
- Use *PSC to control whether the standard event enable register has been cleared at power-up. For example, *PSC 0 may retain the contents of the enable register throughout the power cycle.
- After SYSTem:SECurity:IMMediate, this parameter is set to its default value.

1.9.3 *ESR?

Command Description: Standard event status register query.

Parameter	None
Typical return	0
Read event register (3rd and 4th bits set): *ESR? Typical return: 24	

- Query the standard event register returns a decimal value equal to the binary weighted sum of all bits set in the register.
- Clear by reading the standard event register or by sending *CLS (Clear Status).
- Power-on clears the standard event register.

1.9.4 *IDN?

Command Description: Identifies the query. Returns the identity string of the instrument.

Parameter	Manufacturer name, model number, serial number, version code
------------------	--

Typical return	Factory,device,25420025,V1.0.1.0.9
Return the identification string of the instrument: *IDN? Typical return: Factory, device, 25420025, V1.0.1.0.9	

1.9.5 *LRN?

Command Description: Returns the ASCII string of all commands needed to put the instrument in its current state.

Parameter	None
Typical return	*RST;;CALC:AVER 1;;CALC:LIM 0;...
Return the learning string: *LRN?	

- Typical application scenarios: configuration backup and recovery, unified configuration of multiple instruments, automated test status management, and problem location.

1.9.6 *OPC

Command Description: Set "Operation Complete" (bit) in the standard event register when the current operation is completed.

Parameter	None
Typical return	None
Configure 100 DC voltage measurement and generate an SRQ when measurement is complete: *CLS *ESE 1 *SRE 32 CONF:VOLT:DC SAMP:COUN 100 INIT *OPC	

- Additional commands can be executed before the Run Complete bit is set.
- *OPC and *OPC? The difference is that * OPC sets a state byte when the operation is completed, while *OPC? Output "1" when the operation is complete.

1.9.7 *OPC?

Command Description: Returns 1 to the output buffer after all pending commands are complete. No other commands can be executed until this command is complete.

Parameter	None
Typical return	1
When the measurement ends, configure 100 DC voltage measurements and return "1": CONF:VOLT:DC SAMP:COUN 100 INIT *OPC?	

- The purpose of using this command is to synchronize the application with the instrument.
- *OPC and *OPC? The difference is that *OPC sets a state byte when the operation is completed, while *OPC? Output "1" when the operation is complete.

1.9.8 *PSC {0|1}

*PSC?

Command Description: Configure power-on status to clear.

Parameter	{0 1}, default to 1.
Typical return	1
Disable power-on to clear affected registers: *PSC 0	

- Allows (1) or disables (0) to clear the status enable register on power-up.
- The *PSC command does not affect the clear condition or event register, only the enable register.
- The STATus ENABLE register contains: suspicious data register (STATus:QUESTionable:ENABLE), standard OPERation register (STATus:OPERation:ENABLE), STATus byte condition register (* SRE), standard event ENABLE register (* ESE).
- After SYSTem:SECurity:IMMEDIATE, this parameter is set to its default value.

1.9.9 *RCL {0|1|2|3|4}

Command Description: Invoke instrument status from this file in the internal flash file system root folder, where the specified number is.

Parameter	{0 1 2 3 4}
Typical return	None
Call STATE_2.sta in the root folder of the internal flash file system to the instrument state: *RCL 2	

- *SAV <n> is equivalent to MMEMory:STORe:STATe "INT:\STATE_n.sta".
- *RCL <n> is equivalent to MMEMory:LOAD:STATe "INT:\STATE_n.sta".
- The instrument status enable settings are stored in non-volatile memory. They do not change when the power is off, factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

1.9.10 *SAV {0|1|2|3|4}

Command Description: Store the current instrument status to the status file STATE_<n>. sta in the root folder of the internal flash file system.

Parameter	{0 1 2 3 4}
Typical return	None
Store the instrument status to the status file STATE_1.sta in the internal flash file system root folder: *SAV 1	

- *SAV<n> is equivalent to MMEMory:STORe:STATe "INT:\STATE_n.sta".
- *RCL<n> is equivalent to MMEMory:LOAD:STATe "INT:\STATE_n.sta".
- The instrument status enable settings are stored in non-volatile memory. They do not change when the power is off, factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

1.9.11 *RST

Command Description: Will be restored to factory default state together.

Parameter	None
Typical return	None
Reset the instrument:	

*RST

- Does not affect the stored instrument status (see *SAV).

1.9.12 *SRE<enable_value>

*SRE?

Command Description: Enables bits in the enable register for the status byte register group.

Parameter	The decimal sum of register bits. Defaults to 0.
Typical return	0
Enable 3 and 4 bits in the enable register: *SRE 24 *SRE? Typical return: 24	

- To enable a specific bit, specify the decimal value in the register that corresponds to the sum of the binary weighted values of the bit. The selected bits are accumulated on the "main accumulation" bit (6 bits) of the status byte register. If any of the selected bits is changed from 0 to 1, the instrument will generate a service request signal.
- The query status byte enable register returns a decimal value equal to the sum of the binary weighted values of all bits set in the register.
- The enable register may define which bits in the event register are to be reported to the "status byte" register set.
- *RST or *CLS will not clear the status byte enable register.
- Use *PSC to control whether the standard event enable register has been cleared at power-up. For example, *PSC 0 may retain the contents of the enable register throughout the power cycle.
- After SYSTem:SECurity:IMMediate, this parameter is set to its default value.

1.9.13 *STB?

Command Description: Read the status byte register.

Parameter	None
Typical return	0
Read status registers (e.g. 3 and 5-bit values 1): *STB?	

Typical return: 40

- The query status byte register returns a decimal value equal to the sum of the binary weighted values of all bits set in the register.
- Condition registers provide uninterrupted monitoring of the status of the instrument. Condition register bits are updated in real time; They are neither locked nor buffered.
- The register is read-only; When read, no bits are cleared.
- Power on or *CLS clears the status register.

1.9.14 *TRG

Command Description: Triggers the instrument if TRIGger:SOURce BUS is selected.

Parameter	None
Typical return	None
Return the results of five DC voltage measurements and use the software to trigger the measurement to start: CONF:VOLT:DC SAMP:COUN 5 TRIG:SOUR BUS INIT *TRG FETCH? Typical response: +1.00000000 E+01,... (5 measurements)	

- When the trigger source selects BUS, send READ?, FETCh? Waiting for blocking instructions, the system triggers an instruction conflict error.
- After setting the trigger source, you must send INITiate to put the digital multimeter in the "Waiting for trigger" state. The *TRG command cannot be accepted unless the digital multimeter is in the "waiting to trigger" state.

1.9.15 *TST?

Command Description: Performs a basic self-test of the instrument and returns a pass/fail indication.

Parameter	None
Typical return	+0 (passed) or +1 (one or more tests failed)

Perform a self-test:

*TST?

- If one or more tests fail, the query returns +1 and stores an error in the error queue. For a complete list of error messages related to self-test failures, see Self-Test Error Messages.

1.9.16 *WAI

Command Description: Configure the output buffer of the instrument and wait for all pending operations to complete before executing any other commands through the interface.

Parameter	None
Typical return	None
Wait for all pending actions to complete: *WAI	

- Configuration changes and measurements are considered pending operations. Therefore, *WAI will cause these changes to occur and complete these changes.

1.10 ABORT

Command Description: Terminates an ongoing measurement, returning the instrument to the "Trigger Idle" state.

Parameter	None
Typical return	None
Termination of ongoing measurements: TRIG:SOUR IMM //Set the trigger source to immediate trigger TRIG:COUN 10 //Set the trigger number to 10 INIT //Set trigger status to "Waiting for trigger" ABOR //Interrupt this measurement	

- This command can be used to terminate the current action when the instrument is in a trigger waiting state or is taking a long measurement.

1.11 FETCh?

Command Description: Wait for the most recent measurement to complete and return all available measurement data.

Parameter	None
Typical return	-4.98748741E-01,-4.35163427E-01
Combining CONFigure and INITiate with FETCh? Use in combination. The INITiate command puts the instrument in the "waiting for trigger" state, triggers the measurement when the rear panel Ext Trig input is a pulse signal (low by default), and sends the measurement results to the reading memory. FETCh? The query transmits the measurement results from the reading memory to the instrument's output buffer. CONF:VOLT:DC 10,0.003 TRIG:SOUR EXT SAMP:COUN 4 INIT FETC? Typical Response:-4.98748741 E-01,-4.35163427 E-01,-4.33118686 E-01,-3.48109378 E-01	

- FETCh? The query does not erase the measurements from the readings memory. You can send a query multiple times to retrieve the same data.
- Up to 10000 measurements can be stored in the device reading memory.
- When the measurement configuration changes, or when any of the following commands are executed, the instrument will clear all measurements from the reading memory: INITiate, MEASure:?, READ?, *RST, SYSTem:PRESet.

1.12 INITiate[:IMMediate]

Command Description: Change the status of the trigger system from "Idle" to "Waiting for trigger" and then clear the previous set of measurements from the readings memory. When the specified trigger condition is met after the INITiate command is received, the measurement will begin.

Parameter	None
Typical return	None
Return the results of five DC voltage measurements and use the software to trigger the measurement to start: CONF:VOLT:DC 10 TRIG:SOUR BUS SAMP:COUN 5 INIT *TRG FETC?	

- Using INITiate to store the measurement results in the reading memory (of course, it needs to cooperate with the FETCh? Command to send the reading to the instrument buffer) is better than using READ? Send measurements to the instrument's output buffer fast. The INITiate command is also an "overlapping" command. This means that after performing INITiate, you can't send other commands that do not affect the measurement results.
- Up to 1,000 0 measurements can be stored in the reading memory, if the reading memory overflows, the new measurement will overwrite the oldest measurement stored, the latest measurement will always be kept None any error, but the Reading Mem Ovfl bit (bit 14) is set in the condition register of the suspicious data register.
- To retrieve measurements from the reading memory, use FETCh?. Use DATA: REMove? Or R? Read and erase all or part of the measurements obtained.
- You can use the ABORt command to return to the Trigger Idle state.

1.13 OUTPut:TRIGger:SLOPe {POSitive|NEGative} OUTPut:TRIGger:SLOPe?

Command Description: Select the slope of the voltmeter complete output signal on the back panel VM Comp BNC connector.

Parameter	{POSitive NEGative}, default NEGative
Typical return	POS or NEG
Configure DC voltage measurement and perform two measurements. After each measurement, the signal on the rear panel VM Comp connector will output a positive pulse: CONF:VOLT:DC 10 SAMP:COUN 2 OUTP:TRIG:SLOP POS INIT	

- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

1.14 R? [<max_readings>]

Command Description: Reads and erases measurements from the reading memory up to the specified <max_readings>. This command starts with the earliest measurement when reading data.

Parameter	1 to 10000 readings, default to all readings in memory
------------------	--

Typical return	Null Measurement Read Return # 10 1 measurement read returns # 215 +1.75352750 E-05 2 measurement reads return # 231 +4.08575773 E-06,-5.50934344 E-06
The three earliest readings are read and deleted: R? 3 Typical Response: # 247-4.98748741 E-01,-4.35163427 E-01,-7.41859188 E-01 "# 2" means that the last 2 digits indicate how many characters are in the returned memory string. The two digits after "# 2" are "47". So the rest of the string is 47 bits long.	

- During long reading, use R? And DATA:REMove? The query may periodically delete readings from the reading memory that may cause the reading memory to overflow. R? Does not execute until all readings have been completed. The instrument will send completed readings when it receives the command. If you want the instrument to wait for all readings to complete before sending readings, use the Read? Or Fetch?.
- If you do not specify a value for, all measurements will be read and erased.
- If the reading memory contains fewer readings than the required number, no error will occur. In this case, all available readings in memory will be read and deleted.
- Up to 10000 measurements can be stored in the instrument reading memory. If the reading memory overflows, the new measurement will overwrite the oldest measurement stored; The latest measurements are always retained. No errors are generated, but the Reading Mem Ovfl bit (bit 14) is set in the condition register of the suspect data register.
- When the measurement configuration is changed, or any of the following commands are executed, the instrument will clear all measurements from the reading memory:
 - INITiate
 - MEASure:?
 - READ?
 - *RST
 - SYSTem:PRESet

1.15 READ?

Command Description: Start a new set of measurements, wait for all measurements to complete and transmit all available measurements.

Parameter	None
Typical return	None
Transmission of measurement results from reading memory: READ? Typical Response:-4.98748741 E-01,-4.35163427 E-01,-4.33118686 E-01,- 3.48109378 E-01	

- READ? Instruction equivalents INITiate and FETCh? Send continuously.
- When the measurement configuration is changed, or any of the following commands are executed, the instrument will clear all measurements from the reading memory:
INITiate
MEASure:?
READ?
*RST
SYSTem:PRESet

1.16 **SAMPLE:COUNT {<count>|MIN|MAX|DEF}** **SAMPLE:COUNT? [{MIN|MAX|DEF}]**

Command Description: Specifies the number of samples collected by the instrument in a single trigger.

Parameter	MIN:1, DEF:1, MAX:1000000, <count>:1~1000000
Typical return	1
Set the DC voltage range of 20V, trigger 2 times, sampling 3 times for each trigger, the trigger source is immediate trigger, start the measurement and wait for the measurement to be completed, and return 6 measurement results: CONF:VOLT:DC 20 TRIG:COUN 3 SAMP:COUN 2 TRIG:SOUR IMM READ? Typical response: +3.98149447 E-04, +8.97697671 E-04,... (6 measurements)	

- You can use the set sample count command with the set trigger count command (TRIGger:COUNt), which sets the number of triggers the instrument will accept before returning to the "idle" TRIGger state. The total number of

measurements returned will be the product value of the sample count and the trigger count.

- Up to 10000 measurements can be stored in the reading memory of the device. If the reading memory overflows, the new measurement will overwrite the oldest measurement stored, and the latest measurement will always be retained. No errors are generated, but the Reading Mem Ovfl bit (bit 14) is set in the condition register of the suspect data register.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

1.17 TEST:ALL?

Command Description: Runs an instrument self-test and returns a pass/fail indication.

Parameter	None
Typical return	+0 (passed) or +1 (one or more tests failed)
Perform a self-test: TEST:ALL?	

- If one or more tests fail, the query returns +1 and stores an error in the error queue. For a complete list of error messages related to self-test failures, see Self-Test Error Messages.

1.18 UNIT:TEMPerature {C|F|K|CEL|FAR} UNIT:TEMPerature?

Command Description: Select the unit (°C, ° F, or Kelvin) used for all TEMPerature measurements, SYSTem: TEMPerature? Except for queries.

Parameter	C CEL: °C Celsius; F FAR: ° F Fahrenheit; K: kelvin kelvin; Default is: C
Typical return	C, F or K
Take 4-wire RTD measurements and return results in ° F UNIT:TEMP F MEAS:TEMP? FRTD Typical Response: +6.82320000 E+01	

- The command also accepts CEL or FAR, but the query returns C or F.

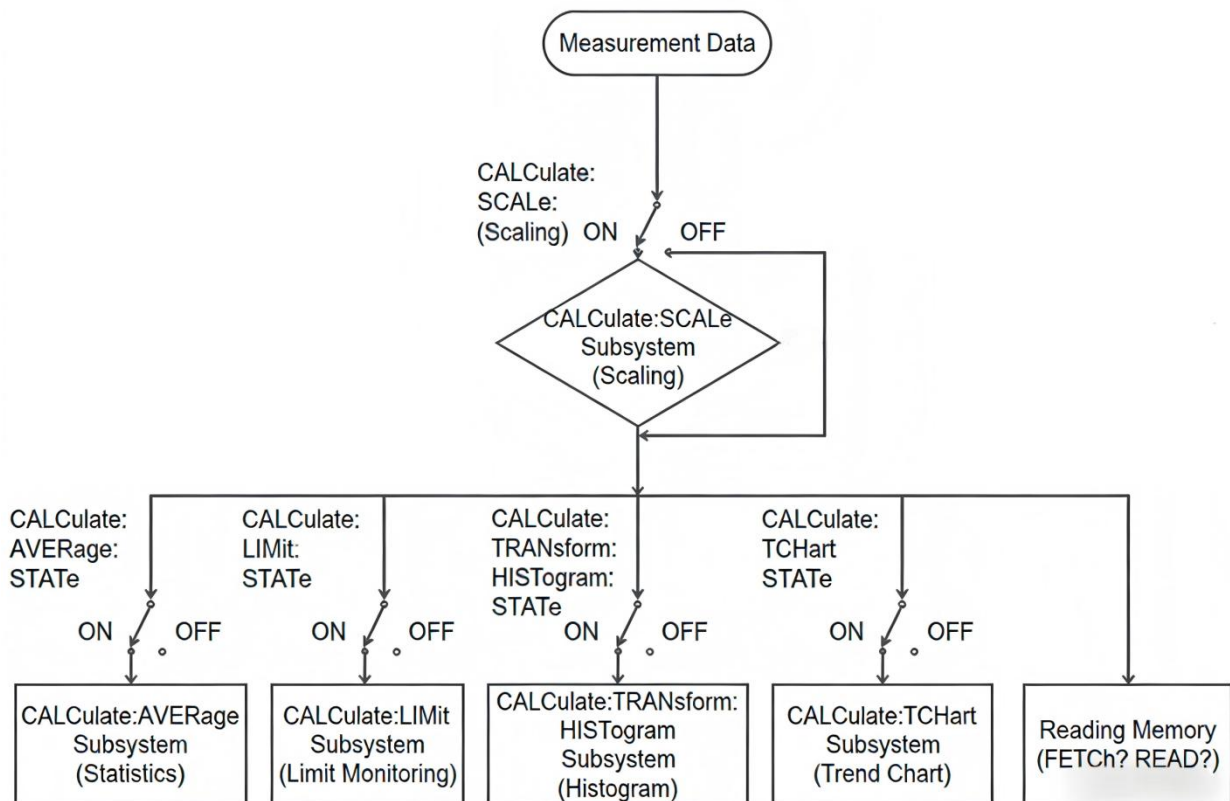
- This parameter is set to its default value after factory reset (* RST) or instrument PRESet (SYSTem: PRESet).

2 Command Subsystem

2.1 CALCulate Subsystem

CALCulate subsystem receives real-time data from the measurement hardware and sends it to the reading memory. It can also optionally perform the following mathematical operations, as shown in the following chart:

- Scaling
- Statistical information
- Restriction check
- Histogram
- Trend chart



2.1.1 CALCulate:CLEAr[:IMMediate]

Command Description: Clear all limit conditions, histogram data, statistics, and measurements.

Parameter	None
Typical return	None
Clear all limit conditions, histogram data, statistics and measurements: CALC:CLE:IMM	

- The synchronization clears after this command is called, so all histograms, statistics, and limit data are restarted at the same time as the measurement is restarted.

2.1.2 CALCulate:LIMit Subsystem

This subsystem specifies the limits of the measured values.

Example

The following example enables a limit test for a 100 DC voltage measurement and indicates whether the measurement is outside the 3.2 to 3.4 V range. Measurements exceeding 3.4 V will set 12 bits of the suspect status register (upper limit failure); Measurements below 3.2 V will be set 11 bits (lower limit failure).

```
*CLS
STAT:PRES
CONF:VOLT 10,.001
SAMP:COUN 100
CALC:LIM:LOW 3.2
CALC:LIM:UPP 3.4
CALC:LIM:STAT ON
INIT
*WAI
STAT:QUES?
```

Typical response: 4096 (at least one measurement outside the upper limit)

2.1.2.1 CALCulate:LIMit:CLEar[:IMMediate]

Command Description: Clears the front panel indication of the current execution limit and clears 11 bits ("lower limit failure") and 12 bits ("upper limit failure") in the Suspicious Data Register Event Register Group Condition register. The corresponding event register bits are not affected. Condition registers provide uninterrupted monitoring of the status of the instrument. Condition register bits are updated in real time; They are neither locked nor buffered. The event register is a read-only register that latches events from the condition register. When an event bit is set, subsequent events corresponding to that bit are ignored.

Parameter	None
Typical return	None

Clear all limits test results:
CALC:LIM:CLE:IMM

- This command does not clear the measurements saved in the reading memory.
- When changing the measurement function, or executing any of the following commands, the instrument clears the front panel indication of exceeding the limit and clears the 11 and 12 bits in the suspect data register:

CALCulate:LIMit:STATe ON

INITiate

MEASure:<function>?

READ?

CALCulate:LIMit:CLEar

*RST

SYSTem:PRESet

- To CLEar statistics, limits, histogram data, and measurement data, use CALCulate:CLEar [:IMMediate].

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

Command Description: Sets the lower/upper limit values of the limit mode.

Parameter	-1.0 E+15 to -1.0 E-15, or 0 (default) or +1.0 E-15 to 1.0 E+15
Typical return	+0.00000000E+00
See Example	

- You can assign a lower limit, an upper limit, or both. Do not set the lower limit above the upper limit.
- Limit crossover: If the measurement result is less than the specified lower limit, set 11 bits in the suspicious data condition register ("lower limit failure"). Measurements greater than the specified upper limit are set to 12 bits ("upper limit failed").
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

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

CALCulate:LIMit[:STATe]?

Command Description: Enables or disables the limit test.

Parameter	{ON 1 OFF 0}, default OFF
Typical return	0 (off) or 1 (on)
See Example	

- When the measurement function is changed or any of the following commands are executed, the instrument clears the front panel indication of exceeding the limit and clears the 11 and 12 bits in the suspect data register:

CALCulate:LIMit:STATe ON

INITiate

MEASure:<function>?

READ?

CALCulate:LIMit:CLEar

*RST

SYSTem:PRESet

- The instrument turns this setting off after changing the measurement function or executing *RST or SYSTem:PRESet.

2.1.3 CALCulate:TRANSform:HISTogram Subsystem

HISTogram subsystem configuration HISTogram display.

Example

This example enables 100 bar charts of 1000 DCV measurements with auto-calibration. It then returns the calculated histogram including the lower and upper bound range values, the total measurement count, and binary data.

CONF:VOLT:DC 10

SAMP:COUN 1000

CALC:TRAN:HIST:RANG:AUTO ON

CALC:TRAN:HIST:POIN 100

CALC:TRAN:HIST:STAT ON

INIT

*WAI

CALC:TRAN:HIST:ALL?

Typical Response: +9.79373828 E+00, +1.00313498 E+01, +1000, <102 binary count>

Note: The response above indicates a 102 binary count because the histogram includes binaries below and above the histogram range values.

2.1.3.1 CALCulate:TRANSform:HISTogram:ALL?

CALCulate:TRANSform:HISTogram:DATA?

Command Description: A query in the form of ALL returns a comma-separated upper and lower range values, the number of measurements, and the cylinder data collected since the histogram data was last cleared. The DATA form returns only the column DATA.

Parameter	None
Typical return	See Example
See Example	

- The column data includes the following cases, in order:
 - Number of measurement results below lower limit range value
 - The number of measurement results per cylinder will not fall below the lower range value
 - The number of measurement results is greater than the upper range value
- The range value is a real number returned as +1.00000000 E+00. Both the number of measurements and the column data are positive integers returned as +100.

2.1.3.2 CALCulate:TRANSform:HISTogram:CLEar[:IMMediate]

Command Description: Clear histogram data if histogram range is enabled.

Parameter	None
Typical return	None
Clear histogram data: CALC:TRAN:HIST:CLE	

- The measurements in the readings memory are not cleared.
- To CLEar statistics, limits, histogram data, and measurement data, use CALCulate:CLEar [:IMMediate].

2.1.3.3 CALCulate:TRANSform:HISTogram:COUNT?

Command Description: Returns the number of measurements collected since the last time the histogram data was cleared.

Parameter	None
Typical return	+555
Returns the number of measurements used to calculate the current histogram: CALC:TRAN:HIST:COUN?	

2.1.3.4 CALCulate:TRANSform:HISTogram:POINTS {<value>|MIN|MAX|DEF}

CALCulate:TRANSform:HISTogram:POINTS? [{MIN|MAX|DEF}]

Command Description: Sets the number of columns between the lower and upper range values of the histogram. There are always two additional cylindrical shapes: one for measurements below the lower limit range and one for measurements above the upper limit range.

Parameter	{10 30 60 100 300 600}, default 100; MIN: 10; MAX: 600; DEF: 100
Typical return	+100
See Example	

- You can specify the LOWER and UPPER RANGE values using CALCulate:TRANSform:HISTogram:RANGE: {LOWER|UPPER}. If CALCulate:TRANSform:HISTogram:RANGE: AUTO is turned on, the lower and upper RANGE values are automatically calculated.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

2.1.3.5 CALCulate:TRANSform:HISTogram:RANGE:AUTO {ON|1|OFF|0}

CALCulate:TRANSform:HISTogram:RANGE:AUTO?

Command Description: Enables or disables automatic selection of lower and upper range values for the histogram.

Parameter	{ON 1 OFF 0}, default ON
Typical return	0 (off) or 1 (on)
See Example	

- ON: The instrument automatically sets the lower and upper limit range values.
- OFF: The LOWER and UPPER RANGE values are specified by CALCulate:TRANSform:HISTogram:RANGE: {LOWer | UPPer}.
- Set LOWER or UPPER RANGE values
(CALCulate:TRANSform:HISTogram:RANGE: {LOWer|UPPer}) Disables automatic selection of LOWER and UPPER RANGE values
(CALCulate:TRANSform:HISTogram:RANGE:AUTO OFF).
- While performing INITiate, MEASure? OR READ? After that, the instrument will restart automatic range value selection (if enabled).
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

2.1.3.6 CALCulate:TRANSform:HISTogram:RANGE:{LOWer|UPPer}

{<value>|MIN|MAX|DEF}

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

[{MIN|MAX|DEF}]

Command Description: Sets the lower and upper range values of the histogram.

Parameter	-1.0 E+15 to -1.0 E-15, or 0.0 (default) or +1.0 E-15 to 1.0 E+15
Typical return	+0.00000000E+00
See Example	

- If automatic range value selection is enabled
(CALCulate:TRANSform:HISTogram:RANGE:AUTO ON), the query returns the calculated RANGE value, or 9.91 E37 (not a number) if HISTogram data does not exist.
- If CALCulate:TRANSform:HISTogram:RANGE:AUTO is turned on, the lower and upper RANGE values are automatically calculated.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

2.1.3.7 CALCulate:TRANSform:HISTogram[:STATe] {ON|1|OFF|0}

CALCulate:TRANSform:HISTogram[:STATe]?

Command Description: Enables or disables histogram calculation.

Parameter	{ON 1 OFF 0}, default OFF
Typical return	0 (off) or 1 (on)

See Example

- The instrument turns this setting off after changing the measurement function or executing *RST or SYSTem:PRSet.

2.1.4 CALCulate:SCALE Subsystem

This subsystem calibrates ACV and DCV measurements.

2.1.4.1 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, this function corresponds to the dB function in CALCulate:SCALE:FUNCTion. When the dB function is enabled, this value is subtracted from each voltage measurement after the measurement is converted to dBm.

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

Parameter	-300.0 dBm to +300.0 dBm. Default: 0
Typical return	+0.00000000E+00
Enable dB calibration with -10 dB reference and 300 Ω dBm reference resistor: CALC:SCAL:DBM:REF 300 CALC:SCAL:DB:REF -10.0 CALC:SCAL:FUNC DB CALC:SCAL:STAT ON	

- Specify a REfERENCE value to disable automatic REfERENCE selection (CALCulate:SCALE:REfERENCE:AUTO OFF).
- The dB relative value parameter is related to the dBm REfERENCE resistance set by CALCulate:SCALE:dBm:REfERENCE.
- After a factory reset (*RST), instrument PRESet (SYSTem:PRESet), or measurement function change, the instrument sets the parameter value to 0.0 with automatic reference selection enabled.

2.1.4.2 CALCulate:SCALE:DBM:REfERENCE {<reference>|MIN|MAX|DEF}

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

Command Description: Select the reference resistor to convert the voltage measurement to dBm. This reference value affects the dBm and dB calibration functions.

Note: This command is only available for ACV and DCV measurement functions.

Parameter	50, 75, 93, 110, 124, 125, 135, 150, 250, 300, 500, 600, 800, 900, 1000, 1200, or 8000 Ω . Default: 600.
Typical return	+6.00000000E+02
Start dBm calibration with 300 Ω reference resistor: CALC:SCAL:DBM:REF 300 CALC:SCAL:FUNC DBM CALC:SCAL:STAT ON	

- After a factory reset (*RST), instrument PRESet (SYSTem:PRESet), or measurement function change is performed, the instrument sets the reference value to its default value.

2.1.4.3 CALCulate:SCALE:FUNCTION {DB|DBM}

CALCulate:SCALE:FUNCTION?

Command Description: Select the operation to be performed by the calibration function.

Note: For ACV and DCV measurement functions only.

Parameter	{DB DBM}
Typical return	DB or DBM
Enable the DB calibration function for next measurement reference: CALC:SCAL:FUNC DB CALC:SCAL:STAT ON	

- DB performs a relative dB calculation. The result is the difference between the input signal and the stored DB relative REFERENCE value (CALCulate:SCALE:DB:REFERENCE), both of which are converted to dBm (dB = measurement in dBm - relative value in dBm).
 - For the dB function, the REFERENCE value can be automatically selected by using the first measurement converted to dBm as the REFERENCE value (see CALCulate:SCALE:REFERENCE:AUTO), or the REFERENCE value can be specified by CALCulate: SCALE: DB: REFERENCE. The dB calibration is only suitable for ACV and DCV measurements.
- The DBM performs dBm calculations. The result is a logarithmic expression calculated based on the power delivered to the REFERENCE resistance (CALCulate:SCALE:DBM:REFERENCE) and relative to 1 mW. (dBm = $10 \times \log_{10}$ (measurement result ²/reference resistance/1 mW)). The dBm calibration is only suitable for ACV and DCV measurements.

- CALCulate:SCALe:FUNCTion must be executed before CALCulate:SCALe [:STATe], otherwise an incompatibility error will be generated.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).
- When you change the measurement function (for example, from DCV to ACV), the calibration is set to OFF. You must re-enable the calibration after changing the measurement function.

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

CALCulate:SCALe:REFerence:AUTO?

Command Description: Enables or disables the automatic reference value calibration function for the dB function.

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

- ON: The first measurement taken will be used as a REFerence for all subsequent measurements and automatic REFerence selection is disabled. For the DB calibration function, convert the first measurement result to dBm and set CALCulate:SCALe:DB:REFerence to the result.
- OFF: CALCulate:SCALe:DB:REFerence specifies a REFerence value for the DB calibration function.
- When the calibration function (CALCulate:SCALe:STATe ON) is enabled, the instrument will enable automatic reference selection.
- This parameter is set to its default value after factory reset (*RST), instrument PRESet (SYSTem:PRESet), or change of measurement function.
- You must execute CALCulate:SCALe:FUNCTion before you execute CALCulate:SCALe [:STATe], otherwise you will generate an incompatibility error.

- When you change the measurement function (for example, from DCV to ACV), the calibration is set to OFF. You must re-enable the calibration after changing the measurement function.

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

CALCulate:SCALe[:STATe]?

Command Description: Enables or disables the calibration function.

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

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

- Enabling the calibration feature also enables automatic null selection (CALCulate:SCALe:REFeRence:AUTO).
- This parameter is set to its default value after factory reset (*RST), instrument PRESet (SYSTem:PRESet), or change of measurement function.
- When you change the measurement function (for example, from DCV to ACV), the calibration is set to OFF. You must re-enable the calibration after changing the measurement function.

2.1.5 CALCulate:AVERag Subsystem

This subsystem calculates measurement statistics.

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

CALCulate:AVERage[:STATe]?

Command Description: Enables or disables statistical calculations.

Parameter	{ON 1 OFF 0}, default OFF
Typical return	0 (off) or 1 (on)

Returns statistics for 100 frequency measurements:

CONF:FREQ 1.0E3,.001

SAMP:COUN 100

CALC:AVER:STAT ON

INIT

*WAI

CALC:AVER:ALL?

Typical Response: +1.00320000 E+03, +1.00312000 E+03, +1.00327000 E+03,
+4.13600000 E-01

- When the measurement function changes, or when any of these commands are executed, the statistics are cleared. CALCulate: AVERage: STATe ON
CALCulate:AVERage:CLEar
INITiate MEASure:?
READ?
*RST
SYSTem:PRESet
- The instrument turns this setting off after changing the measurement function or executing *RST or SYSTem:PRESet.

2.1.5.2 CALCulate:AVERage:ALL?

CALCulate:AVERage:AVERage?

CALCulate:AVERage:COUNt?

CALCulate:AVERage:MAXimum?

CALCulate:AVERage:MINimum?

CALCulate:AVERage:PTPeak?

CALCulate:AVERage:SDEViation?

Command Description: Returns the arithmetic mean (mean), standard deviation, minimum and maximum values of all measurements taken since the last time the statistics were cleared.

Parameter	None
Typical return	ALL returns: +1.00320000 E+03, +1.00312000 E+03, +1.00327000 E+03, +4.13600000 E-01 Average returns: +1.00320000 E+03 Count returns: +1.00000000 E+02 Maximum Return: +1.00320000 E+03

	Minimum return: +1.00320000 E+03 Ptpeak returns: +1.00320000 E+03 +03Sdeviation returns: +1.00320000 E+03
Returns statistics for 100 frequency measurements: CONF:FREQ 1.0E3,.001 SAMP:COUN 100 CALC:AVER:STAT ON INIT *WAI CALC:AVER:ALL? Typical Response: +1.00320000 E+03, +1.00312000 E+03, +1.00327000 E+03, +4.13600000 E-01	

- When the measurement function changes, or when any of these commands are executed, the statistics are cleared.

CALCulate:AVERage:STATe ON

CALCulate:AVERage:CLEar

INITiate

MEASure:<function>?

READ?

*RST

SYSTem:PRESet

- All values except COUNT are returned as +1.00000000 E+01. The COUNT command returns a signed positive integer: +129.
- The CALC: AVER: AVER and CALC: AVER: SDEV queries return +9.91000000 E +37 (not a number) when using dB or dBm calibration.

2.1.5.3 CALCulate:AVERage:CLEar[:IMMediate]

Command Description: Clears all calculated statistics: minimum, maximum, mean, peak-peak, count, and standard deviation.

Parameter	None
Typical return	None
Clear saved statistics: CALC:AVER:CLE	

- This command does not clear the measurements in the readings memory.
- When the measurement function changes, or when any of these commands are executed, the statistics are cleared.

CALCulate:AVERage:STATe ON

CALCulate:AVERage:CLEar

INITiate

MEASure:<function>?

READ?

*RST

SYSTem:PRESet

- To CLEar statistics, limits, histogram data, and measurement data, use CALCulate:CLEar [:IMMediate].

2.1.6 CALCulate:TCart Subsystem

2.1.6.1 CALCulate:TCart[:STATe] {ON|1|OFF|0}

CALCulate:TCart[:STATe]?

Command Description: Enables or disables trend chart data.

Parameter	{OFF ON 0 1}, Default: OFF.
Typical return	0 (OFF) or 1 (ON)
Enable trend graph data for 100 measurements: CALCulate:TCart:STATe ON CONF:VOLT:DC 10 SAMP:COUN 100 INIT FETC? Typical Response: +2.80434597 E-05, +2.25489615 E-05,... (500 Measurement Results)	

- When remotely controlling this instrument, you must send INIT or READ? This feature was previously enabled (ON) to view trend chart data. If you send INIT or READ? After disabling or enabling this feature, no data will be displayed in the trend chart.
- This parameter is set to its default value after factory reset (* RST) or instrument PRESet (SYSTem: PRESet).

2.2 CONFigure Subsystem

The CONFigure command is the easiest way to CONFigure measurements. These commands will restore the instrument to the default measurement configuration value. However, these commands do not automatically start the measurement, so you can modify the measurement properties before starting the measurement.

Note: Use INITiate or READ? Start the measurement.

CONFigure command default settings

CONFigure command Select functions, ranges, and sampling speeds with one command. All other parameters are set to their default values (same below). If the range and sampling speed are not set, their default values are also restored.

Measurement parameters	Default setting
Automatic zero adjustment	open
Measuring range	AUTO
Number of samples per trigger	1 sample
Number of Trigger	1 trigger
Trigger delay	Automatic delay
Trigger Source	immediately
Trigger slope	NEGative
Mathematical function	disable

Using CONFigure

The following example uses CONFigure and READ? Perform externally triggered measurements. The CONFigure command configures DC voltage measurement, but does not put the instrument in a wait-for-trigger state.

READ? The query puts the instrument in the "waiting for trigger" state, starts the measurement when the back panel Ext Trig input is a pulse signal (low by default), stores the measurement results in the reading memory, and transmits the measurement results to the instrument's output buffer. Default range (auto-range adjustment) and resolution (10PLC) are used for measurement.

```
CONF:VOLT:DC
```

```
TRIG:SOUR EXT
```

```
READ?
```

```
Typical response:-5.21391630 E-04
```

The following example is similar to the previous example, but this example uses INITiate and FETCh? Replaced READ?. The INITiate command puts the instrument in the "waiting for trigger" state, triggers the measurement when the rear panel Ext Trig input is a pulse signal (low by default), and sends the measurement results to the

reading memory. FETCh? The query transmits the measurement results from the reading memory to the instrument's output buffer.

```
CONF:VOLT:DC
```

```
TRIG:SOUR EXT
```

```
INIT
```

```
FETC?
```

Typical Response:-5.21205366 E-04

Using INITiate to store measurement results in reading memory is better than using READ? It is fast to send the measurement results to the instrument's output buffer (assuming you send FETCh? Until you are done). The INITiate command is also a "duplicate" command. This means that after performing INITiate, you can't send other commands that do not affect the measurement results. This allows you to check data availability before initiating a read attempt, otherwise it may timeout. Note that FETCh? The query waits until terminated after all measurements are completed. Up to 10,000 measurements can be stored.

The following example configures the instrument for a 2-wire resistance measurement, triggers the instrument to take a measurement using INITiate, and stores the measurement results in the reading memory. Select the 10 k Ω range.

```
CONF:RES 10000
```

```
INIT
```

```
FETC?
```

Typical response: +5.21209585 E+04

2.2.1 CONFigure?

Command Description: Returns a string indicating the current function, range and resolution.

Parameter	None
Typical return	"VOLT +2.00000000E-01,+2.00000000E-08"
Returns the current function, range, and resolution. CONF?	

2.2.2 CONFigure:CONTinuity

Command Description: Sets all measurement parameters and trigger parameters in on-off mode to their default values.

Parameter	None
Typical return	None

Configure the instrument to ON-OFF mode. Then, measure with an external trigger with a positive slope (rising edge) and read the measurement:

CONF:CONT

TRIG:SOUR EXT; SLOP POS

READ?

- For each measuring instrument less than or equal to the CONTinuity THReshold (which can be set by the [:SENSe]:CONTinuity:THReshold:VALue command), a beep (if the beeper is enabled) is emitted and the actual resistance measurement is displayed on the display.
- From the set threshold to 2.0 k Ω , the instrument displays the actual resistance measurement. None buzzing. Over 2.2 k Ω , the instrument displays "OPEN" None buzzing.
- FETCh?, READ? And MEASure: CONTinuity? The query returns the measured resistance and on OPEN returns +9.90000000 E+37.
- Use READ? Or INITiate to start measuring.

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

Command Description: Sets all measurement parameters and trigger parameters in AC/DC current measurement mode to their default values. In addition, you can specify the range and resolution.

Parameter	<range>: {200uA 2mA 20mA 200mA 2A 10A AUTO}, default AUTO (automatic range adjustment). <resolution> (AC): Optional and ignored. <resolution> (DC): See resolution Table. The integration time will be set to 10PLC by default.
Typical return	None
Configure AC current measurement with a 2 A range. Take two measurements and take readings: CONF:CURR:AC 2 SAMP:COUN 2 READ? Typical Response: +2.31198440 E-04, +2.32914096 E-04	

- You can pass in the AUTO parameter or choose to automatically adjust the range. None passing any parameters, or you can manually select a fixed range. Automatic Range Adjustment Conveniently select the range for each

measurement based on the input signal. For the fastest measurement, use manual range adjustment (automatic range adjustment may take more time).

- If the input signal is greater than the value measured for the specified gear, the word Overload is displayed on the instrument panel and "+9.90000000 E+37" is returned from the remote interface.
- Use READ? Or INITiate to start measuring.

2.2.4 CONFigure:DIODe

Command Description: Sets all measurement parameters and trigger parameters in diode mode to their default values.

Parameter	None
Typical return	None
Configure and read default diode measurements: CONF:DIOD READ? Typical Response: +1.32130000 E-01	

- The range when performing the diode test is fixed: the range is 5 VDC (with a 1 mA current source output).
- The voltage is displayed if it is between 0 and 5.05 V. The instrument beeps when the voltage is in the specified range (if the buzzer is enabled). If the signal exceeds 5.05 V, the front panel displays "OPEN" and the value returned from SCPI is 9.9 E37.
- FETCh? READ? And MEASure: DIODe? The query returns the measured voltage regardless of the magnitude of its value.
- Use READ? Or INITiate to start measuring.

2.2.5 CONFigure:{FREQuency|PERiod}

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

Command Description: Sets all measurement parameters and trigger parameters in frequency/period mode to their default values. You can also specify the range and resolution of frequency or period.

Parameter	<range>(FREQ): 3Hz to 1MHz, default is 20Hz. <range>(PER): 1us to 333.33 ms, default is 50ms. <resolution>: The default is the resolution corresponding to the aperture of 100ms.
Typical return	None

Configure and read the default frequency measurement:

CONF:FREQ

READ?

Typical Response: +7.79645018 E+01

- Frequency or period < range > parameters are required only when you specify measurement resolution parameters. There is no need to send a new command for each new frequency or period to be measured. The < range > and < resolution > parameters affect the aperture (gate time).
- If the input voltage is too large for the selected voltage range, the word Overload is displayed on the instrument panel and "+9.90000000 E+37" is returned from the remote interface. Automatic range adjustment can be enabled for input voltage.

2.2.6 CONFigure:{RESistance|FRESistance}

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

Command Description: Set all measurement parameters and trigger parameters in two-wire/four-wire resistance measurement mode to their default values. In addition, you can specify gear by passing in parameters.

Parameter	<range>: {200Ω 2kΩ 20kΩ 200kΩ 1MΩ 10MΩ 100MΩ}, default AUTO (automatic range adjustment) <resolution>: See Resolving Tables. The integration time will be set to 10PLC by default.
Typical return	None
Four-wire resistance measurement is configured using a 200 Ω range. Take two measurements and take readings: CONF:FRES 200 SAMP:COUN 2 READ? Typical response : +6.71881065 E+01, +6.83543086 E+01	

- You can pass in the AUTO parameter or choose to automatically adjust the range None passing any parameters, or you can manually select a fixed range. Automatic Range Adjustment Conveniently select the range for each measurement based on the input signal. For the fastest measurement, use manual range adjustment (automatic range adjustment may take more time).

- If the input signal is greater than the value measured for the specified gear, the word Overload is displayed on the instrument panel and "+9.90000000 E+37" is returned from the remote interface.
- Use READ? Or INITiate to start measuring.

2.2.7 CONFigure:TEMPerature

[{FRTD|RTD|FTHermistor|THERmistor|TCouple|DEFault} [, {DEFault} [,1 [, {MIN|MAX|DEF}]]]]

Command Description: Sets all measurement parameters and trigger parameters in on-off mode to their default values.

Parameter	<probe_type>: {FRTD RTD FTHermistor THERmistor TCouple}. Default: TCouple. <type> : RTD and FRTD fixed values 85; FTH and FTH fixed 5000; TC Optional {J K E T N R S B} (default J). <resolution>: See Parsing Tables or Ranges, resolution, and NPLC. The default value is equivalent to 10 PLC.
Typical return	None
Configure 4-wire RTD measurement. Then, measurements are made with an external trigger with a positive slope (rising edge), and the measurements are read: CONF:TEMP FRTD,85 TRIG:SOUR EXT; SLOP POS READ?	

- To change the TEMPerature UNIT, use UNIT: TEMPerature.
- If the input signal is greater than what can be measured, the word Overload is displayed on the instrument panel and "+9.90000000 E+37" is returned from the remote interface.
- Use READ? Or INITiate to start measuring.

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

Command Description: Set all measurement parameters and trigger parameters to their default values for AC or DC voltage measurement. In addition, you can specify the gear by passing in parameters.

Parameter	<range>: {200 mV 2 V 20 V 200 V 1000 V(DC) 750V(AC)}, default AUTO. <resolution> (AC): Optional and ignored. <resolution> (DC): See resolution Table. The default setting integration time is 10PLC.
Typical return	None
AC voltage measurement is configured with a 200 V range. Take two measurements and take readings: CONF:VOLT:AC 200 SAMP:COUN 2 READ? Typical Response: +2.23274236 E-02, +2.24660907 E-02	

- You can pass in the AUTO parameter or choose to automatically adjust the range None passing any parameters, or you can manually select a fixed range. Automatic Range Adjustment Conveniently select the range for each measurement based on the input signal. For the fastest measurement, use manual range adjustment (automatic range adjustment may take more time).
- If the input signal is greater than the value measured for the specified gear, the word Overload is displayed on the instrument panel and "+9.90000000 E+37" is returned from the remote interface.
- Use READ? Or INITiate to start measuring.

2.2.9 CONFigure:CAPacitance [{<range>|AUTO|MIN|MAX|DEF}] [, {<resolution>|MIN|MAX|DEF}]]

Command Description: Set all measurement parameters and trigger parameters to their default values for capacitance measurement. In addition, you can specify the gear by passing in parameters.

Parameter	<range>: {2nF 20nF 200nF 2uF 20uF 200uF 2mF 20mF 100mF}, default AUTO. <resolution>: Optional and ignored.
Typical return	None
Capacitance measurements were configured using the 2 μ F range. Take two measurements and take readings: CONF:CAP 2uF SAMP:COUN 2 READ? Typical Response: +2.91764411 E-10, +2.91715824 E-10	

- You can pass in the AUTO parameter or choose to automatically adjust the range None passing any parameters, or you can manually select a fixed range. Automatic Range Adjustment Conveniently select the range for each measurement based on the input signal. For the fastest measurement, use manual range adjustment (automatic range adjustment may take more time).
- If the input signal is greater than the value measured for the specified gear, the word Overload is displayed on the instrument panel and "+9.90000000 E+37" is returned from the remote interface.
- Use READ? Or INITiate to start measuring.

2.3 DATA Subsystem

With this subsystem, data can be configured and deleted from the reading memory. When the measurement configuration is changed, or the following commands are executed, the instrument will clear all measurements from the reading memory:

INITiate

MEASure:<function>?

READ?

2.3.1 DATA:LAST?

Command Description: Returns the last measurement taken with units.

Parameter	None
Typical return	+3.51457288E-03 VDC
Returns the last measurement: DATA:LAST? Typical Response: A measurement result with units. If no data is available, 9.91 E37 with units (not numbers) is returned. Example: +1.63730000 E+00 VDC	

2.3.2 DATA:POINts?

Command Description: Returns the total number of measurements currently in the reading memory.

Parameter	None
Typical return	+3
Return the number of measurements in the reading memory (215): DATA:POIN? Typical response: +215	

- Up to 10,000 measurements can be stored in the instrument reading memory.

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

Command Description: Reads and erases the <num_readings> measurement result from the reading memory. If less of the <num_readings> measurement is available, the query returns an error unless the WAIT parameter is specified, in which case the query waits until the <num_readings> measurement is available.

Parameter	1~10000
Typical return	4.97215654E-01,-4.97343268E-01,...

The three oldest readings are read and erased from the reading memory:

DATA:REMove? 3

Typical Response:-4.97215654 E-01,-4.97343268 E-01,-4.97121213 E-01

- During long reading, use R? And DATA: REMove? The query may periodically delete readings from the reading memory that may cause the reading memory to overflow. R? Does not execute until all readings have been completed. The instrument will send completed readings when it receives the command. If you want the instrument to wait for a reading to complete before sending a reading, use the Read? Or Fetch?.
- Up to 10000 measurements can be stored in the instrument reading memory. If the reading memory overflows, the new measurement will overwrite the oldest measurement stored; The latest measurements are always retained. No errors are generated, but the Reading Mem Ovfl bit (bit 14) is set in the condition register of the suspect data register (see Introduction to the Status System).

2.3.4 DATA:POINts:EVENT:THReshold

DATA:POINts:EVENT:THReshold?

Command Description: Sets or queries a memory threshold.

Parameter	1~10000, default is 1
Typical return	+1
Set the reading memory threshold to 200: DATA:POIN:EVEN:THR 200	

- To report any subsequent events, the measurement count must first be lowered below the programmed threshold before the threshold is reached again.
- Use STATus: OPERation: ENABle to ENABle the memory threshold bit (9 bits in the standard OPERation event register) to report to the STATus byte.
- Once the memory threshold bit (9 bits in the standard OPERation EVENT register) is set, the setting will remain until it is set by STATus:OPERation:EVENT? Or *CLS clear.
- The standard operating condition register displays the current condition. For more information, see Introduction to the STATus subsystem.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

2.4 DISPlay Subsystem

2.4.1 DISPlay[:WINDow]:TEXT:CLEAr

Command Description: Clear text messages from the display.

Parameter	None
Typical return	None
Clear the displayed message: DISP:TEXT:CLE	

- Display text is not affected by *RST. Which is cleared when turned on.

2.4.2 DISPlay[:WINDow]:TEXT[:DATA] "string"

DISPlay[:WINDow]:TEXT[:DATA]?

Command Description: Displays a text message on the front panel display.

Parameter	A string with quotation marks up to 40 characters long. Letters (A-Z), numbers (0-9), and special characters can be used.
Typical return	None
DISP:TEXT "Test progress..."	

- Sending DISPlay:TEXT will DISPlay the TEXT.
- Display text is not affected by *RST.

2.4.3 DISPlay[:WINDow]:VIEW {NUMeric|HISTogram|TCHart|METer}

DISPlay[:WINDow]:VIEW?

Command Description: Specifies the display of measurement data as a number, histogram, trend chart, or bar meter.

Parameter	{NUMeric HISTogram TCHart METer}. Default: NUM NUMeric: Digital Display Mode; HISTogram: HISTogram display mode TCHart: trend chart display mode; METer: bar chart display mode
Typical return	NUM
Configure the measurement display mode to histogram: DISP:VIEW HIST DISP:VIEW?	

Typical response: HIST

- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

2.4.4 DISPlay[:WINDow]:NUMeric:DECimal {POINT|COMMa}

DISPlay[:WINDow]:NUMeric:DECimal?

Command Description: Specifies the display decimal sign style.

Parameter	{POINT COMMa}. Default: POIN. POINT: POINT (.); COMMa: COMMa (,)
Typical return	POIN
Configure the display decimal sign style as comma: DISP:NUM:DEC COMM DISP:NUM:DEC? Typical response: COMM	

- This parameter value is not affected by *RST or SYSTem:PRESet.

2.4.5 DISPlay[:WINDow]:NUMeric:THOUsand {OFF|ON|SPACE}

DISPlay[:WINDow]:NUMeric:THOUsand?

Command Description: Specifies the numeric thousand sign.

Parameter	{OFF ON SPACE}. Default: OFF. OFF: OFF SPAC: Spaces ON: If the decimal point is a dot, a comma is displayed; If the decimal point is a comma, it is displayed as a point
Typical return	OFF
Configure the numeric thousand symbol to turn on: DISP:NUM:THOU ON DISP:NUM:THOU? Typical response: ON	

- This parameter value is not affected by *RST or SYSTem:PRESet.

2.4.6 DISPlay[:WINDow]:BRIGhtness <1~100>

DISPlay[:WINDow]:BRIGhtness?

Command Description: Specifies the display brightness.

Parameter	<value>: 1 ~ 100, default is 100.
Typical return	100
Configure the display brightness to 50: DISP:BRIG 50 DISP:BRIG? Typical response: 50	

- This parameter value is not affected by *RST or SYSTem:PRESet.

2.4.7 DISPlay[:WINDow]:SAVer:[STATe] {0|1|2|4|8}

DISPlay[:WINDow]:SAVer:[STATe]?

Command Description: Specifies the display hold time.

Parameter	{0 1 2 4 8}. Default: 0. 0: closed; 1: 1 hour; 2: 2 hours; 4: 4 hours; 8: 8 hours
Typical return	0
After the screen display is set to no operation for 1 hour: DISP:SAV 1 DISP:SAV? Typical response: 1	

- This parameter value is not affected by *RST or SYSTem:PRESet.

2.5 FORMat Subsystem

2.5.1 FORMat:BORDER {NORMal|SWAPped}

FORMat:BORDER?

Command Description: Sets the byte order of binary data block transfer.

Parameter	{NORMal SWAPped} Default: NORM.
Typical return	NORM
Select the order of switching bytes: FORMat:BORDER SWAP	

- Only affects MEASure?, READ?, FETCh?, DATA: REMove? And R? The data format of the command.
- In the NORMal byte order (the default order), the most significant byte (MSB) of each data point is assumed to be the first byte.
- In the SWAPped byte order, the least significant byte (LSB) of each data point is assumed to be the first byte. Most PCs use an "switch-over" byte order.
- After a factory reset (*RST) or instrument PRESet (SYSTem:PRESet) is performed, the default value will be restored.

2.5.2 FORMat[:DATA] {ASCIi|REAL} [,<len>]

FORMat[:DATA]?

Command Description: Sets the data format return type.

Parameter	{ASCIi REAL} [,<len>]; <len> ASCIi: 9 or REAL: 64
Typical return	ASC,9
Specify the 64-bit REAL data format: FORM:DATA REAL,64 或 FORM:DATA REAL	

- Only affects MEASure?, READ?, FETCh?, DATA: REMove? And R? The data format of the command.
- If the specified data format is ASCIi, the numeric data is converted to ASCIi characters. Numbers are separated by commas specified in IEEE 488.2. The <length> parameter is optional, but "9" is the default and only allowed value, and the instrument will return 9 significant bits (e.g. +0.12345678 E-01).
- If the specified data format is REAL, the digital data is converted to REAL binary data in the IEEE 488.2 finite length data block format. The <length>

parameter is optional, but "64" is the default and only allowed value. The byte order is controlled by FORMat: BORDer.

- After a factory reset (*RST) or instrument PRESet (SYSTem:PRESet) is performed, the default value will be restored.

2.6 MEASure Subsystem

The MEASure query is the easiest way to get measured values because the query always takes the default measurement parameters. You use a command to set the measurement mode, gear, and resolution, but you cannot change the default values of other parameters. The execution result will be returned directly.

Note: A MEASure query is functionally equivalent to sending CONFigure, followed by READ?. The difference is that you need to bring the parameters you want to set after the MEASure command after the CONFigure command.

MEASure command default settings

The MEASure command allows you to select functions, ranges, and sampling speeds with one command. All other parameters are set to their default values (the same below). If the range and sampling speed are not set, their default values are also restored.

Measurement parameters	Default setting
Automatic zero adjustment	open
Measuring range	AUTO
Number of samples per trigger	1 sample
Number of Trigger	1 trigger
Trigger delay	Automatic delay
Trigger Source	immediately
Trigger slope	NEGative
Mathematical function	disable

Use MEASure? inquire

The example below is configured with DC voltage measurement, internally triggering the instrument to take the measurement, and reading the measurement result. The default range (auto-adjusting range) is used for measurement.

MEAS:VOLT:DC?

Typical Response:-4.96380404 E-02

The following example configures the instrument for a two-wire resistance measurement, triggers the instrument to measure and reads the measurement result. Select the 1 k Ω range. MEAS:RES? 2000

Typical response: +9.84668434 E+02

2.6.1 MEASure:CONTinuity?

Command Description: Set all measurement parameters and trigger parameters in on-off mode to their default values and make a measurement, and the measurement results will be returned directly.

Parameter	None
Typical return	+2.00000000E+02
Configure the instrument for continuous measurement. The measurement is then taken, and the measurement is read: MEAS:CONT? Typical Response: +1.32130000 E-02	

- For the on-off test (two-wire resistance measurement), the range is fixed at 2k Ω .
- For each measuring instrument less than or equal to the CONTinuity THReshold (which can be set by the [:SENSe]:CONTinuity:THReshold:VALue command), a beep (if the beeper is enabled) is emitted and the actual resistance measurement is displayed on the display.
- From the set threshold to 2 k Ω , the instrument displays the actual resistance measurement None buzzing. Over 2.2 k Ω , the instrument displays "OPEN" None buzzing.
- FETCh?, READ? And MEASure: CONTinuity? The query returns the measured resistance and on OPEN returns +9.90000000 E+37.

2.6.2 MEASure:CURREnt:{AC|DC}?

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

Command Description: The measurement is triggered immediately after all measurement parameters and trigger parameters in AC/DC current measurement mode are set to their default values, and the measurement results are returned immediately after the acquisition. In addition, you can specify the range and resolution.

Parameter	<range>: {200uA 2mA 20mA 200mA 2A 10A AUTO}, default AUTO (automatic range adjustment) <resolution> (AC): Optional and ignored. <resolution> (DC): See resolution Table. The integration time will be set to 10PLC by default.
Typical return	+2.00000000E+00
AC current measurement is configured with a 2 A range. The measurement is then taken, and the measurement is read: MEAS:CURREnt:AC? 2	

Typical Response: +1.53430000 E-01

- You can pass in the AUTO parameter or choose to automatically adjust the range None passing any parameters, or you can manually select a fixed range. Automatic Range Adjustment Conveniently select the range for each measurement based on the input signal. For the fastest measurement, use manual range adjustment (automatic range adjustment may take more time).
- If the input signal is greater than the value measured for the specified gear, the word Overload is displayed on the instrument panel and "+9.90000000 E+37" is returned from the remote interface.

2.6.3 MEASure:DIODe?

Command Description: Trigger the measurement immediately after setting all measurement parameters and trigger parameters in on-off mode to their default values, and return the measurement results immediately after the acquisition is completed.

Parameter	None
Typical return	+2.00000000E+00
Configure and read default diode measurements: MEAS:DIOD? Typical response: +1.35690000 E-01	

- The range and resolution are fixed for diode testing: the range is 5 VDC (with 1 mA current source output).
- If the voltage is between 0 and 5.05 V, it is displayed on the front panel. The instrument beeps when the signal is converted to a voltage within the threshold range (unless the buzzer is disabled). If the signal exceeds 5.05 V, the front panel displays "OPEN" and the value returned from SCPI is 9.9 E37.
- FETCh?, READ? And MEASure: DIODe? The query returns the measured voltage regardless of the magnitude of its value.

2.6.4 MEASure:{FREQuency|PERiod}?

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

Command Description: The measurement is triggered immediately after all measurement parameters and trigger parameters in frequency/period mode are set to their default values, and the measurement results are returned immediately after the acquisition is completed. You can also specify the range and resolution of frequency or period.

Parameter	<range>(FREQ): 3 Hz to 1 MHz, 20 Hz by default. <range>(PER): 1 us to 333.33 ms, default 50 ms. <resolution>: The default is the resolution corresponding to the aperture of 100ms.
Typical return	+2.00000000E+03
Frequency measurements are configured with the default aperture. The measurement is then taken, and the measurement is read: MEAS:FREQ? Typical response: +1.59480000 E+03	

- Frequency or period parameters are required only when you specify measurement resolution parameters. There is no need to send a new command for each new frequency or period to be measured. And parameters affect the aperture (gate time).
- If the input voltage is too large for the selected voltage range, the word Overload is displayed on the instrument panel and "+9.90000000 E+37" is returned from the remote interface. Automatic range adjustment can be enabled for input voltage.
- The input signal of the frequency or period measurement has an AC voltage component. By default, this command selects the voltage range using Auto Range.
- When no signal, 0 is returned.

2.6.5 MEASure:{RESistance|FRESistance}?

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

Command Description: Set all measurement parameters and trigger parameters in two-wire/four-wire resistance measurement mode to their default values to trigger the measurement immediately, and return the measurement results immediately after the acquisition. In addition, you can also specify the gear by passing in parameters.

Parameter	<range>: {200 Ω 2 kΩ 20 kΩ 200 kΩ 1 MΩ 10 MΩ 100 MΩ}, default AUTO (automatic range adjustment) <resolution>: See Resolving Tables. The integration time will be set to 10 PLC by default.
Typical return	+2.00000000E+02
Configure the 4-wire resistance measurement using the 200 Ω range at the default resolution. The measurement is then taken, and the measurement is read: MEAS:FRES? 200 Typical Response: +8.89340000 E+01	

- If the input signal is greater than the value measured for the specified gear, the word Overload is displayed on the instrument panel and "+9.90000000 E+37" is returned from the remote interface. You can pass in the AUTO parameter or choose to automatically adjust the range None passing any parameters, or you can manually select a fixed range. Automatic Range Adjustment Conveniently select the range for each measurement based on the input signal. For the fastest measurement, use manual range adjustment (automatic range adjustment may take more time).
- If the input signal is greater than the value measured for the specified gear, the word Overload is displayed on the instrument panel and "+9.90000000 E+37" is returned from the remote interface.

2.6.6 MEASure:TEMPerature

[{FRTD|RTD|FTHermistor|THERmistor|TCouple|DEFAult} [, {DEFAult} [,1 [, {MIN|MAX|DEF}]]]]

Command Description: The measurement is triggered immediately after all measurement parameters and trigger parameters in temperature mode are set to their default values, and the measurement results are returned immediately after the acquisition is completed.

Parameter	<probe_type>: {FRTD RTD FTHermistor THERmistor TCouple}. Default: TCouple. <type> : RTD and FRTD fixed value 85; FTH and FTH fixed value 5000; TC optional {J K E T N R S B} (default J). <resolution>: See Parsing Tables or Ranges, resolution, and NPLC. The default value is equivalent to 10 PLC.
Typical return	+2.00000000E+01
Configure 4-wire RTD measurements with the default resolution. The measurement is then taken, and the measurement is read: MEAS:TEMP? FRTD, 85 Typical Response: +2.45980000 E+01	

- To change the TEMPerature UNIT, use UNIT: TEMPerature.
- If the input signal is greater than what can be measured, the word Overload is displayed on the instrument panel and "+9.90000000 E+37" is returned from the remote interface.
- For thermocouple measurements, select an internal reference. See SENSE:TEMPerature:TCouple:RJUNction:TYPE.

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

Command Description: The measurement is triggered immediately after all measurement parameters and trigger parameters are set to their default values, and the measurement results are returned immediately after the acquisition is completed. In addition, you can specify the gear by passing in parameters.

Parameter	<range>: {200 mV 2 V 20 V 200 V 1000 V(DC) 750V(AC)}, default AUTO. <resolution> (AC): Optional and ignored. <resolution> (DC): See resolution Table. The default setting integration time is 10PLC.
Typical return	+2.00000000E+01
Configure DC voltage measurements using the 20 V range. The measurement is then taken, and the measurement is read: MEAS:VOLT:DC? 20 Typical Response: +8.54530000 E+01	

- You can pass in the AUTO parameter or choose to automatically adjust the range None passing any parameters, or you can manually select a fixed range. Automatic Range Adjustment Conveniently select the range for each measurement based on the input signal. For the fastest measurement, use manual range adjustment (automatic range adjustment may take more time).
- If the input signal is greater than the value measured for the specified gear, the word Overload is displayed on the instrument panel and "+9.90000000 E+37" is returned from the remote interface.

2.6.8 MEASure:CAPacitance [{<range>|AUTO|MIN|MAX|DEF}][,{<resolution>|MIN|MAX|DEF}]

Command Description: Set all measurement parameters and trigger parameters to their default values, trigger the measurement immediately after the capacitance measurement, and return the measurement results immediately after the acquisition. In addition, you can specify the gear by passing in parameters.

Parameter	<range>: {2nF 20nF 200nF 2uF 20uF 200uF 2mF 20mF 100mF}, default AUTO. <resolution>: Optional and ignored.
Typical return	+2.00000000E-10

Configure capacitance measurement. The measurement is then taken, and the measurement is read:

MEAS:CAP?

Typical Response: +3.02534021 E-10

- You can pass in the AUTO parameter or choose to automatically adjust the range None passing any parameters, or you can manually select a fixed range. Automatic Range Adjustment Conveniently select the range for each measurement based on the input signal. For the fastest measurement, use manual range adjustment (automatic range adjustment may take more time).
- If the input signal is greater than the value measured for the specified gear, the word Overload is displayed on the instrument panel and "+9.90000000 E+37" is returned from the remote interface.

2.7 MMEemory Subsystem

The instructions of the MMEemory subsystem are used for general file management.

Folder and file formats

Many MMEemory commands point to folders and files. These have specific structures, as described below.

<folder> format

- <folder> format is "[[<drive>:] <path>]", where <drive> can be INTernal or USB, <path> is the folder path, and <filespec> specifies a subset of files.
- INTernal Specifies the INTernal flash file system. USB Specifies the front panel USB storage device.
- If <drive> is specified, <path> is interpreted as an absolute folder path. The absolute path begins with "\" or "/" and starts at the root folder <drive>.
- If you omit < drive >, < path > is the path relative to the folder specified by MMEemory: CDIRectory. The relative path must not start with \ or /.
- Folder and file names cannot contain the following characters: \ : * ? " < > |
- <folder> parameter cannot exceed 240 characters.
- Specify that the folder must exist and cannot be marked as hidden or system. The exception is MMEemory: MDIRectory, which creates a folder. For MMEemory: MDIRectory, all folder levels above the new level must exist.

<file> format

- The format of < file > is "[[< drive >:] < path >] < file _ name >", where < drive > can be INTernal or USB and < path > is the folder path.
- INTernal Specifies the INTernal flash file system. USB Specifies the front panel USB storage device.
- If < drive > is specified, < path > is interpreted as an absolute folder path. The absolute path begins with "\" or "/" and starts at the root folder < drive >.
- If you omit < drive >, < path > is the path relative to the folder specified by MMEemory: CDIRectory. The relative path must not start with \ or /.
- Folder and file names cannot contain the following characters: \ : * ? " < > |
- The combination of folder and file names must not exceed 240 characters.

2.7.1 MMEemory:CATalog[:ALL]? [<folder>[<filespec>]]

Command Description: Returns a list of files in the specified folder.

Parameter	<folder>: folder path, defaults to INT:\. <filespec>: file specification
------------------	---

Typical return	+0,+83703808
Query the list of files in a folder: MMEM:CAT? Typical return: +0, +83703808	

- If < file spec > is ignored or it is *. *, the command or query works for all files. You can also use * as a generic wildcard: *. sta, * csv *. *, and so on.
- The first number is the number of bytes used on the drive. The second number indicates the number of bytes available. Each < file list > is in the following format: "< file name >, < file type >, < file size >" (including quotation marks), where < file name > is the file name including the file extension (if any); < file type > or. sta file,. csv file,. prf file), FOLD (for folders), empty for all other file extensions; < file size > is the file size expressed in bytes.
- If no file exists, only < storage space used >, < storage space available > will be returned.

2.7.2 MMEMory:CDIRectory <folder>

MMEMory:CDIRectory?

Command Description: Select the default folder for the MMEMory subsystem command.

Parameter	<folder>: folder path, defaults to INT:\.
Typical return	INT:\
Select the default folder as BACK MMEM:CDIR BACK MMEM:CDIrectory? Typical return: INT:\ BACK	

- The folder must exist. The default path specified is the volatile setting.

2.7.3 MMEMory:MDIRectory <folder>

Command Description: Create a new directory (folder) on the storage medium.

Parameter	<folder>: folder path.
Typical return	None
Create a new folder as BACK MMEM:MDIR INT:\BACK	

2.7.4 MMEMory:RDIRectory <folder>

Command Description: Delete a directory (folder) on a storage medium.

Parameter	<folder>: folder path.
Typical return	None
Delete folder as BACK MMEM:RDIR INT:\BACK	

- You can only delete empty folders. Otherwise, the instrument will generate a "Directory not empty" error.

2.7.5 MMEMory:COPY <file1>,<file2>

Command Description: Copy < file1 > to < file2 >. Each file name must include a file extension.

Parameter	<file1>: Source file name. <file2>: Target file name.
Typical return	None
On the internal flash file system, copy the status file from the root directory to another folder: MMEM:COPY "INT:\MyData.csv","USB:\MyData.csv"	

- Each file name must include a file extension.
- The source files and source folders must exist.
- The destination folder must exist.
- If the target file exists, it is overwritten.

2.7.6 MMEMory:DELeTe {<file>|<filespec>}

Command Description: Delete a file.

Parameter	<file>: file name <filespec> may include * as a wildcard: *. png, *. sta, abc *. *, etc.
Typical return	None
Delete a file from the internal flash file system root: MMEM:DEL "INT:\MyData.csv "	

- <filespec> may include * as a wildcard: *. csv, *. png, etc.
- Specify that the folder must exist and cannot be marked as hidden or system.

- The SYSTem:SECurity:IMMediate command deletes and cleans all files.

2.7.7 MMEMory:MOVE <file1>,<file2>

Command Description: Move or rename files.

Parameter	<file1>: source file name <file2>: Target file name
Typical return	None
On the internal flash file system, move the status file from the root directory to another folder: MMEM:COPY "INT:\MyData.csv","USB:\MyData.csv"	

- Each file name must include a file extension. To rename a file, specify the same folder for < file 1 > and < file 2 >.

2.7.8 MMEMory:LOAD:PREFerences <file>

MMEMory:STORe:PREFerences <file>

Command Description:

- Load: Instrument and loads I/O settings and user preferences from file.
- Storage: Stores I/O settings and user preferences in a single file.

Parameter	<file>: file name
Typical return	None
Load and store preference files: MMEM:LOAD:PREF "INT:/PREF_0.prf" MMEM:STOR:PREF "INT:/PREF_0.prf"	

- Any valid file name If the file name does not contain the. prf file extension, the instrument firmware will automatically attach it.

2.7.9 MMEMory:LOAD:STATe <file>

MMEMory:STORe:STATe <file>

Command Description:

- Load: Instrument and loads the instrument status from the file.
- Storage: Stores the instrument status in a file.

Parameter	<file>: file name
Typical return	None

Load and store preference files:

```
MMEM:LOAD:STA "INT:/PREF_0.prf"
```

```
MMEM:STOR:STA "INT:/PREF_0.prf"
```

- Any valid file name If the file name does not contain the .sta file extension, the instrument firmware will automatically attach it.

2.7.10 MMEMory:STATe:RECall:AUTO {ON|1|OFF|0}

MMEMory:STATe:RECall:AUTO?

Command Description: Power-ON settings: ON sets the user, OFF sets as the default. If the user does not specify a boot setting file, the default configuration file is still called.

Parameter	{OFF 0 1 ON} Default: OFF
Typical return	0
Specify the boot settings file: MMEM:STAT:REC:SEL "INT:\STATE_0" MMEMory:STATe:RECall:SElect? "INT:/STATE_0.sta"	

- When the instrument first leaves the factory, it has been configured to automatically call the power-off status file when power is restored. This setting is non-volatile.

2.7.11 MMEMory:STATe:RECall:SElect <file>

Command Description: Select the state of the instrument to be used on power-up when auto-call mode is enabled.

Parameter	<file>: file name
Typical return	None
Select to set the instrument status when auto call mode is enabled: MMEM:STAT:REC:SEL "INT:\STATE_0" MMEMory:STATe:RECall:SElect? "INT:/STATE_0.sta"	

- The folder must exist when the instrument first left the factory and was configured to automatically call the power-off status file when the power is restored. This setting is non-volatile.

2.7.12 MMEMory:STATe:VALid? <file>

Command Description: Returns 1 if the specified status file exists. Otherwise returns 0.

Parameter	<file>: file name
Typical return	0
Query the specified file status: MMEM:STAT:VAL? "INT:\STATE_0.sta" Typical return: 1	

- The specified folder must exist and the specified file cannot be empty.

2.7.13 MMEMory:DOWNload:DATA <binary_block>

Command Description: The data in < binary block > will be written to the selected file.

Parameter	< binary_block >: # number of digits to write, number to write, content to write
Typical return	None
Writes the binary block to the specified file: MMEM:DOWN:FNAME "INT:\Myfile" MMEM:DOWN:DATA #13DMM	

- If you execute this command, any data previously stored in the file is lost.

2.7.14 MMEMory:DOWNload:FNAME <file>

MMEMory:DOWNload:FNAME?

Command Description: Creates or opens the specified file name.

Parameter	<file>: file name
Typical return	None
Create the Myfile file: MMEM:DOWN:FNAME "INT:\Myfile"	

- Specifies that the folder must exist and is overwritten if the target file exists; This file is created if it does not already exist.

2.7.15 MMEMory:STORe:DATA <file>

Command Description: Stores all measurements in the reading memory to the specified data file.

Parameter	<file>: file name
Typical return	None
Store measurement data to a MyMeas file: MMEM:STOR:DATA "INT:\MyMeas.csv"	

- If the file name does not contain a . csv file extension, the instrument firmware will automatically attach it.

2.7.16 MMEMory:UPLoad? <file>

Command Description: Uploads file contents from the instrument to the host computer.

Parameter	<file>: file name
Typical return	None
To load the MyMeas file onto the computer: MMEMory:UPLoad? "INT:\MyMeas.csv"	

2.8 SENSE Subsystem

SENSe subsystem configuration measurements. The most basic SENSE command is [SENSe:]FUNCTION [:ON], which selects the measurement FUNCTION. All other SENSE commands are associated with specific measurement types:

current

Frequency and Period

Resistance

Temperature

Voltage

Capacitance

Data 2

2.8.1 [SENSe:]FUNCTION[:ON] “<function>”

[SENSe:]FUNCTION[:ON]?

Command Description: Select the measurement mode (preserve all measurement properties related to the function).

Parameter	CONTinuity CURRent:AC CURRent[:DC] DIODe FREQuency FREStance PERiod RESistance TEMPerature VOLTage:AC VOLTage[:DC] CAPacitance The default is VOLTage [: DC].
Typical return	Returns the abbreviated form of the selected function enclosed in quotation marks, None displaying the optional keywords: "CONT", "CURR: AC", "CURR", "DIOD", etc.
Select AC voltage function: FUNC "VOLT:AC"	

- If you change the measurement function, remember all the measurement properties of the previous function (range, resolution, etc.). If you return to the original function, those measurement properties will be restored.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

2.8.2 [SENSe:]CURRent Subsystem

This subsystem is configured for AC and DC current measurements.

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

Command Description: Enables or disables null functions for AC or DC current measurements.

Note: This parameter is not shared in AC and DC measurements and is independent of AC and DC measurements.

Parameter	{ON 1 OFF 0}, default to OFF
Typical return	0 (off) or 1 (on)
The AC current measurement was configured by subtracting 100 mA from the measurement using a null function. Two measurements are then taken and the measurements are sent to the instrument's output buffer: CONF:CURR:AC CURR:AC:NULL:STAT ON;VAL 100 mA SAMP:COUN 2 READ? Typical Response: +1.12650000 E+00, +1.12650000 E+00	

- Enabling the scaling feature also enables automatic zeroing VALue selection ([SENSe:] CURRent: {AC | DC}: NULL: VALue: AUTO ON).
- To set a fixed zero VALue, use this command:
[SENSe:]CURRent:{AC|DC}:NULL:VALue.
- The instrument disables empty functions after factory reset (*RST), instrument PRESet (SYSTem:PRESet), or CONFigure function.

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

Command Description: Specify a null value for the current measurement. If the null state is turned on, the null value is deducted from each sample.

Note: This parameter is not shared in AC and DC measurements and is independent of AC and DC measurements.

Parameter	-10.5 A to 10.5 A, default 0
Typical return	+1.00000000E+01

The AC current measurement was configured by subtracting 100 mA from the measurement using a null function. Two measurements are then taken and the measurements are sent to the instrument's output buffer:

```
CONF:CURREN:AC
```

```
CURREN:AC:NULL:STAT ON;VAL 100 mA
```

```
SAMP:COUN 2
```

```
READ?
```

```
Typical Response: +1.12650000 E+00, +1.12650000 E+00
```

- Specifying a zeroing VALue disables automatic zeroing VALue selection ([SENSe:]CURRENt:{AC|DC}:NULL:VALue: AUTO OFF).
- To use the zero value, you must first turn on the zero switch ([SENSe:]CURRENt:{AC|DC}:NULL:STATe ON).
- The instrument disables empty functions after factory reset (*RST), instrument PRESet (SYSTem: PRESet), or CONFIgure function.

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

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

Command Description: Enables or disables automatic null selection for AC or DC current measurements.

Note: This parameter is not shared in AC and DC measurements and is independent of AC and DC measurements.

Parameter	{ON 1 OFF 0}, default to OFF
Typical return	0 (off) or 1 (on)
The AC current measurement was configured by subtracting 100 mA from the measurement using a null function. Two measurements are then taken and the measurements are sent to the instrument's output buffer: <pre>CONF:CURREN:AC CURREN:AC:NULL:STAT ON;VAL 100 mA SAMP:COUN 2 READ? Typical Response: +1.06580000 E+00, +1.06950000 E+00</pre> Take another set of measurements with automatic null selection: <pre>CURREN:AC:NULL:VAL:AUTO ON READ? Typical Response: +0.00000000 E+00, +0.03650000 E+00</pre>	

- When the auto-reference selection is turned on, the first measurement made is used as a null value for all subsequent measurements.
[SENSe:]CURRent:{AC|DC}:NULL:VALue has been set to this VALue.
Automatic null selection will be disabled.
- When automatic NULL selection is turned OFF (OFF), specify a NULL VALue using the following command: [SENSe:]CURRent:{AC|DC}:NULL: VALue.
- The instrument enables automatic NULL selection when the NULL function is enabled ([SENSe:]CURRent:{AC|DC}:NULL:STATe ON).
- This parameter is set to its default value after factory reset (*RST), instrument PRESet (SYSTem:PRESet), or CONFIgure function.

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

Command Description: Manually select the measurement range.

Parameter	<range>: {200 μ A 2 mA 20 mA 200 mA 2 A 10A}. Default value: AUTO (automatic range adjustment).
Typical return	+1.00000000 E-01
AC current measurement is configured with a 2 A range. Take two measurements and take readings: CONF:CURR:AC CURR:AC:RANG 2 SAMP:COUN 2 READ? Typical Response: +1.12650000 E+00, +1.12650000 E+00	

- Select Fixed RANGe ([SENSe:].RANGe) to disable automatic RANGe adjustment.
- If the input signal is greater than the value measured for the specified gear, the word Overload is displayed on the instrument panel and "+9.90000000 E+37" is returned from the remote interface.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

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

Command Description: Disables or enables automatic range adjustment for AC and DC current measurements.

Note: This parameter is not shared in AC and DC measurements and is independent of AC and DC measurements.

Parameter	{ON 1 OFF 0}, default ON
Typical return	0 (off) or 1 (on)
Configure AC current measurement and perform automatic range adjustment immediately. Take two measurements and take readings: CONF:CURREN:AC CURREN:AC:RANG:AUTO ON SAMP:COUN 2 READ? Typical Response: +1.12650000 E+00, +1.12650000 E+00	

- With Auto Range Adjustment enabled, the instrument selects the range based on the input signal.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

2.8.2.6 [SENSe:]CURRENt[:DC]:NPLC {<PLC>|MIN|MAX|DEF} [SENSe:]CURRENt[:DC]:NPLC? [{MIN|MAX|DEF}]

Command Description: Sets the integration time expressed in the number of power line cycles (PLC) for DC current. Longer integration time gives higher measurement resolution, but the measurement speed is slower.

Parameter	0.006、0.02、0.06、0.2、1、10、100. Default: 10. For more information, see Range, Resolution, and NPLC.
Typical return	+1.00000000E+01
DC current measurements were configured with 10 PLC integration time. The measurement is then taken, and the measurement is read: CONF:CURREN:DC VOLT:DC:NPLC 10 READ? Typical Response: +4.98283002 E-04	

- Provides normal mode (line frequency noise) suppression with only 1, 10, or 100 PLC integration times.
- Setting the integration time also sets the measurement resolution. The parsing table shows the relationship between integration time and resolution. See [SENSe:] VOLTage [:DC]:RESolution.

- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

2.8.2.7 SENSE:]CURREnt[:AC]:BANDwidth {|MIN|MAX|DEF} [SENSe:]CURREnt[:AC]:BANDwidth? [{MIN|MAX|DEF}]

Command Description: Set the AC current filtering function.

Parameter	{3 Hz 20 Hz 200 Hz}. Default: 20Hz
Typical return	+2.00000000E+01
Configure AC current 200mA range Use a 3Hz filter to measure and read the measurement results: CONF:CURREnt:AC 200mA VOLT:AC:BAND 3 READ?	

- Entering 15 Hz selects a low speed filter (3 Hz). Entering 190 Hz selects a medium speed filter (20 Hz) to support the appropriate low cutoff frequency.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

2.8.2.8 [SENSe:]CURREnt[:DC]:RESolution {<resolution>|MIN|MAX|DEF} [SENSe:]CURREnt[:DC]:RESolution? [{MIN|MAX|DEF}]

Command Description: Select measurement resolution for DC current.

Parameter	<resolution>: See Parsing Tables or Ranges, resolution, and NPLC. The default is equivalent to 10 PLC. Specify <resolution> in units of measurement (V, A, Hz, Ω , etc.).
Typical return	+3.00000000E-05
DC current measurement is configured with 3 μ A resolution. The measurement is then taken, and the measurement is read: CONF:CURREnt:DC 1 CURREnt:DC:RES 3E-6 READ? Typical Response: +2.26531500 E-01	

- You can specify MIN (best resolution) or MAX (worst resolution) instead of <resolution>.

- In order to achieve normal mode (line frequency noise) suppression, a resolution corresponding to the integration time is used, which is an integral multiple of the number of source line cycles.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

2.8.2.9 [SENSe:]CURREnt:AC:SECondary {"OFF"|"FREQuency"|"VOLTage:AC"} [SENSe:]CURREnt:AC:SECondary?

Command Description: Select AC current measurement auxiliary measurement function.

Parameter	{"OFF" "FREQuency" "VOLTage:AC"} . Default: "OFF".
Typical return	FREQ
AC current measurement is configured with a 2 A range. Frequency is selected as an auxiliary measurement. Take measurements and retrieve measurements. CONF:CURREnt:AC 2 CURREnt:AC:SEC "FREQ" READ?;DATA2? Typical response: +0.20000000 E+00; +1.00000000 E+04	

- "FREQuency"-FREQuency measurement of the input signal.
- "VOLTage: AC"-AC VOLTage measurement of the input signal.
- Use READ? Or INITiate to start measuring.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

2.8.2.10 [SENSe:]CURREnt[:DC]:SECondary {"OFF"|"VOLTage:DC"} [SENSe:]CURREnt[:DC]:SECondary?

Command Description: Select the DC current measurement auxiliary measurement function.

Parameter	{"OFF" "VOLTage:DC"}
Typical return	VOLT:DC
DC current measurements were configured using the 20mA range. The DC voltage is selected as the auxiliary measurement result. Take measurements and retrieve measurements. CONF:CURREnt:DC 20mA VOLT:DC:SEC "VOLT"	

READ?;DATA2?

Typical Response: +5.70882545 E-04; +1.00000000 E-01

- "VOLTate: DC"-DC voltage measurement of the input signal.
- Use READ? Or INITiate to start measuring.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

2.8.2.11 [SENSe:]CURREnt[:DC]:ZERO:AUTO[:STATe] {ON|1|OFF|0} [SENSe:]CURREnt[:DC]:ZERO:AUTO[:STATe]?

Command Description: Disable or enable the DC current zeroing function.

Parameter	{ON 1 OFF 0}, default ON
Typical return	0 (off) or 1 (on)
Configure DC current measurement and perform automatic zeroing immediately. Take two measurements and take readings: CONF:CURR:DC 2 VOLT:DC:ZERO:AUTO ON SAMP:COUN 2 READ? Typical Response: +3.55361441 E-04, +1.14888780 E-03	

- ON (default): After each measurement, the DMM internal measurement offset. This measurement is then subtracted from the previous reading. This prevents the offset voltage on the DMM input circuit from affecting the measurement accuracy.
- OFF: The instrument takes the last determined zeroing measurement and subtracts it from each measurement. Whenever you change a function, range, or integration time, it takes a new zero reading.

2.8.3 [SENSe:]{FREQuency|PERiod} Subsystem

This subsystem configures frequency and cycle measurements.

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

Command Description: Enables or disables the zeroing function.

Note: This parameter is independent of frequency and period measurements.

Parameter	{ON 1 OFF 0}, default to OFF
Typical return	0 (off) or 1 (on)
The frequency measurement is configured by subtracting 1 kHz from the measurement using a null function. Take two measurements and take readings: CONF:FREQ FREQ:NULL:STAT ON; VAL 1 kHz SAMP:COUN 2 READ? Typical Response: +1.04560000 E+03, +1.04580000 E+03	

- Enabling the NULL feature also enables automatic zeroing VALue selection ([SENSe:] {FREQuency|PERiod}:NULL:VALue:AUTO ON).
- To set a fixed NULL VALue, use: [SENSe:] {FREQuency|PERiod}:NULL:VALue.
- The instrument disables empty functions after factory reset (*RST), instrument PRESet (SYSTem:PRESet), or CONFIgure function.

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

Command Description: Sets the zeroing value.

Note: This parameter is independent of frequency and period measurements.

Parameter	Frequency:-1.1 E6 to +1.1 E6. Default: 0. Period:-1.1 to +1.1 seconds. Default: 0.
Typical return	+0.00000000E-00
The frequency measurement is configured by subtracting 1 kHz from the measurement using a null function. Take two measurements and take readings: CONF:FREQ FREQ:NULL:STAT ON; VAL 1 kHz SAMP:COUN 2 READ? Typical Response: +1.04560000 E+03, +1.04580000 E+03	

- Specifying a zeroing VALue disables automatic zeroing VALue selection ([SENSe:] {FREQuency|PERiod}:NULL:VALue: AUTO OFF).
- To use the zero value, you must first turn on the zero switch ([SENSe:] {FREQuency|PERiod}:NULL:STATe ON).

- This parameter is set to its default value after a factory reset or CONFIGure function.

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

Command Description: Enables or disables automatic null selection for frequency and period measurements.

Note: This parameter is independent of frequency and period measurements.

Parameter	{ON 1 OFF 0}, default to OFF
Typical return	0 (off) or 1 (on)
Configure the frequency measurement and use the empty function to subtract 1 kHz from the measurement. Take two measurements and take readings: CONF:FREQ FREQ:NULL:STAT ON; VAL 1 kHz SAMP:COUN 2 READ? Typical Response: +1.04598700 E+00, +1.04515600 E+00 Take another set of measurements with automatic null selection: FREQ:NULL:VAL:AUTO ON READ? Typical Response: +0.00000000 E+00, +0.06590000 E+00	

- When the automatic reference value select switch is turned on, the first measurement taken is used as the zeroing value for all subsequent measurements. Set [SENSe:] {FREQuency|PERiod}:NULL:VALue to this VALue. The automatic reference value selection function is then disabled.
- After disabling automatic zero value selection (OFF), try to manually specify a zero value with this command:
[SENSe:]{FREQuency|PERiod}:NULL:VALue.
- When the zeroing function is enabled, the instrument enables automatic zeroing value selection ([SENSe:] {FREQuency|PERiod}:NULL:STATe ON).
- This parameter is set to its default value after factory reset (*RST), instrument PRESet (SYSTem:PRESet), or CONFIGure function.

2.8.3.4 [SENSe:]{FREQuency|PERiod}:RANGe:LOWer {<freq>|MIN|MAX|DEF} [SENSe:]{FREQuency|PERiod}:RANGe:LOWer? [{MIN|MAX|DEF}]

Command Description: Sets the AC bandwidth used to detect the signal during frequency and period measurements.

Note: This parameter is shared between frequency and period measurements.

Parameter	{3 Hz 20 Hz 200 Hz}. Default: 20Hz.
Typical return	+2.00000000E+01
Take frequency measurements and read the measurements. Using 3 Hz filter bandwidth: CONF:FREQ FREQ:RANG:LOW 3 READ?	

- Entering 15 Hz selects a low speed filter (3 Hz). Entering 190 Hz selects a medium speed filter (20 Hz) to support the appropriate low cutoff frequency.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

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

Command Description: Select a fixed voltage range for frequency and cycle measurements.

Parameter	<range>: {200 mV 2 V 20 V 200 V 750V}, default is 200 mV
Typical return	+2.00000000E-02
Frequency measurements are configured using a 20 VAC range. Take two measurements and take readings: CONF:FREQ FREQ:VOLT:RANG 20 SAMP:COUN 2 READ?	

- Select Fixed RANGE ([SENSe:] <function>:RANGe) to disable automatic RANGE adjustment.

- If the input signal is greater than the value measured for the specified gear, the word Overload is displayed on the instrument panel and "+9.90000000 E+37" is returned from the remote interface.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

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

Command Description: Disables or enables automatic voltage range adjustment for frequency and cycle measurements.

Parameter	{ON 1 OFF 0}, default ON
Typical return	0 (off) or 1 (on)
Configure frequency measurement and perform automatic range adjustment of AC voltage immediately. Take two measurements and take readings: CONF:FREQ FREQ:VOLT:RANG:AUTO ON SAMP:COUN 2 READ?	

- With Auto Range Adjustment enabled, the instrument selects the range based on the input signal.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

2.8.3.7 [SENSe:]FREQuency:SECondary {"OFF"|"PERiod"} [SENSe:]FREQuency:SECondary?

Command Description: Select an auxiliary measurement function for frequency measurement.

Parameter	{"OFF" "PERiod"} . Default: "OFF".
Typical return	PER
Configure frequency measurements, select periods as auxiliary measurements, and make measurements and retrieve measurements. CONF:FREQ MAX, MAX FREQ:SEC "PERiod" READ?;DATA2? Typical Response: +1.00000000 E+02; +1.00000000 E-02	

- "PERiod"-Periodic measurement of the input signal.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

2.8.3.8 [SENSe:]PERiod:SECondary {"OFF"|"FREQuency"}

[SENSe:]PERiod:SECondary?

Command Description: Select an auxiliary measurement function for periodic measurement.

Parameter	{"OFF" "FREQuency"}. Default: "OFF".
Typical return	FREQ
Configure periodic measurements, select frequencies as auxiliary measurements, and make measurements and retrieve measurement results. CONF:PER MAX, MAX PER:SEC "FREQ" READ?;DATA2? Typical response: +1.00000000 E-02; +1.00000000 E+02	

- "FREQuency"-FREQuency measurement of the input signal.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

2.8.3.9 [SENSe:]{FREQuency|PERiod}:APERture {<value>|MIN|MAX|DEF}

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

Command Description: Select gate time in frequency/period measurement mode.

Note: This parameter is shared between frequency and period measurements.

Parameter	<value>: {10ms 100ms 1s}, default is 100ms MIN: 10 ms; MAX: 1 s; DEF: 100 ms
Typical return	+1.00000000E-01
Frequency measurements were configured using 100 ms. Take two measurements and take readings: CONF:FREQ FREQ:APER 0.1 SAMP:COUN 2 READ?	

- The aperture for frequency and period measurements does not automatically adjust the range.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

2.8.4 [SENSe:]{RESistance|FRESistance} Subsystem

This subsystem is configured with 2-wire and 4-wire resistance measurements.

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

Command Description: Set the integration time expressed as the number of power line cycles (PLC) for all resistance measurements. Longer integration time gives higher measurement resolution, but the measurement speed is slower.

Parameter	0.006、0.02、0.06、0.2、1、10、100. Default: 10. For more information, see Range, Resolution, and NPLC.
Typical return	+1.00000000E+01
The 4-wire resistance measurement was configured using 10 PLC integration time. The measurement is then taken, and the measurement is read: CONF:FRES FRES:NPLC 10 READ? Typical Response: +6.36520000 E+01	

- Provides normal mode (line frequency noise) suppression with only 1, 10, or 100 PLC integration times.
- Setting the integration time also sets the measurement resolution. The parsing table shows the relationship between integration time and resolution. See [SENSe:] VOLTage [:DC]:RESolution.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

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

Command Description: Enables or disables empty functions for all resistance measurements.

Parameter	{ON 1 OFF 0}, default to OFF
------------------	------------------------------

Typical return	0 (off) or 1 (on)
Configure a 2-wire resistance measurement, using a wire resistance of a null function of 100 mΩ. Take two measurements and take readings: CONF:RES RES:NULL:STAT ON;VAL 0.1 SAMP:COUN 2 READ? Typical response: +1.04570000 E+02, +1.04530000 E+02	

- Enabling the scaling feature also enables automatic zeroing value selection ([SENSe:]{RESistance|FRESistance}:NULL:VALue:AUTO ON).
- To set a fixed zero VALue, use this command:
[SENSe:]{RESistance|FRESistance}:NULL:VALue.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

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

Command Description: Specify a null value for all resistance measurements.

Parameter	-110 MΩ to +110 MΩ, default 0
Typical return	+1.000000000E+01
Configure the 2-wire resistance measurement and use the zeroing function to remove the wire resistance of 100 mΩ. Take two measurements and take readings: CONF:RES RES:NULL:STAT ON;VAL 0.1 SAMP:COUN 2 READ? Typical response: +1.04570000 E+02, +1.04530000 E+02	

- Specifying a zeroing value disables automatic zeroing value selection ([SENSe:] {RESistance|FRESistance}:NULL:VALue:AUTO OFF).
- To use the zero value, you must first turn on the zero switch ([SENSe:]{RESistance|FRESistance}:NULL:STATe ON).
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

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

Command Description: Enables or disables automatic null selection for all resistance measurements.

Parameter	{ON 1 OFF 0}, default to OFF
Typical return	0 (off) or 1 (on)
Configure the 2-wire resistance measurement and use the empty function to remove the 100 mΩ wire resistance. Take two measurements and take readings: CONF:RES RES:NULL:STAT ON;VAL 0.1 SAMP:COUN 2 READ? Typical Response: +1.06580000 E+00, +1.06950000 E+00 Take another set of measurements with automatic null selection: RES:NULL:VAL:AUTO ON READ? Typical Response: +0.00000000 E+00, +0.03650000 E+0	

- When the auto-reference selection is turned on, the first measurement made is used as a null value for all subsequent measurements.
[SENSe:]{RESistance|FRESistance}:NULL:VALue has been set to this VALue. Automatic null selection will be disabled.
- When automatic NULL selection is disabled (OFF), specify a NULL VALue using the following command:
[SENSe:]{RESistance|FRESistance}:NULL:VALue.
- The instrument enables automatic NULL selection when the NULL function is enabled ([SENSe:]{RESistance| FRESistance}:NULL:STATe ON).
- This parameter is set to its default value after factory reset (*RST), instrument PRESet (SYSTem:PRESet), or CONFigure function.

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

Command Description: Select a fixed measurement range for all resistance measurements.

Parameter	<range>: {200 Ω 2 kΩ 20 kΩ 200 kΩ 1 MΩ 10 MΩ 100 MΩ}, default 200 Ω
------------------	---

Typical return	+2.00000000E+02
Use 20 k Ω range configuration 2-wire resistance measurement. The measurement is then taken, and the measurement is read: CONF:RES RES:RANG 20E3 READ? Typical response: +1.36520000 E+03	

- Select Fixed RANGE ([SENSe:] <function>:RANGe) to disable automatic RANGE adjustment.
- If the input signal is greater than the value measured for the specified gear, the word Overload is displayed on the instrument panel and "+9.90000000 E+37" is returned from the remote interface.
- This parameter is set to its default value after factory reset (*RST), instrument PRESet (SYSTem:PRESet), or CONFigure function.

2.8.4.6 [SENSe:]RESistance:ZERO:AUTO[:STATe] {ON|1|OFF|0} [SENSe:]RESistance:ZERO:AUTO[:STATe]?

Command Description: Disables or enables the automatic range adjustment function in two-wire/four-wire resistance measurement mode.

Parameter	{ON 1 OFF 0}, default ON
Typical return	0 (off) or 1 (on)
Configure 2-wire resistance measurement and perform automatic range adjustment immediately. Take two measurements and take readings: CONF:RES RES:RANG:AUTO ON SAMP:COUN 2 READ? Typical response: +1.04570000 E+02, +1.04530000 E+02	

- With Auto Range Adjustment enabled, the instrument selects the range based on the input signal.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

2.8.5 [SENSe:]TEMPerature Subsystem

This subsystem configures temperature measurements.

2.8.5.1 [SENSe:]TEMPerature:NPLC {<PLC>|MIN|MAX|DEF}

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

Command Description: Sets the integration time expressed in the number of power line cycles (PLC) for the temperature measurement. Longer integration time gives higher measurement resolution, but the measurement speed is slower.

Parameter	0.006、0.02、0.06、0.2、1、10、100. Default: 10. For more information, see Range, Resolution, and NPLC.
Typical return	+1.00000000E+01
Configure 4-wire RTD measurements using 10 PLC integration time. The measurement is then taken, and the measurement is read: CONF:TEMP FRTD TEMP:NPLC 10 READ? Typical Response: +6.65890000 E+01	

- Provides normal mode (line frequency noise) suppression with only 1, 10, or 100 PLC integration times.
- Setting the integration time also sets the measurement resolution. The parsing table shows the relationship between integration time and resolution. See [SENSe:] VOLTage [: DC]: RESolution.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

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

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

Command Description: Enables or disables empty functions for temperature measurements.

Parameter	{ON 1 OFF 0}, default to OFF
Typical return	0 (off) or 1 (on)
The 4-wire RTD measurement is configured using the empty function subtracting 25. Take two measurements and take readings: CONF:TEMP RTD TEMP:NULL:STAT ON;VAL 25 SAMP:COUN 2 READ?	

Typical Response: +1.04670000 E+00, +1.04890000 E+00

- Enabling the scaling feature also enables automatic zeroing value selection ([SENSe:] TEMPerature:NULL:VALue:AUTO ON).
- To set a fixed zero VALue, use this command:
[SENSe:]TEMPerature:NULL:VALue.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

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

Command Description: Specify a null value for the temperature measurement. If the null state is turned on, the null value is deducted from each sample.

Parameter	-1200 to +1200, default is 0
Typical return	+0.00000000E-00
The 4-wire RTD measurement is configured using the empty function subtracting 25. Take two measurements and take readings: CONF:TEMP RTD TEMP:NULL:STAT ON;VAL 25 SAMP:COUN 2 READ? Typical Response: +1.04670000 E+00, +1.04890000 E+00	

- Specifying a NULL VALue disables automatic NULL selection ([SENSe:]TEMPerature:NULL:VALue:AUTO OFF).
- To use the zero value, you must first turn on the zero switch ([SENSe:]TEMPerature:NULL:STATe ON).
- This parameter is set to its default value after factory reset (*RST), instrument PRESet (SYSTem:PRESet), or CONFigure function.

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

Command Description: Enables or disables automatic null selection for temperature measurements.

Parameter	{ON 1 OFF 0}, default ON
------------------	--------------------------

Typical return	0 (off) or 1 (on)
Take another set of measurements with automatic null selection: CONF:TEMP RTD TEMP:NULL:STAT ON TEMP:NULL:VAL:AUTO ON SAMP:COUN 2 READ? Typical Response: +0.00000000 E+00, +0.05690000 E+00	

- When the auto-reference selection is turned on, the first measurement made is used as a null value for all subsequent measurements.
[SENSe:]TEMPerature:NULL:VALue has been set to this VALue. Automatic null selection will be disabled.
- When automatic NULL selection is turned OFF (OFF), specify a NULL VALue using the following command: [SENSe:]TEMPerature:NULL:VALue.
- The instrument enables automatic NULL selection ([SENSe:]TEMPerature:NULL:STATe ON) when the NULL function is enabled.
- This parameter is set to its default value after factory reset (*RST), instrument PRESet (SYSTem:PRESet), or CONFigure function.

2.8.5.5 [SENSe:]TEMPerature:SECondary {"OFF"|"SENSe:DATA"}

[SENSe:]TEMPerature:SECondary?

Command Description: Select the temperature measurement auxiliary function.

Parameter	{"OFF" "SENSe:DATA"}, default "OFF"
Typical return	OFF
Configure 2-wire RTD measurement. Select the raw sensor value (ohmic value in this example) as the auxiliary measurement. Take measurements and retrieve measurements. CONF:TEMP RTD,85 TEMP:SEC "SENS:DATA" READ?;DATA2? Typical response: +5.41660846 E+00; +1.02115279 E+02	

- "SENSe: DATA" is the raw sensor value; The resistance of the thermistor/RTD, the voltage of the thermocouple.
- Use READ? Or INITiate to start measuring.

- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

2.8.5.6 [SENSe:]TEMPerature:TRANsducer:{FRTD|RTD}:RESistance[:REFerence] {|MIN|MAX|DEF}

[SENSe:]TEMPerature:TRANsducer:{FRTD|RTD}:RESistance[:REFerence]?
[{MIN|MAX|DEF}]

Command Description: Set or query the nominal value of the zero-degree resistor R0 corresponding to the RTD.

Parameter	MIN: 80, MAX: 120, DEF: 100
Typical return	+1.00000000 E+02
A 4-wire RTD measurement was configured using an RTD with an R0 of 100.1 Ω. Take two measurements and take readings: CONF:TEMP FRTD TEMP:TRAN:FRTD:RES 100.1 SAMP:COUN 2 READ? Typical response: +1.09530000 E+02, +1.09570000 E+02	

- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

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

Command Description: Configure the temperature measurement probe type and wiring mode.

Parameter	FRTD: four-wire RTD; RTD: Second line RTD FTHermistor: four-wire thermistor; THERmistor: two-wire THERmistor TCouple: Thermocouple
Typical return	FRTD, RTD, FTH, THER or TC
A 2-wire RTD measurement was configured using an RTD with an R0 of 100.2 Ω. Take two measurements and take readings: FUNC "TEMP" TEMP:TRAN:TYPE RTD	

```
TEMP:TRAN:FRTD:RES 100.2
SAMP:COUN 2
READ?
Typical Response: +2.59530000 E+01, +2.59570000 E+01
```

- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

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

{<temperature>|MIN|MAX|DEF}}

[SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction? [{MIN|MAX|DEF}]

Command Description: Set the cold end temperature value in °C as a fixed unit for thermocouple measurement.

Parameter	MIN:-20 °C; MAX: + 80 °C; DEF: 0 °C
Typical return	+0.00000000 E+00 (always in °C).
Configure Type K thermocouple measurement. Select a fixed reference junction and set the reference junction temperature to + 20 °C. Take two measurements and take readings: <pre>CONF:TEMP TC,K TEMP:TRAN:TC:RJUN:TYPE FIX TEMP:TRAN:TC:RJUN 20.0 SAMP:COUN 2 READ? Typical Response: +3.31785468 E+00, +3.61554515 E+00</pre>	

- This command is fixed in °C and is not affected by the UNIT:TEMPerature command configuration.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

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

{<temperature>|MIN|MAX|DEF}

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

[{MIN|MAX|DEF}]

Command Description: Fine-tune the temperature difference between the built-in cold end and the actual temperature difference of the measurement terminal.

Parameter	MIN:-20 °C; MAX: + 20 °C; DEF: 0 °C
Typical return	+2.00000000E+01
Temperature selection K-type thermocouple, internal cold end temperature compensation is used, and the actual cold end temperature is 5 °C lower than the internal temperature, and the temperature is turned down by 5 °C. The measurement is then taken, and the measurement is read: CONF:TEMP TC,K TEMP:TRAN:TC:RJUN:TYPE INT TEMP:TRAN:TC:CHEC ON SYST:TEMP? TEMP:TRAN:TC:RJUN:OFFS:ADJ -5 READ? Typical Response: +3.31785468 E+00	

- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet). The instrument has an internal cold end temperature sampling point designed, so this adjustment is not recommended to ensure the specified performance index.
- This fixation is in °C and is not affected by the UNIT:TEMPerature command configuration.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

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

Command Description: Configure the thermocouple cold end compensation method.

Parameter	INTernal: Built-in cold end temperature FIXed: Custom cold end temperature Default is INT
Typical return	FIX or INT
Configure Type K thermocouple measurement. Select a fixed reference junction and set the reference junction temperature to + 20 °C. Take two measurements and take readings: CONF:TEMP TC,K TEMP:TRAN:TC:RJUN:TYPE FIX TEMP:TRAN:TC:RJUN 20	

SAMP:COUN 2

READ?

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

- You can use the SYSTem: TEMPerature command to read the internal reference junction TEMPerature value.
- This fixation is in °C and is not affected by the UNIT:TEMPerature command configuration.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

2.8.5.11 [SENSe:]TEMPerature:TRANsducer:TCouple:TYPE {J|K|E|T|N|R|S|B} [SENSe:]TEMPerature:TRANsducer:TCouple:TYPE?

Command Description: Configure the thermocouple type.

Parameter	{J K E T N R S B} . Default to J
Typical return	J, K, E, T, N, R, S or T
Configure Type K thermocouple measurement. Select a fixed reference junction and set the reference junction temperature to + 20 °C. Take two measurements and take readings: CONF:TEMP TC,K TEMP:TRAN:TC:RJUN:TYPE FIX TEMP:TRAN:TC:RJUN 20 SAMP:COUN 2 READ? Typical Response: +3.31785468 E+00, +3.61554515 E+00	

- Thermocouple measurements require a cold end temperature compensation, which can be used either by internal measurements or by known fixed cold end temperatures. The internal reference junction temperature is used by default
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

2.8.5.12 [SENSe:]TEMPerature:TRANsducer:{FTHermistor|THERmistor}:TYPE 5000 [SENSe:]TEMPerature:TRANsducer:{FTHermistor|THERmistor}:TYPE?

Command Description: Configure the thermistor type.

Parameter	Fixed at 5000
Typical return	+5000
Configure 4-wire thermistor measurement. Take two measurements and take readings: CONF:TEMP FTH TEMP:TRAN:FTH:TYPE 5000 SAMP:COUN 2 READ? Typical response: +2.04530000 E+02, +2.04570000 E+02	

2.8.5.13 [SENSe:]TEMPerature:ZERO:AUTO {OFF|ON} [SENSe:]TEMPerature:ZERO:AUTO?

Command Description: Disable or enable the DC voltage zeroing function.

Parameter	{OFF ON}. Default: ON
Typical return	0 (OFF) or 1 (ON)
Configure 2-wire RTD measurements and perform automatic zeroing immediately. Take two measurements and take readings: CONF:TEMP RTD TEMP:ZERO:AUTO ON SAMP:COUN 2 READ? Typical Response: +2.57530000 E+01, +2.57570000 E+01	

- ON (default): After each measurement, the DMM internal measurement offset. This measurement is then subtracted from the previous reading. This prevents the offset voltage on the DMM input circuit from affecting the measurement accuracy.
- OFF: The instrument takes the last determined zeroing measurement and subtracts it from each measurement. Whenever you change a function, range, or integration time, it takes a new zero reading.
- 4 wire resistance measurement, this measurement setting is ignored.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

2.8.6 [SENSe:]VOLTage Subsystem

This subsystem configures DC/AC voltage measurement.

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

Command Description: Enables or disables null functions for AC or DC voltage measurements.

Note: This parameter is not shared in AC and DC measurements and is independent of AC and DC measurements.

Parameter	{ON 1 OFF 0}, default OFF
Typical return	0 (off) or 1 (on)
The AC voltage measurement was configured by subtracting 100 mV from the measurement using a null function. Take two measurements and take readings: CONF:VOLT:AC VOLT:AC:NULL:STAT ON;VAL 100 mV SAMP:COUN 2 READ? Typical Response:-9.86836080 E-02,-9.86850832 E-02	

- Enabling the NULL function also enables automatic zeroing VALue selection ([SENSe:]VOLTage:{AC|DC}:NULL:VALue:AUTO ON).
- To set a fixed NULL VALue, use: [SENSe:]VOLTage:{AC|DC}:NULL:VALue.
- The instrument disables empty functions after factory reset (*RST), instrument PRESet (SYSTem:PRESet), or CONFigure function.

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

Command Description: Specify a null value for the voltage measurement. If the null state is turned on, the null value is deducted from each sample.

Note: This parameter is not shared in AC and DC measurements and is independent of AC and DC measurements.

Parameter	-1050 to +1050 V (DC), default 0 -787.5 to +787.5 V (AC), default 0
Typical return	+1.00000000E+01

The AC voltage measurement was configured by subtracting 100 mV from the measurement using a null function. Take two measurements and take readings:

CONF:VOLT:AC

VOLT:AC:NULL:STAT ON;VAL 100 mV

SAMP:COUN 2

READ?

Typical Response:-9.86836080 E-02,-9.86850832 E-02

- Specifying a zeroing VALue disables automatic zeroing VALue selection ([SENSe:]VOLTage:{AC|DC}:NULL:VALue: AUTO OFF).
- To use the zero value, you must first turn on the zero switch ([SENSe:]VOLTage:{AC|DC}:NULL:STATe ON).
- This parameter is set to its default value after a factory reset or the CONFigure function.

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

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

Command Description: Enables or disables automatic null selection for AC or DC voltage measurements.

Note: This parameter is not shared in AC and DC measurements and is independent of AC and DC measurements.

Parameter	{ON 1 OFF 0}, default to OFF
Typical return	0 (off) or 1 (on)
The AC voltage measurement was configured by subtracting 100 mV from the measurement using a null function. Take two measurements and take readings: CONF:VOLT:AC VOLT:AC:NULL:STAT ON;VAL 100 mV SAMP:COUN 2 READ? Typical Response:-9.86836080 E-02,-9.86850832 E-02 Take another set of measurements with automatic null selection: VOLT:AC:NULL:VAL:AUTO ON READ? Typical Response: +0.00000000 E+00, +3.61633739 E-06	

- When the auto-reference selection is turned on, the first measurement made is used as a null value for all subsequent measurements.

[SENSe:]VOLTage:{AC|DC}:NULL:VALue has been set to this VALue.
Automatic null selection will be disabled.

- When automatic NULL selection is turned OFF (OFF), specify a NULL VALue using the following command: [SENSe:]VOLTage:{AC|DC}:NULL:VALue.
- The instrument enables automatic NULL selection ([SENSe:]VOLTage:{AC|DC}:NULL:STATe ON) when the NULL function is enabled.
- This parameter is set to its default value after factory reset (*RST), instrument PRESet (SYSTem:PRESet), or CONFigure function.

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

Command Description: Manually select the measurement range.

Note: This parameter is not shared in AC and DC measurements and is independent of AC and DC measurements.

Parameter	<range>: {200 mV 2 V 20 V 200 V 1000 V(DC) 750V(AC)} The default is 200 mV.
Typical return	+2.00000000E-01
Configure AC voltage measurement with 2 V range. Take two measurements and take readings: CONF:VOLT:AC VOLT:AC:RANG 2 SAMP:COUN 2 READ? Typical Response: +1.14455020 E-03, +1.14463101 E-03	

- Select Fixed RANGe ([SENSe:] <function>:RANGe) to disable automatic RANGe adjustment.
- If the input signal is greater than the value measured for the specified gear, the word Overload is displayed on the instrument panel and "+9.90000000 E+37" is returned from the remote interface.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

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

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

Command Description: Disables or enables automatic range adjustment for AC and DC voltage measurements.

Note: This parameter is not shared in AC and DC measurements and is independent of AC and DC measurements.

Parameter	{ON 1 OFF 0}, default ON
Typical return	0 (off) or 1 (on)
Configure AC voltage measurement with 2 V range. Take two measurements and take readings: CONF:VOLT:AC VOLT:AC:RANG 2 SAMP:COUN 2 READ? Typical Response: +1.14455020 E-03, +1.14463101 E-03	

- With Auto Range Adjustment enabled, the instrument selects the range based on the input signal.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

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

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

Command Description: Sets the integration time expressed in the number of power line cycles (PLC) for the DC voltage. Longer integration time gives higher measurement resolution, but the measurement speed is slower.

Parameter	0.006、0.02、0.06、0.2、1、10、100. Default: 10. For more information, see Range, Resolution, and NPLC.
Typical return	+1.00000000E+01
DC voltage measurement was configured with 10 PLC integration time. The measurement is then taken, and the measurement is read: CONF:VOLT:DC VOLT:DC:NPLC 10 READ? Typical Response: +4.98283002 E-04	

- Provides normal mode (line frequency noise) suppression with only 1, 10, or 100 PLC integration times.
- Setting the integration time also sets the measurement resolution. The parsing table shows the relationship between integration time and resolution. See [SENSe:]VOLTage[:DC]:RESolution.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

2.8.6.7 [SENSe:]VOLTage[:DC]:IMPedance:AUTO {ON|1|OFF|0} [SENSe:]VOLTage[:DC]:IMPedance:AUTO?

Command Description: Select the input impedance in DC voltage measurement mode.

Parameter	{ON 1 OFF 0}. Default: OFF.
Typical return	0 (OFF) or 1 (ON)
All DC voltage measurements were performed with an input impedance of 10 MΩ: VOLT:IMP:AUTO OFF	

- OFF: For all ranges, the input impedance of DC voltage measurement is fixed at 10 MΩ to minimize noise pickup.
- ON: The input impedance of the DC voltage measurement varies with the range. For 200 mV, 2 V, and 20 V ranges, set it to "HI-Z" (> 10 GΩ) to reduce the impact of measurement loading errors on these lower ranges. Keep the 200 V and 1000 V ranges at 10 MΩ input impedance.
- CONFigure and MEASure? The command automatically selects "OFF".
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

2.8.6.8 [SENSe:]VOLTage[:AC]:BANDwidth{[MIN|MAX|DEF]} [SENSe:]VOLTage[:AC]:BANDwidth? [{MIN|MAX|DEF}]

Command Description: Set AC voltage filtering function.

Parameter	{3 Hz 20 Hz 200 Hz}. Default: 20Hz
Typical return	+2.00000000E+01
Configure AC voltage 200V range Use a 3Hz filter to measure and read the measurement results: CONF:VOLT:AC 200	

```
VOLT:AC:BAND 3
READ?
```

- Entering 15 Hz selects a low speed filter (3 Hz). Entering 190 Hz selects a medium speed filter (20 Hz) to support the appropriate low cutoff frequency.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

2.8.6.9 [SENSe:]VOLTage[:DC]:RESolution {<resolution>|MIN|MAX|DEF} [SENSe:]VOLTage[:DC]:RESolution? [{MIN|MAX|DEF}]

Command Description: Select measurement resolution for DC voltage.

Parameter	<resolution> See resolution Table or Range, resolution, and NPLC. The default is equivalent to 10 PLC. Specify <resolution> in unit of measurement (V, A, Hz, Ω , etc.)
Typical return	+3.00000000E-05
DC voltage measurement is configured with 6 μ V resolution. The measurement is then taken, and the measurement is read: CONF:VOLT:DC 2 VOLT:DC:RES 6E-6 READ?	

- You can specify MIN (best resolution) or MAX (worst resolution) instead.
- In order to achieve normal mode (line frequency noise) suppression, a resolution corresponding to the integration time is used, which is an integral multiple of the number of source line cycles.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

2.8.6.10 [SENSe:]VOLTage:AC:SECondary {"OFF"|"FREQuency"|"CURRent:AC"} [SENSe:]VOLTage:AC:SECondary?

Command Description: Auxiliary measurement function for AC voltage measurement.

Parameter	{"OFF" "FREQuency" "CURRent:AC"}. Default: "OFF".
Typical return	FREQ

Configure AC voltage measurement with 200 V range. Frequency is selected as an auxiliary measurement. Take measurements and retrieve measurements.

CONF:VOLT:AC 200

VOLT:AC:SEC "FREQ"

READ?;DATA2?

Typical Response: +6.02455553 E-01; +5.01003000 E+01

- "FREQuency"-FREQuency measurement of the input signal.
- "CURRent: AC"-AC CURRent measurement of the input signal.
- Use READ? Or INITiate to start measuring.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

2.8.6.11 [SENSe:]VOLTage[:DC]:SECondary {"OFF"|"CURRent:DC"} [SENSe:]VOLTage[:DC]:SECondary?

Command Description: Auxiliary measurement function for DC voltage measurement.

Parameter	{"OFF" "CURRent:DC"} , default: "OFF".
Typical return	CURR:DC
Configure DC voltage measurements using the 20 V range. The direct current is selected as the auxiliary measurement result. Take measurements and retrieve measurements. CONF:VOLT:DC 20 VOLT:DC:SEC "CURR" READ?;DATA2? Typical Response: +5.70882545 E-04; +1.85264666 E-09	

- "CURRent: DC"-DC CURRent measurement of the input signal.
- Use READ? Or INITiate to start measuring.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

2.8.6.12 [SENSe:]VOLTage[:DC]:ZERO:AUTO[:STATe] {ON|1|OFF|0} [SENSe:]VOLTage[:DC]:ZERO:AUTO[:STATe]?

Command Description: Disable or enable the DC voltage zeroing function.

Parameter	{ON 1 OFF 0}, default ON
Typical return	0 (off) or 1 (on)
Configure DC voltage measurement and perform automatic zeroing immediately. Take two measurements and take readings: CONF:VOLT:DC 2 VOLT:DC:ZERO:AUTO ON SAMP:COUN 2 READ? Typical Response: +3.55361441 E-04, +1.14888780 E-03	

- **ON (default):** After each measurement, the DMM internal measurement offset. This measurement is then subtracted from the previous reading. This prevents the offset voltage on the DMM input circuit from affecting the measurement accuracy.
- **OFF:** The instrument takes the last determined zeroing measurement and subtracts it from each measurement. Whenever you change a function, range, or integration time, it takes a new zero reading.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

2.8.7 [SENSe:]CAPacitance Subsystem

This subsystem configures capacitance measurement.

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

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

Command Description: Enables or disables empty functions for capacitance measurements.

Parameter	{ON 1 OFF 0}, default to OFF
Typical return	0 (off) or 1 (on)
Configure capacitance measurement, turn on null function, use auto null function. Take two measurements and send the measurements to the instrument's output buffer: CONF:CAP AUTO CAP:NULL ON CAP:NULL:VAL:AUTO ON SAMP:COUN 2 READ?	

Typical Response: +0.00000000 E+00,-1.19136868 E-14

- Enabling the NULL function also enables auto-zeroing VALue selection ([SENSe:]CAPacitance:NULL:VALue: AUTO ON).
- To set a fixed NULL VALue, use: [SENSe:]CAPacitance:NULL:VALue.
- The instrument disables empty functions after factory reset (*RST), instrument PRESet (SYSTem:PRESet), or CONFigure function.

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

Command Description: Specify a null value for the capacitance measurement. If the null state is turned on, the null value is deducted from each sample.

Parameter	-110 to +110 mF, default 0 MIN:-110 mF; MAX: +110 mF; DEF: 0
Typical return	+0. 0000000E-00
Configure the capacitance measurement by subtracting 100 nF from the measurement using the zeroing function. Two measurements are then taken and the measurements are sent to the instrument's output buffer: CONF:CAP CAP:NULL:STAT ON;VAL 100nF SAMP:COUN 2 READ? Typical response:-9.99597915 E-08,-9.99597738 E-08	

- Specifying a NULL VALue disables automatic NULL selection ([SENSe:]CAPacitance:NULL:VALue:AUTO OFF).
- To use the zero value, you must first turn on the zero switch ([SENSe:]Capacitance:NULL:STATe ON).
- This parameter is set to its default value after factory reset (*RST), instrument PRESet (SYSTem:PRESet), or CONFigure function.

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

Command Description: Enables or disables automatic null selection for capacitance measurements.

Parameter	{ON 1 OFF 0}, default ON
------------------	--------------------------

Typical return	0 (off) or 1 (on)
Configure capacitance measurement, turn on empty function, use automatic empty function. Take two measurements and send the measurements to the instrument's output buffer: CONF:CAP AUTO CAP:NULL ON CAP:NULL:VAL:AUTO ON SAMP:COUN 2 READ? Typical Response: +0.00000000 E+00, +6.50485656 E-14	

- When the auto-reference selection is turned on, the first measurement made is used as a null value for all subsequent measurements.
[SENSe:]CAPacitance:NULL:VALue has been set to this VALue. Automatic null selection will be disabled.
- After automatic NULL selection is turned OFF (OFF), specify a NULL VALue using the following command: [SENSe:]CAPacitance:NULL:VALue.
- The instrument enables automatic NULL selection ([SENSe:]CAPacitance:NULL:STATe ON) when the NULL function is enabled.
- This parameter is set to its default value after factory reset (*RST), instrument PRESet (SYSTem:PRESet), or CONFigure function.

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

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

Command Description: Manually select the measurement range.

Parameter	<range>: {2 nF 20 nF 200 nF 2 uF 20 uF 200 uF 2 mF 20 mF 100 mF AUTO} . Defaults to 2 nF. MIN: 2 nF; MAX: 100 mF; DEF: 2nF
Typical return	+2.00000000 E-09
Capacitance measurements are configured with a 2 uF gear. Take two measurements and take readings: CONF:CAP CAP:RANG 2E-6 SAMP:COUN 2 READ? Typical response: +3.64977984 E-10, +3.64948016 E-10	

- Select Fixed RANGE ([SENSe:]:RANGe) to disable automatic RANGE adjustment.
- If the input signal is greater than the value measured for the specified gear, the word Overload is displayed on the instrument panel and "+9.90000000 E+37" is returned from the remote interface.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

2.8.7.5 [SENSe:]CAPacitance:RANGe:AUTO {OFF|ON} [SENSe:]CAPacitance:RANGe:AUTO?

Command Description: Capacitance measurement disables or enables automatic range adjustment.

Parameter	{ON 1 OFF 0}, default ON
Typical return	0 (off) or 1 (on)
Configure AC current measurement and perform automatic range adjustment immediately. Take two measurements and take readings: CONF:CAP CAP:RANG:AUTO ON SAMP:COUN 2 READ? Typical Response: +3.96203524 E-11, +3.96189935 E-11	

- With Auto Range Adjustment enabled, the instrument selects the range based on the input signal.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

2.8.8 [SENSe:]CONTInuity Subsystem

This subsystem configures on-off measurements.

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

Command Description: Configure a threshold resistor.

Parameter	MIN: 0.1; MAX: 2000; DEF: 10
Typical return	+1.00000000E+01

Configure the threshold resistance to 2000Ω:
CONT:THR:VAL 2000

2.8.9 [SENSe:]DIODE Subsystem

This subsystem configures diode measurements.

2.8.9.1 [SENSe:]DIODE:THReshold:{LOWer|UPPer}:VALue {[MIN|MAX|DEF]} [SENSe:]DIODE:THReshold:{LOWer|UPPer}:VALue? [MIN|MAX|DEF]

Command Description: Configure the upper and lower threshold voltages of the diode.

Parameter	MIN: 0.001; MAX: 5; LOWer default: 0.3 V; UPPer default: 0.8 V
Typical return	+1.00000000E+01
Configuration diode threshold voltage is 0.3 ~ 0.8 V DIOD:THR:LOW:VAL 0.3 DIOD:THR:UPP:VAL 0.8	

2.8.10 [SENSe:]DATA2 Subsystem

2.8.10.1 [SENSe:]DATA2?

Command Description: Returns auxiliary measurement results.

Parameter	None
Typical return	+1.85264666E-09
Configure DC voltage measurements using the 20 V range. The direct current is selected as the auxiliary measurement result. Take measurements and retrieve measurements. CONF:VOLT:DC 20 VOLT:DC:SEC "CURR" READ?;DATA2? Typical Response: +5.70882545 E-04; +1.85264666 E-09	

- If no valid secondary measure is currently specified, the query returns "9.91000000 E+37" (which is the IEEE488.2 definition that is not a number (commonly referred to as NaN)).

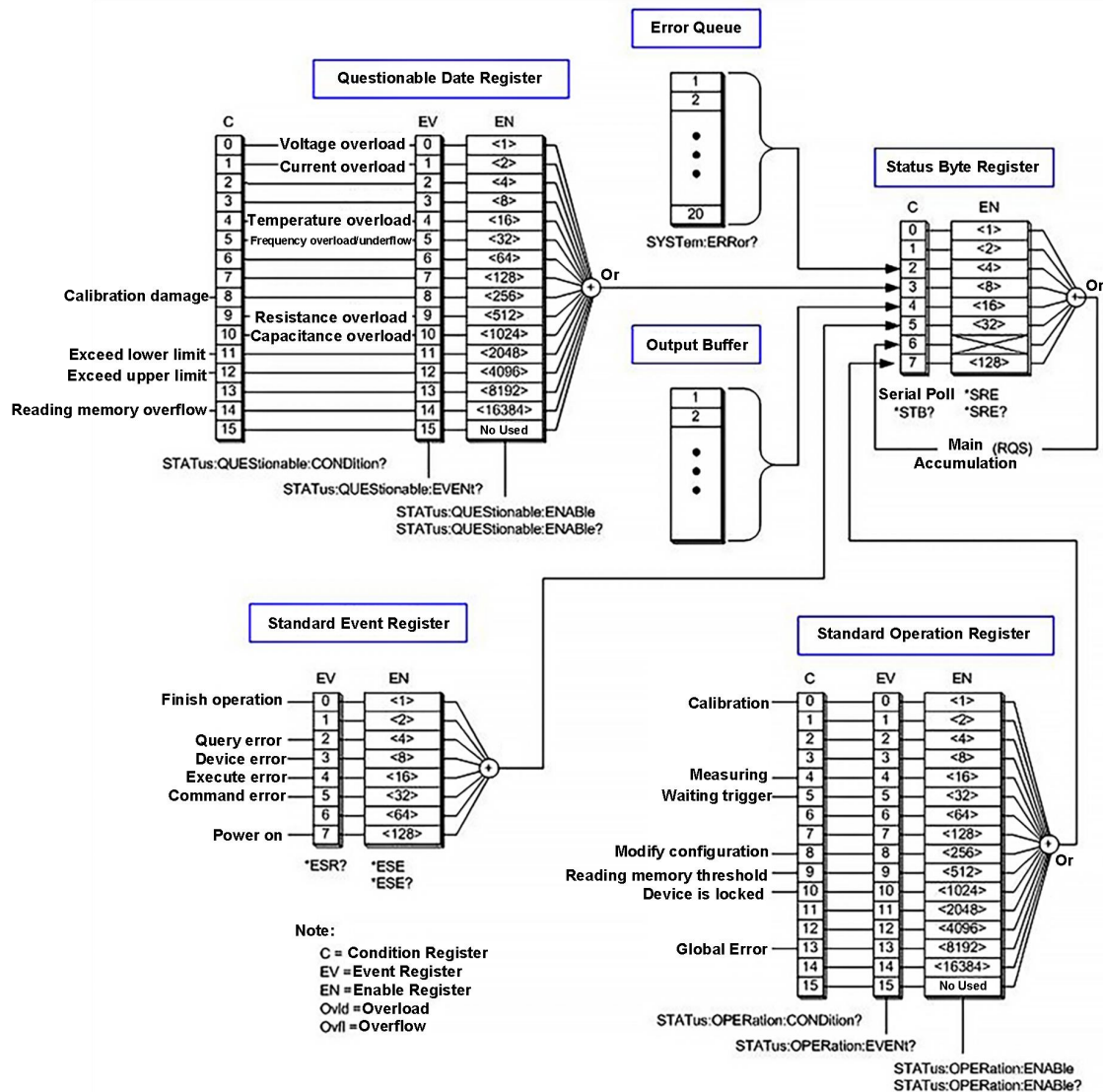
- Use READ? Or INITiate to start measuring. Using DATA2? Retrieve auxiliary measurement results.
- Using [SENSe:]CURRent:AC:SECondary, [SENSe:]CURRent:DC:SECondary, [SENSe:]FREQuency:SECondary, [SENSe:]PERiod:SECondary, [SENSe:]TEMPerature:SECondary, [SENSe:]VOLTage:AC:SECondary, [SENSe:]VOLTage:DC:SECondary Configure auxiliary measurements.
- When the measurement configuration changes, or when any of the following commands are executed, the instrument will clear all measurements from the reading memory: INITiate, MEASure?, READ?, *RST, SYSTem:PRESet.

2.8.10.2 [SENSe:]DATA2:CLEar[:IMMediate]

Command Description: Clear the latest results of the auxiliary measurement.

Parameter	None
Typical return	None

2.9 STATus Subsystem



Status register

The following table describes the standard byte registers.

Bit number	Bit Name	Decimal value	Definition
0	Not used	1	Reserve for future use.
1	Not used	2	Reserve for future use.
2	Error sequence	4	One or more errors have been stored in the error sequence. Use SYSTem:ERRor? Read and delete errors.
3	Summary of Suspicious Data	8	Sets one or more bits in the suspect data register (bits must be enabled, see STATus:QUESTionable:ENABLE).

4	Available Information	16	Data in the instrument output buffer is available.
5	Standard Event Summary	32	Sets one or more bits in the standard event register (bits must be enabled, see *ESE).
6	Primary accumulation	64	One or more bits are set in the status byte register and may generate a request for service (RQS). The *SRE enable bit must be used.
7	SUMMARY OF	128	Sets one or more bits in the suspect data register (bits must be enabled, see STATus:OPERation:ENABLE).

Standard event register

The following table describes the standard event registers.

Bit number	Bit Name	Decimal value	Definition
0	Operation completed	1	All commands before and including *OPC have been executed.
1	Not used	2	Return 0.
2	Query Error	4	The instrument tried to read the output buffer, but it was empty. Alternatively, a new command line is received before the previous query is read. Alternatively, both the input and output buffers are full.
3	Device Error	8	Device-specific errors occurred, including self-test errors or calibration errors (errors within the-300 range or any positive errors have been generated) See SCPI Error Messages for a complete list of SCPI Error Messages.
4	Execution error	16	An execution error occurred (error within-200 range has been generated).
5	Command error	32	A command syntax error occurred (error within-100 scale has been generated).
6	Not used	64	Return 0.
7	Power up	128	Power was turned off and turned on since the event register was last read or cleared.

Suspicious data register

The following table lists the bit definitions for the suspect data register:

Note:

The overload bit is set once per INITiate command. If the overload bit is cleared, it is not reset until a new INITiate is issued.

Bit number	Bit Name	Decimal value	Definition
0	Voltage overload	1	Reported as an event only. Returns 0. Read the event register.
1	Current overload	2	Reported as an event only. Returns 0. Read the event register.
2		4	Not used.
3		8	Not used.
4	Temperature overload	16	Reported as an event only. Returns 0. Read the event register.
5	Frequency overload	32	Reported as an event only. Returns 0. Read the event register.
6		64	Not used.
7		128	Not used.
8	Calibration anomaly	256	Reported as an event only. Returns 0. Read the event register.
9	Resistive overload	512	Reported as an event only. Returns 0. Read the event register.
10	Capacitance overload	1024	Reported as an event only. Returns 0. Read the event register.
11	Limit lower limit alarm	2048	When the limit value is turned on, at least one measurement result fails the lower limit test.
12	Limit cap alert	4096	When the limit is turned on, at least one measurement result fails the upper limit test.
13		8192	Not used.
14	The memory has	16384	The reading memory is full. One or more of the oldest measurement results have been overwritten.
15		32768	Not used.

Standard operating register

The following table lists the bit definitions for the standard operation registers:

Bit	Bit Name	Decimal	Definition
-----	----------	---------	------------

number		value	
0	calibration	1	The instrument is performing a calibration.
1		2	Not used.
2		4	Not used.
3		8	Not used.
4	Measuring	16	The instrument is started and measurements are taking or are about to take measurements.
5	Waiting for trigger	32	The instrument is waiting for trigger.
6		64	Not used.
7		128	Not used
8	Configuration changes	256	Since the last INIT, READ? Or MEASure?, Changed the instrument configuration from the front panel or from the SCPI.
9	Memory threshold	512	The set number of measurements is stored (DATA: POINTs:EVENT:THReshold).
10	Instrument locked	1024	If the remote interface is locked, perform the setting. Clear the setting when the lock on the remote interface is released.
11		2048	Not used.
12		4096	Not used.
13	Global Error	8192	Set if any remote interface has an error in its error queue.
14		16384	Not used.
15		32768	Not used.

2.9.1 STATus:OPERation:CONDition?

Command Description: Returns the sum of conditional register bits for a standard operation register bank. The register is read-only; When reading, no bits are cleared. Condition registers provide uninterrupted monitoring of the status of the instrument. Condition register bits are updated in real time; They are neither locked nor buffered.

Parameter	None
Typical return	32

Read condition register (5 bits set):
STAT:OPER:COND?

- The bits of the condition register reflect the current situation. If the condition send changes, the corresponding bit in the condition register is cleared.
- The *PSC command controls whether the enable register is cleared on power-up.

2.9.2 STATus:OPERation:ENABLE

STATus:OPERation:ENABLE?

Command Description: Enables the bit of the enable register for the standard operation register bank. The selected bits are then reported to the status byte. The enable register may define which bits in the event register are to be reported to the "status byte" register set. The enable register is readable and writable.

Parameter	The decimal value is equal to the sum of the binary weighted values of all bits in the register.
Typical return	32
Enable the 5 bits of the enable register (decimal value is 32): STAT:OPER:ENAB 32	

- Use the <enable> parameter to specify which bit to report to the status byte. The specified decimal value corresponds to the binary weighted sum of the bits you want to enable in the register. For example, to enable 5 bits (decimal value = 32) and 9 bits (decimal value = 512), the corresponding decimal value is 544 (32 + 512).
- STATus: PRESet clears all bits in the enable register.

2.9.3 STATus:OPERation[:EVENT]?

Command Description: Returns the sum of bits in the event register for the standard operation register bank.

Parameter	The decimal value is equal to the sum of the binary weighted values of all bits in the register.
Typical return	512
Read event register (set 9 bits): STAT:OPER:EVEN?	

- Once the bit is set, it remains set until cleared by reading the event register or by sending *CLS (clear state).

2.9.4 STATus:PRESet

Command Description: Clear the suspicious data enable register and the standard operation enable register.

Parameter	None
Typical return	None
Clear the enable register bit: STAT:PRES	

2.9.5 STATus:QUEStionable:CONDition?

Command Description: Returns the sum of bits in the condition register for the suspicious data register group. The register is read-only; When reading, no bits are cleared. Condition registers provide uninterrupted monitoring of the status of the instrument. Condition register bits are updated in real time; They are neither locked nor buffered.

Parameter	None
Typical return	4096
Read condition register (12 bits set): STAT:QUES:COND?	

- The bits of the condition register reflect the current situation. If the condition send changes, the corresponding bit in the condition register is cleared.

2.9.6 STATus:QUEStionable:ENABLE

STATus:QUEStionable:ENABLE?

Command Description: Enables bits in the enable register for the suspicious data register group. The enable register may define which bits in the event register are to be reported to the "status byte" register set. The enable register is readable and writable.

Parameter	The decimal value is equal to the sum of the binary weighted values of all bits in the register.
Typical return	512
Enables 9 bits of the enable register (decimal value is 512). STAT:QUES:ENAB 512	

- Use parameters to specify which bit to report to the status byte. The specified decimal value corresponds to the binary weighted sum of the bits you want to enable in the register. For example, enabling 0 bits (decimal value = 1), 1 bits

(decimal value = 2), and 12 bits (decimal value = 4096), the corresponding decimal value should be 4099 (1 + 2 + 4096).

- STATus:PRESet clears all bits in the enable register.
- The *PSC command controls whether the enable register is cleared on power-up.

2.9.7 STATus:QUEStionable[:EVENT]?

Command Description: Returns an event register for a suspicious data register group. The event register is a read-only register that latches events from the condition register. When an event bit is set, subsequent events corresponding to that bit are ignored. When a register is read, the register bits will be cleared.

Parameter	None
Typical return	1024
Read event register (set 10 bits): STAT:QUES?	

- Once the bit is set, it remains set until cleared by reading the event register or by sending *CLS (clear state).

2.10 SYSTem Subsystem

The SYSTem subsystem includes general commands, I/O configuration commands, and interface lock commands.

2.10.1 Common Commands

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

SYSTem:BEEPer:STATe?

Command Description: Disables or enables buzzer sounding during continuity, diode or probe hold measurements, or when an error occurs with the current panel or remote interface.

Parameter	{ON 1 OFF 0}, default ON
Typical return	0 (off) or 1 (on)
Disable buzzer status: SYST:BEEP:STAT OFF	

- This command does not affect the front panel key sounding.

2.10.1.2 SYSTem:BEEPer[:IMMediate]

Command Description: The command control emits a beep.

Parameter	None
Typical return	None
Single beep: SYST:BEEP	

- You can use this command to emit a beep regardless of the current state of the buzzer.

2.10.1.3 SYSTem:LOCal

Command Description: Sets the instrument status to local and enables front panel operations.

Parameter	None
Typical return	None
Set the instrument status to local: SYST:LOCS	

2.10.1.4 SYSTem:TEMPerature?

Command Description: Returns the internal temperature of the instrument in °C.

Parameter	None
Typical return	+2.74687500E+01
The internal temperature of the instrument will be returned: SYST:TEMP?	

- The return value is not affected by UNIT:TEMPerature.

2.10.1.5 SYSTem:CLICk:STATe {ON|1|OFF|0}

SYSTem:CLICk:STATe?

Command Description: Turns on or off the interactive sound when the front panel button or soft key is pressed.

Parameter	{ON 1 OFF 0} , default ON
------------------	---------------------------

Typical return	0 (Off) 1 (On)
Disable key interaction sound: SYST:CLIC:STAT OFF SYST:CLIC:STAT? Typical response: 0	

- This command does not affect buzzer sounding related to diodes, continuity tests, and errors, etc.
- This setting is non-volatile; This setting does not change due to power-up cycles or, factory resets (*RST) or instrument presets (SYSTem:PRESet).

2.10.1.6 SYSTem:DATE <year>,<month>,<day> SYSTem:DATE?

Command Description: Sets the date of the instrument's real-time clock.

Parameter	<year>: greater than 2020 <month>: 1 to 12 <day>: 1 to 31
Typical return	+2025,+12,+23
Set the system date to December 25, 2025: SYST:DATE 2025,12,25 SYST:DATE? Typical Response: +2025, +12, +25	

- The real-time clock is used for mass memory (MMEMory) system file timestamps.
- The real-time clock is battery powered and retains the date and time when the power is turned off.
- Date and time are not affected by *RST or SYSTem:PRESet.
- The real-time clock does not adjust itself to accommodate time zone changes or daylight saving times. Be sure to set the date and time when you first receive the instrument.

2.10.1.7 SYSTem:ERRor[:NEXT]?

Command Description: Read and clear an error in the error queue.

Parameter	None
------------------	------

Typical return	-113,"Undefined header"
Read and clear the first error in the error queue: SYST:ERR?	

- Up to 20 errors can be stored in the instrument error queue. Each remote interface I/O has its own interface-specific error queue.
- Error retrieval is first-in, first-out and clears errors when you read them.
- If the number of errors exceeds 20, the latest error stored in the queue is replaced with -350, "Queue overflow".

2.10.1.8 SYSTem:HELP?

Command Description: Returns a complete list of SCPI commands for this instrument.

Parameter	None
Typical return	#48085 :ABORt/nquery/ :CALibration:COUNT?/qonly/ :CALibration:DATE?/qonly/
Returns a list of SCPI commands: SYST:HELP?	

- The query returns a finite length block of data that allows any type of data to be transferred in a series of 8-bit data bytes. The first line is a tic-tac-toe (#) followed by a digit indicating the number of digits in the decimal integer that follows. This number is followed by a decimal integer indicating the number of bytes of data followed, followed by the first line break. (For example, "# 47947" in the first line indicates that there are 7947 bytes of data.) The rest of the block has a command on each line, each ending with a newline character (ASCII character 10). The beginning of the returned list looks like this. Please note that the actual content may vary depending on firmware version : #48085
:ABORt/nquery/ :CALibration:ADC?/qonly/ :CALibration:ALL?/qonly/
:CALibration:COUNT?/qonly/ :CALibration:DATA is in this list.
- /nquery/indicates a command None a query.
- /qonly/represents a query None a command format.
- All other commands consist of a command and query.
- The syntax of each command can be found in the Command Quick Reference.

- This list may include commands or queries not mentioned in this article. Contains commands that are no longer in use for easy compatibility with older instruments.

2.10.1.9 SYSTem:LABel "<string>"

SYSTem:LABel?

Command Description: Use large font to display messages in the lower half of the instrument front panel display.

Parameter	Strings with quotation marks up to 40 characters in length You can use letters (A-Z), numbers (0-9) and special characters such as @,%, *, etc. Default ""
Typical return	""
Set the message to display on the screen: SYST:LAB "Test..." To close the message, send the following command to change the label to an empty string. This also removes the label area from the screen: SYST:LAB ""	

- If you enter a string longer than 40 characters, the instrument truncates the string after the first 40 characters.
- This parameter value is not affected by *RST or SYSTem:PRESet.

2.10.1.10 SYSTem:LFRrequency?

Command Description: Returns the power supply frequency of the device.

Parameter	None
Typical return	+50
Read current power frequency of the device: SYST:LFR?	

- The multimeter will automatically detect the power frequency when it is turned on. The range of 55 Hz to 66 Hz is considered 60 Hz, and other frequencies are considered 50 Hz.
- This parameter value is not affected by *RST or SYSTem:PRESet.

2.10.1.11 SYSTem:PRESet

Command Description: Resets device status.

Parameter	None
Typical return	None
Reset device status: SYST:PRES	

- This command is basically the same as *RST. The difference is: *RST resets the instrument for SCPI operation, while SYSTem:PRESet resets the instrument for front panel operation. Therefore, * RST turns off histograms and statistics, while SYSTem:PRESet turns them on.

2.10.1.12 SYSTem:SECurity:IMMediate

Command Description: Clear all user-accessible instrument memory except calibration constants and restart the instrument.

Parameter	None
Typical return	None
Clear all user-accessible instrument memory: SYST:SEC:IMM	

- Usually used before removing the instrument from the safe zone.
- Initialize all instrument settings to their factory reset (*RST) values. This command will also clear all user-defined states and test stored data and preference information.

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

SYSTem:TIME?

Command Description: Sets the time of the instrument's real-time clock.

Parameter	<hour>: 0 to 23 <minute>: 0 to 59 <second>: 0 to 59
Typical return	17,56,15.000
Set instrument time to 20:15:30 (8:15:30 PM): SYST:TIME 20,15,30	

- The real-time clock is used for memory system file timestamps.

- The real-time clock is battery powered and retains the date and time when the power is turned off.
- Date and time are not affected by *RST or SYSTem:PRESet.
- The real-time clock does not adjust itself to accommodate time zone changes or daylight saving times. Be sure to set the date and time when you first receive the instrument.

2.10.1.14 SYSTem:UPTime?

Command Description: Returns the length of time the instrument has been running since the last time it was powered up.

Parameter	None
Typical return	+1,+9,+1,+2
Return the time the instrument continues to run: SYST:UPT?	

- Typically used to verify that the instrument is sufficiently warmed up after calibration.
- The returned numbers indicate days, hours, minutes, and seconds, respectively.

2.10.1.15 SYSTem:VERSion?

Command Description: Returns the version of the SCPI (Programmable Instrument Standard Command) that the instrument complies with.

Parameter	None
Typical return	1999.0
Return SCPI version: SYST:VERS?	

2.10.1.16 SYSTem:WMESsage "<string>"

SYSTem:WMESsage?

Command Description: Displays a power-on message.

Parameter	Strings with quotation marks up to 40 characters in length You can use letters (A-Z), numbers (0-9) and special characters such as @,%, *, etc. Default ""
Typical return	""

Displays a power-on message:
 SYST:WMES "Input poweron message"

- Specifying an empty string ("") disables power-up messages.
- This setting is non-volatile; This setting does not change due to power-up cycles or, factory resets (*RST) or instrument presets (SYSTem:PRESet).
- Set this parameter to its default value when the instrument first leaves the factory and after SYSTem: SECurity: IMMEDIATE.

2.10.2 Lock Command

This subsystem locks and releases the instrument I/O interface, as shown in the following example

- Initial status = unlocked, number = 0
 (From USB) SYST:LOCK:REQ? Return "1" (request successful)
- Status = Unlocked, Time = 1
 (FROM VXI11) SYST:LOCK:REQ? Returns "0" because USB is locked
- Status = Unlocked, Time = 1
 (From USB) SYST:LOCK:REQ? Return "1" (request successful)
- Status = Unlocked, Number = 2
 (From USB) SYST:LOCK:REL
- Status = Unlocked, Time = 1
 (From USB) SYST:LOCK:REL
- Status = Unlocked, Time = 0

For each successful lock request, an unlock must occur. Two requests require two releases.

2.10.2.1 SYSTem:LOCK:NAME?

Command Description: Returns the I/O interface being used by querying the computer.

Parameter	None
Typical return	USB
See Interface Locking Example	

- After determining the interface to use, use SYSTem:LOCK:OWNer? Identify the interface with the lock (if any).

- I/O Returns an interface such as "USB", "VXI11", or "WEB" to indicate which I/O interface is being used by the query computer.

2.10.2.2 SYSTem:LOCK:OWNer?

Command Description: Returns the currently locked I/O interface.

Parameter	None
Typical return	USB
See Interface Locking Example	

- When the lock is active, bit 10 (STATus:OPERation:CONDition?) in the standard operations register is set. This bit is cleared when the locks on all I/O interfaces are released.
- Return the interface "USB", "VXI11", or "WEB" to indicate which I/O interface is currently locked. Returns "NONE" if the interface is not locked.

2.10.2.3 SYSTem:LOCK:RELease

Command Description: The lock count is reduced by 1, and the I/O interface may be released from which commands can be executed.

Parameter	None
Typical return	None
See Interface Locking Example	

- When the lock is active, bit 10 (STATus:OPERation:CONDition?) in the standard operations register is set. This bit is cleared when the locks on all I/O interfaces are released.

2.10.2.4 SYSTem:LOCK:REQuest?

Command Description: Requires the current I/O interface to be locked. This allows you to lock the instrument configuration or share the instrument with other computers.

Parameter	None
Typical return	+0 (Denied) or +1 (Authorized)
See Interface Locking Example	

- Lock requests can be nested; Each request increases the lock count by 1. For each request, you need to RELEase (SYSTem:LOCK:RELEase) from the same I/O interface.
- The lock remains at the level of the I/O interface (USB, LAN, etc.) and you are responsible for coordination between all threads and/or programs on that interface.
- When a request is authorized, only I/O sessions from the current interface can change the instrument state. You can only query the instrument status from other I/O interfaces.
- Allow locking can be set 10 bits in the standard OPERation register (STATus:OPERation:CONDition?). When the lock is active, lock the entire instrument front panel including the Local key.
- When a LAN disconnection is detected, the LAN session lock is automatically released.

2.10.3 I/O Configuration Commands

2.10.3.1 SYSTem:COMMunicate:ENABLE {ON|1|OFF|0},<interface>

SYSTem:COMMunicate:ENABLE? <interface>

Command Description: Disable or enable remote interfaces such as Socket, USB, or LAN. You can also disable or enable available remote services, such as Sockets, VXI11, and the built-in Web interface.

Parameter	{ON 1 OFF 0},<interface>. Default: ON. <interface>: {GPIB USB LAN SOCKets VXI11 WEB SERial}
Typical return	0 OFF or 1 ON
Disable USB interface: SYST:COMM:ENAB OFF,USB	

- The GPIB interface is optional.
- After you make changes, you must turn the instrument off and then turn it on for the changes to take effect.
- If the LAN interface is disabled, none of the associated LAN services are started when the instrument is powered on.
- The interface enabling settings are stored in non-volatile memory. They do not change when the power is off, factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

2.10.3.2 SYSTem:COMMunicate:GPIB:ADDRess <address>

SYSTem:COMMunicate:GPIB:ADDRess?

Command Description: Assign a GPIB (IEEE-488) address to the instrument. Each device on the GPIB interface must have a unique address.

Parameter	0 to 30. Default: 16.
Typical return	+16
Set the GPIB address to 16: SYST:COMM:GPIB:ADDR 16	

- The computer's GPIB interface card has its own address. Avoid using this address for any instruments on the GPIB bus.
- Turn the power off and then turn it on again for the command to take effect.
- GPIB is enabled or disabled by SYSTem:COMMunicate:ENABLE.
- The GPIB interface is optional. For more information, see Models and Options.
- This setting is non-volatile; This setting does not change due to power-up cycles or, factory resets (*RST) or instrument presets (SYSTem:PRESet).
- Set this parameter to its default value when the instrument first leaves the factory and after SYSTem:SECurity:IMMEDIATE.

2.10.3.3 SYSTem:COMMunicate:SERial:BAUD <baudrate>

SYSTem:COMMunicate:SERial:BAUD?

Command Description: Set the serial port baud rate.

Parameter	{1200 2400 4800 9600 19200 38400 57600 115200} Default: 9600
Typical return	9600
Set serial port baud rate to 9600: SYST:COMM:SER:BAUD 9600	

- Turn the power off and then turn it on again for the command to take effect.
- This setting is non-volatile; This setting does not change due to power-up cycles or, factory resets (*RST) or instrument presets (SYSTem:PRESet).
- Set this parameter to its default value when the instrument first leaves the factory and after SYSTem:SECurity:IMMEDIATE.

2.10.3.4 SYSTem:COMMunicate:SERIal:BITS <5|6|7|8>

SYSTem:COMMunicate:SERIal:BITS?

Command Description: Set serial port data bits.

Parameter	{5 6 7 8} Default: 8
Typical return	8
Set serial port data bits to 8-bit mode: SYST:COMM:SER:BITS 8	

- Turn the power off and then turn it on again for the command to take effect.
- This setting is non-volatile; This setting does not change due to power-up cycles or, factory resets (*RST) or instrument presets (SYSTem:PRESet).
- Set this parameter to its default value when the instrument first leaves the factory and after SYSTem:SECurity:IMMediate.

2.10.3.5 SYSTem:COMMunicate:SERIal:PARity[:TYPE]

{EVEN|ODD|ZERO|ONE|NONE}

SYSTem:COMMunicate:SERIal:PARity[:TYPE]?

Command Description: Set the serial port verification mode.

Parameter	{EVEN ODD ZERO ONE NONE} Default: NONE
Typical return	NONE
The serial port check digit will be turned off: SYST:COMM:SER:PAR NONE	

- Turn the power off and then turn it on again for the command to take effect.
- This setting is non-volatile; This setting does not change due to power-up cycles or, factory resets (*RST) or instrument presets (SYSTem:PRESet).
- Set this parameter to its default value when the instrument first leaves the factory and after SYSTem:SECurity:IMMediate.

2.10.3.6 SYSTem:COMMunicate:SERIal:SBITs <1|1.5|2>

SYSTem:COMMunicate:SERIal:SBITs?

Command Description: Set the serial port stop bit.

Parameter	{1 1.5 2} Default: 1
Typical return	1
Set serial port stop bit to 1-bit mode: SYST:COMM:SER:SBITS 1	

- Turn the power off and then turn it on again for the command to take effect.
- This setting is non-volatile; This setting does not change due to power-up cycles or, factory resets (*RST) or instrument presets (SYSTem:PRESet).
- Set this parameter to its default value when the instrument first leaves the factory and after SYSTem:SECurity:IMMEDIATE.

2.10.3.7 SYSTem:COMMunicate:LAN:CONTrol?

Command Description: Reads the initial control connection port number for socket communication.

Parameter	None
Typical return	5025 (0 if the interface does not support socket words)
Returns the control connection port number: SYST:COMM:LAN:CONT?	

2.10.3.8 SYSTem:COMMunicate:LAN:HOSTname

SYSTem:COMMunicate:LAN:HOSTname?

Command Description: Assign a hostname to the instrument.

Parameter	A string up to 15 characters. Must start with a letter (A-Z) Can include letters, numbers (0-9), or Dash ("-") defaults to DMM-(machine serial number)
Typical return	"DMM-nnnnnnnnn" nnnnnnnn is the machine serial number
Set the hostname to DMM: SYST:COMM:LAN:HOST "DMM" SYST:COMM:LAN:HOST? Typical return: "DMM"	

- Turn the power off and then turn it on again for the command to take effect.
- This setting is non-volatile; This setting does not change due to power-up cycles or, factory resets (*RST) or instrument presets (SYSTem:PRESet).

- Set this parameter to its default value when the instrument first leaves the factory and after `SYSTem:SECurity:IMMediate`.

2.10.3.9 `SYSTem:COMMunicate:LAN:DHCP`

`SYSTem:COMMunicate:LAN:DHCP?`

Command Description: Enables or disables the instrument to use DHCP.

Parameter	{ON 1 OFF 0}; On by default
Typical return	0 (Off), 1 (On)
Turn on DHCP: <code>SYST:COMM:LAN:DHCP ON</code> <code>SYST:COMM:LAN:DHCP?</code> Typical return: 1	

- Turn the power off and then turn it on again for the command to take effect.
- This setting is non-volatile; This setting does not change due to power-up cycles or, factory resets (*RST) or instrument presets (`SYSTem:PRESet`).
- Set this parameter to its default value when the instrument first leaves the factory and after `SYSTem:SECurity:IMMediate`.

2.10.3.10 `SYSTem:COMMunicate:LAN:IPADdress`

`SYSTem:COMMunicate:LAN:IPADdress?`

Command Description: Assign a static Internet Protocol (IP) address to the instrument.

Parameter	Command : "nnn.nnn.nnn.nnn". Default: "192.168. 1.99" Query: {CURRent STATic}. Default: CURRent.
Typical return	192.168.1.99
Set the static IP address: <code>SYST:COMM:LAN:IPAD "192.168.30.100"</code> <code>SYST:COMM:LAN:IPAD?</code> Typical return: 192.168. 30.100	

- Turn the power off and then turn it on again for the command to take effect.
- This setting is non-volatile; This setting does not change due to power-up cycles or, factory resets (*RST) or instrument presets (`SYSTem:PRESet`).
- Set this parameter to its default value when the instrument first leaves the factory and after `SYSTem:SECurity:IMMediate`.

- **CURRent**: Returns the address currently being used by the instrument.
- **STATic**: Returns a STATic address from non-volatile memory. Use this address when DHCP is disabled or unavailable.

2.10.3.11 SYSTem:COMMunicate:LAN:MAC?

Command Description: Returns the instrument's MAC address in quotation marks as an ASCII string of 12 hexadecimal characters (0-9 and A-F).

Parameter	None
Typical return	FFFFFFFFFFFF
Query MAC address: SYST:COMM:LAN:MAC? Typical return: "FFFFFFFFFFFF"	

- MAC addresses are also known as link layer addresses, Ethernet (station) addresses, LANIC IDs, or hardware addresses.

2.10.3.12 SYSTem:COMMunicate:LAN:GATeway

SYSTem:COMMunicate:LAN:GATeway?

Command Description: Assign a default gateway to the instrument.

Parameter	Command : "nnn.nnn.nnn.nnn". Default: "0.0. 0.0" Query: {CURRent STATic}. Default: CURRent.
Typical return	0.0.0.0
Set the static subnet gateway: SYST:COMM:LAN:GATeway "192.168.30.254" SYST:COMM:LAN:GATeway? Typical return: 192.168. 30.254	

- Turn the power off and then turn it on again for the command to take effect.
- This setting is non-volatile; This setting does not change due to power-up cycles or, factory resets (*RST) or instrument presets (SYSTem:PRESet).
- Set this parameter to its default value when the instrument first leaves the factory and after SYSTem:SECurity:IMMEDIATE.
- **CURRent**: Returns the address currently being used by the instrument.
- **STATic**: Returns a STATic address from non-volatile memory. Use this address when DHCP is disabled or unavailable.

2.10.3.13 SYSTem:COMMunicate:LAN:SMASk

SYSTem:COMMunicate:LAN:SMASk?

Command Description: Assigning a subnet mask to the instrument is used to determine whether the client IP address is on the same local subnet.

Parameter	Command : "nnn.nnn.nnn.nnn". Default: '255.255. 255.0' Query: {CURRent STATic}. Default: CURRent.
Typical return	255.255.255.0
Set the static subnet mask: SYST:COMM:LAN:SMAS "255.255.255.0"255.0" SYST:COMM:LAN:SMAS? Typical return: 255.255. 255.0	

- Turn the power off and then turn it on again for the command to take effect.
- This setting is non-volatile; This setting does not change due to power-up cycles or, factory resets (*RST) or instrument presets (SYSTem:PRESet).
- Set this parameter to its default value when the instrument first leaves the factory and after SYSTem:SECurity:IMMEDIATE.
- CURRent: Returns the address currently being used by the instrument.
- STATic: Returns a STATic address from non-volatile memory. Use this address when DHCP is disabled or unavailable.

2.11 TRIGger Subsystem

The TRIGger subsystem configuration control triggers related configurations.

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

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

Command Description: Select the number of triggers accepted by the instrument in a measurement.

Parameter	MIN: 1 DEF: 1 MAX: 1000000 INFinity: Continuous Trigger
Typical return	+1.00000000E+00 For continuous trigger (INFinity), the query returns "9.9 E37".

Ten sets of five DC voltage measurements are returned:

CONF:VOLT:DC

SAMP:COUN 5

TRIG:COUN 10

READ?

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

- You can use the specified trigger COUNT with a SAMPLE COUNT (SAMPLE:COUNt), and the SAMPLE COUNT sets the number of samples per trigger. In this case, the number of measurements returned is simply the sample count multiplied by the trigger count.
- Up to 1,000 0 measurements can be stored in the reading memory, and if the reading memory overflows, the new measurement will overwrite the oldest measurement stored; The latest measurements are always retained. No errors are generated, but the Reading Mem Ovfl bit (bit 14) is set in the condition register of the suspect data register.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

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

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

Command Description: Sets the delay between the trigger signal and the first measurement.

Parameter	MIN: 0 MAX: 3600 DEF: 0 Step ~ 40us
Typical return	+0.00000000E+00
Returns the results of three DC voltage measurements. There is a 2 second delay before each measurement. CONF:VOLT:DC 10 SAMP:COUN 3 TRIG:DEL 2 READ? Typical Response: +4.97274898 E-04, +5.06901177 E-04, +4.98350773 E-04	

- Due to internal quantization, the actual latency you set may vary slightly from the value you specify. The increment is approximately 40 μ s.

- TRIGger:DElay:AUTO is ON by default. The instrument automatically determines the delay based on the function, range and integration time. You may need to set a longer delay than automatic delay for long cables, high capacitance, or high impedance signals.
- If you have more than one measurement configured for each trigger of the instrument (SAMPle:COUNt > 1), after the trigger, a delay is inserted between two adjacent measurements.
- After a factory reset (*RST) or instrument PRESet (SYSTem:PRESet) is performed, the instrument selects to automatically trigger delay.

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

TRIGger:DElay:AUTO?

Command Description: Disables or enables auto-trigger delay.

Parameter	{ON 1 OFF 0}, default ON
Typical return	0 (off) or 1 (on)
Returns the results of five DC voltage measurements. There is an automatic delay before each measurement. CONF:VOLT:DC 10 SAMP:COUN 5 TRIG:DEL:AUTO 1 READ? Typical response : +3.07761360 E-03,-1.16041169 E-03, +5.60585356 E-06, +1.21460160 E-04, +2.85898531 E-04	

- Selecting a specific TRIGger DELay using TRIGger:DElay disables automatic TRIGger DELay.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

2.11.4 TRIGger:SLOPe {POSitive|NEGative}

TRIGger:SLOPe?

Command Description: Select whether to let the instrument use the rising edge (POS) or falling edge (NEG) of the incoming signal on the Ext Trig BNC connector on the back panel as the trigger signal.

Parameter	{POSitive NEGative}, default NEGative
Typical return	POS or NEG

Ten groups of five DC voltage measurements are returned, and each measurement group is started with forward external trigger:

CONF:VOLT:DC

SAMP:COUN 5

TRIG:COUN 10

TRIG:SOUR EXT;SLOP POS

READ?

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

- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

2.11.5 TRIGger:SOURce {IMMediate|EXTeRnal|BUS}

TRIGger:SOURce?

Command Description: Select the trigger source for the measurement.

Source	Description
IMMediate	The trigger signal is always there. When the instrument is placed in the "waiting for trigger" state, a trigger signal will be sent out immediately.
BUS	Once the digital multimeter is in the "waiting to trigger" state, the *TRG triggers the instrument via the remote interface.
EXTeRnal	The instrument receives the hardware trigger applied to the back panel Ext Trig input and each time OUTPut:TRIGger:SLOPe The specified number of measurements (SAMPle:COUNt) is used when receiving a TTL pulse. If the instrument receives an external trigger before it is ready, the instrument will buffer a trigger.

Parameter	{IMMediate EXTeRnal BUS}, default IMMediate
Typical return	IMM, EXT or BUS
Ten groups of five DC voltage measurements are returned, and each measurement group is started with forward external trigger: CONF:VOLT:DC SAMP:COUN 5 TRIG:COUN 10 TRIG:SOUR EXT;SLOP POS READ?	

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

- After selecting the trigger source, you must send INITiate or READ? Place the instrument in the "Waiting for trigger" state. The trigger will only be received from the selected trigger source if the instrument is in the "Waiting for trigger" state.
- Recommendation: Use an appropriate fixed manual range for all trigger measurements. That is, turn off the automatic RANGE adjustment ([SENSe:]:RANGe:AUTO OFF) or set a fixed RANGE using the [SENSe:]:RANGe, CONFigure, or MEASure commands.
- This parameter is set to its default value after factory reset (*RST) or instrument PRESet (SYSTem:PRESet).

3 Range, resolution, and integration time

The following table shows the integration time (in PLC and seconds) for each range and resolution.

To determine the PLC for the specified range and resolution:

Find the range in the left column. Units of measurement are not applicable (i.e., 1 range is used for 1 V or 1 A; 100 range is used for 100 V or 100 Ω).

From the range value, follow the corresponding resolution row on the right until the specified resolution is within two adjacent columns of the digital multimeter model.

The NPLC value at the top of the column adjacent to the left is the NPLC "setting" for the given range and resolution.

For example: If you specify the range and resolution as 20 VDC and 20 μ V, respectively, you find range 20 in this table. move to the right, 20 μ V resolution ($2E-5$) is found in the column under 10 NPLC.

PLC	100	10	1	0.2	0.06	0.02	0.006
50Hz power supply	2s	0.2s	20ms	4ms	1.2ms	400us	120us
60Hz power supply	1.667s	0.167s	16.7ms	3.33ms	1ms	333.3us	100us
ResFactor	0.3ppm	1ppm	3ppm	10ppm	30ppm	100ppm	300ppm
Measuring range	Resolution						
200u	6E-11	2E-10	6E-10	2E-9	6E-9	2E-8	6E-8
2m	6E-10	2E-9	6E-9	2E-8	6E-8	2E-7	6E-7
20m	6E-9	2E-8	6E-8	2E-7	6E-7	2E-6	6E-6
200m	6E-8	2E-7	6E-7	2E-6	6E-6	2E-5	6E-5
2	6E-7	2E-6	6E-6	2E-5	6E-5	2E-4	6E-4
10	3E-6	1E-5	3E-5	1E-4	3E-4	1E-3	3E-3
20	6E-6	2E-5	6E-5	2E-4	6E-4	2E-3	6E-3
200	6E-5	2E-4	6E-4	2E-3	6E-3	2E-2	6E-2
1k	3E-4	1E-3	3E-3	1E-2	3E-2	1E-1	3E-1
2k	6E-4	2E-3	6E-3	2E-2	6E-2	2E-1	6E-1
20k	6E-3	2E-2	6E-2	2E-1	6E-1	2	6
200k	6E-2	2E-1	6E-1	2	6	20	60

1M	3E-1	1	3	10	30	100	300
10M	3	10	30	100	300	1k	3k
100M	30	100	300	1k	3k	10k	30k

ResFactor x range = resolution.

Frequency and Period

Resolution	Gate time
100ppm x < range > (MAXimum)	10ms
10ppm x < range > (DEFault)	100ms
1ppm x < range > (MINimum)	1s

4 DC Measurement Resolution and Integration Time

Setting the integration time also sets the measurement resolution. This table shows the integration time relationship between the number of power line cycles (PLC) and the resolution.

Integration time			Resolution
Number of power cycles	50Hz power supply	60Hz power supply	
0.006 PLC(MINimum)	120us	100us	300ppm(MAXimum)
0.02 PLC	400us	333.3us	100ppm
0.06PLC	1.2ms	1ms	30ppm
0.02PLC	4ms	3.33ms	10ppm
1 PLC	20ms	16.7ms	3ppm
10 PLC(DEFault)	200ms	166.7ms	1ppm(DEFault)
100 PLC(MAXimum)	2s	1.667s	0.3ppm(MINimum)

5 Automatic trigger delay

If TRIGger:DElay:AUTO is on, the instrument selects the TRIGger DELay for you, as shown in the table below.

Note:

- All frequency and period measurements have an auto-trigger delay of 1 second.
- Continuity and diode functions ignore trigger delay.
- The 2-wire and 4-wire temperature measurements measure the delay using the corresponding 2-wire and 4-wire resistors.

5.1 DC Voltage Default Delay

PLC	0.006	0.02	0.06	0.2	1	10	100
50Hz power supply	120us	400us	1.2ms	4ms	20ms	200ms	2s
60Hz power supply	100us	333.3us	1ms	3.33ms	16.7ms	166.7ms	1.667s
Measuring range	Delay						
All	1ms						

5.2 DC Current Default Delay

PLC	0.006	0.02	0.06	0.2	1	10	100
50Hz power supply	120us	400us	1.2ms	4ms	20ms	200ms	2s
60Hz power supply	100us	333.3us	1ms	3.33ms	16.7ms	166.7ms	1.667s
Measuring range	Delay						
All	1ms						

5.3 Resistor (2-wire) Default Delay

PLC	0.006	0.02	0.06	0.2	1	10	100
-----	-------	------	------	-----	---	----	-----

50Hz power supply	120us	400us	1.2ms	4ms	20ms	200ms	2s
60Hz power supply	100us	333.3us	1ms	3.33ms	16.7ms	166.7ms	1.667s
Measuring range	Delay						
<=200kΩ	1ms						
1MΩ	4ms						
10MΩ	60ms						
100MΩ	60ms						

5.4 Resistor (4-wire) Default Delay

PLC	0.006	0.02	0.06	0.2	1	10	100
50Hz power supply	120us	400us	1.2ms	4ms	20ms	200ms	2s
60Hz power supply	100us	333.3us	1ms	3.33ms	16.7ms	166.7ms	1.667s
Measuring range	Delay						
<=200kΩ	1ms						
1MΩ	4ms						
10MΩ	60ms						
100MΩ	60ms						

5.5 AC Voltage Default Delay

	Filter (Hz)		
Measuring range	3	20	200
All	2.5s	0.8s	0.2s

5.6 AC Current Default Delay

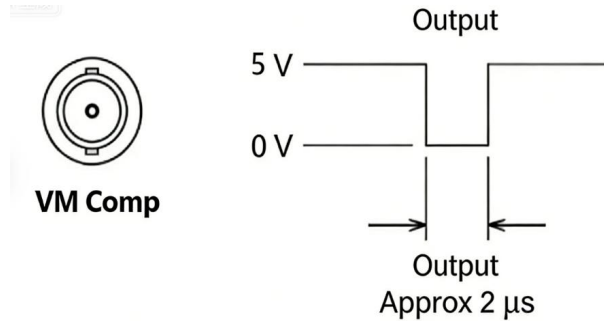
	Filter (Hz)		
Measuring range	3	20	200
All	2.5s	0.8s	0.2s

5.7 Frequency and Period

Regardless of how the gate time is set, the default delay for frequency and cycle is 1s.

6 VM acquisition completed output

After each measurement is completed, the back panel VM Comp (Acquisition Complete) output provides 5 V pulses to perform a standard hardware signal exchange sequence between the measurement and the switching device.



The signal shown is a negative pulse.

7 SCPI error message

The instrument returns an error message per SCPI standard.

- Up to 20 errors can be stored in the instrument error queue. Each remote interface I/O session (USB, VXI-11, Socket) has its own interface-specific error queue. The error appears in the error queue for the I/O session that caused the error. For example, if the ERRor is caused by a command sent over USB, send SYSTem:ERRor? From USB. To read the error queue. Errors generated by the instrument hardware are broadcast to all I/O sessions.
- The instrument beeps whenever an error is generated (unless disabled by SYSTem:BEEPer:STATe OFF). The front panel Error indicator opens when there is one or more errors in the Error queue.
- Error retrieval is first-in, first-out (FIFO) and clears errors when you read them. After reading all interface-specific errors, retrieves the errors in the global error queue. The Error indicator is closed after reading all errors from the interface-specific and global Error queues.
- If the number of errors exceeds 20, the latest error stored in the queue is replaced with -350, "Queue overflow". You cannot continue to store more errors until you delete them from the queue. If No error occurs when reading the error queue, the instrument will respond +0, "No error".
- The front panel reads errors in all I/O sessions and the global error queue. To read the Error queue from the front panel, press the Error icon.
- The status summary indication of the error is made in the status byte register. For more information about the SCPI state system, see Introduction to the State Subsystem.
- Clear the interface specific error queue when the *CLS (Clear Status) command is executed and the instrument is repowered. When the error queue is read, all errors are cleared. Performing a factory reset (*RST) or instrument PRESet (SYSTem:PRESet) does not clear the error queue.
- If the Error indication icon has been displayed, there is an Error in the Error queue. Switch to local operation (the Remote indicator will be turned off). Then press Please press the Error icon to view the Error message, close Exit and clear the Error queue.

7.1 Command Error (-100...)

- 101, "Invalid character"
- 103, "Invalid separator"
- 104, "Data type error"
- 108, "Parameter not allowed"
- 109, "Missing parameter"
- 113, "Undefined header"
- 131, "Invalid suffix"
- 138, "Suffix not allowed"

- 148, "Character data not allowed"
- 151, "Invalid string data"
- 170, "Expression error"

7.2 Execution Error (-200...)

- 200, "Execution error"
- 220, "Parameter error"
- 221, "Settings conflict;trigger source is BUS"
- 221, "Settings conflict;trigger mode is continue"
- 221, "Settings conflict;lower limit > upper limit"
- 221, "Settings conflict;upper limit < lower limit"
- 222, "Data out of range;trigger delay"
- 222, "Data out of range;DBM REF RES"
- 224, "Illegal parameter value"
- 230, "Data corrupt or stale"
- 256, "File name not found"
- 257, "File name error;not a folder name"
- 257, "File name error;invalid character in name"

7.3 Command Error (-300...)

- 310, "System error"
- 350, "Queue overflow"
- 363, "Input buffer overrun"
- 365, "Time out error"

7.4 Query Error (-400...)

- 410, "Query INTERRUPTED"

7.5 Other errors (+300... and +500...)

- 311, "Not able to specify resolution with Auto range"
- 514, "Not allowed; Instrument locked by another I/O session"

7.6 Self-test errors (600...)

- 610, "Self-test failed: unable to sense power frequency"
- 611, "Self-test failed: unable to sense power Voltage"
- 612, "Self-test failed: unable to sense pen Temp"
- 613, "Self-test failed: FPGA bus error"
- 614, "Self-test failed: FPGA clock"
- 615, "Self-test failed: calibration memory reading error"
- 616, "Self-test failed: unable to communicate with uart-GBIP"

8 Reset Measurement State

Reset to the specified value after * RST or SYSTem: PRESet.

Parameter			Factory settings	
Test Function			DCV	
Basic Functions	DCV	Range	Auto	
		Aperture	10 PLC	
		Auto Zero	On	
		Input Z	10M	
	ACV	Range	Auto	
		Filter	>20Hz	
	DCI	Range	Auto	
		Aperture	10 PLC	
		Auto Zero	On	
	ACI	Range	Auto	
		Filter	>20Hz	
	Ω 2W/ Ω 4W	Ω 2W/ Ω 4W	2WR	
		Range	Auto	
		Aperture	10 PLC	
		Auto Zero	On	
	Cont	Threshold	10 Ω	
	Diode	Threshold Low	300mV	
		Threshold High	800mV	
	CAP	Range	Auto	
	Freq	Frequency/Period	Frequency	
		Range	Auto	
		Filter	>20Hz	
		Gate time	100ms	
	Temp	Probe	TCouple	
		Probe Setting	Type	JITS90
			Reference	Internal
			Offset Adjust	0°C
			Fixed Offset	0°C
		RTD	R0	100 Ω
		Auto Zero	On	
		Aperture	10 PLC	

Parameter			Factory settings
		Units	°C
Math	Relative	All measurement function	Off
		Reference value	0
	Statistics	On/Off	On
	Limits	On/Off	Off
		High	0
		Low	0
		Center	0
		Span	0
	dB/dBm	On/Off	Off
		Function	dB
		Ref R	600 Ω
		dB Ref Value	0 dBm
Acquire	Acquire mode		Continue
	Trigger Settings	Trigger Source	Auto
		External Slope	Negative
		Delay	Auto
		Manual Delay	0s
		Samples/Trigger	1
	VMC Output	Negative/positive	Negative
Display	Display Mode		Number
	Number	2nd Meas	Off
		Digit Mask	Auto
	Bar	Scale	Default
	Trend	Recent/All	Recent
	Histogram	Binning/Auto	Auto
		Cumulative	Off

9 Factory settings

Initialize all instrument settings to reset measurement status (* RST) values after SYSTem:SECurity:IMMediate. This command also clears all user-defined status information, preference information, measurement data, and I/O settings (where I/O settings must be turned off and then powered on to the instrument for changes to take effect).

Parameter			Factory settings
System setting	Power on		Default
	Decimal Pt		Point
	Separator		None
	Beeper		On
	Sound		On
	Brightness		100%
	Scrn Svr		Off
	Power on Message		None
	Label		Off
	Label Text		None
I/O setting	LAN	LAN	On
		IP Obtain mode	DHCP
		Host Name	dmm-device serial number
	USB	USB SCPI	On
	Serial	Serial SCPI	On
		Baud rate	9600
		Data bits	8
		Stop bits	1
		Parity	None