

RIGOL

Programming Guide

DM3058/DM3058E Digital Multimeter

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RIGOL Technologies, Inc.

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Summary

This manual provides the guidance for remote control programming of DM3058/DM3058E digital multimeter. Users can carry on remote control to a multimeter or do the further development according to this manual. We believe that this manual's readers have read the detailed **RIGOL** DM3058/DM3058E multimeter user guide, and been familiar with the **RIGOL** DM3058/DM3058E multimeter's operation.

The manual contains following chapters:

Chapter 1 Introduction

Give a general overview of commands usage.

Chapter 2 General Commands

Introduce the common commands includes IEEE488 commands, Status subsystem commands and System commands.

Chapter 3 RIGOL Command System

Introduce the details of each sub-command of **RIGOL** DM3058/DM3058E digital multimeter.

Chapter 4 Compatible Agilent Commands

Describe the Agilent commands that are compatible with **RIGOL** DM3058/DM3058E digital multimeter in great detail.

Chapter 5 Compatible Fluke Commands

Describe the Fluke commands that are compatible with **RIGOL** DM3058/DM3058E digital multimeter in great detail.

Chapter 6 Application Examples

The application examples of **RIGOL** DM3058/DM3058E digital multimeter commands.

Appendix

List all the incompatible Agilent and Fluke commands.

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Chapter 1 Introduction

This chapter gives you an instruction in how to operate **RIGOL** DM3058/DM3058E digital multimeter correctly using remote control programming in connection with the command symbols and parameters, including:

- Programming Introduction
- Symbol Instruction
- Parameter Types
- Commands in this Manual

Programming Introduction

The programming system provides an easy way for remote control through corresponding commands, sending and identifying the command word with ASCII strings. Connect a computer with the multimeter through communication interfaces such as USB, GPIB*, LAN* or RS-232 before use.

The operations that you can do through the commands:

- Setup the multimeter.
- Make measurements.
- Acquire data (instrument working condition or measurement results) from the multimeter.

Note*: The GPIB and LAN interfaces are only supported by DM3058.

Symbol Instruction

1. Colon :

Commands usually begin with a colon (:), which is used to separate the keyword from lower-level keyword, denoting the beginning of an operation to the multimeter.

2. Interrogation ?

A query is formed by adding an interrogation (?) at the end of the command. The query command usually contains different data, and both of them usually divided by a space.

3. Braces { }

When several elements separated by a vertical line (|) are enclosed by braces, { }, only one element may be selected. For example, {ON | OFF} indicates that only ON or OFF may be selected, not both.

4. Triangle Brackets < >

The item enclosed in < > should be replaced by an actual value as a parameter.

5. Square brackets []

Some parameters or command keywords are enclosed by square bracket ([]), indicating that which are optional or could be ignored. If no parameter is set, the system will select a default. For example, [MINimum/MAXimum] can be ignored in command *CALCulate:LIMit:LOWer?* [MINimum/MAXimum], while [:EVENT] in command *STATus:OPERation[:EVENT]?*.

Parameter Types

1. Consecutive Integer Parameter

The parameters could be an integer within the valid range. For example, setting the screen brightness from "0~32" through ":SYSTem:DISPlay:BRIGht". Note do not set the parameters with decimal, or else an unexpected exception may occurred.

2. Consecutive Real Number Parameter

Under the precision condition, the parameters could be an arbitrary value within the valid range (usually the default precision takes six effective digits behind the decimal point). For example, in command :CALCulate:REL:OFFSet, the parameters meet the range of the real number in Table 3-2.

3. Discrete Parameters

The parameters can only be the cited value. For example, the parameter of ":MEASure:VOLTage:AC" could only be 0, 1, 2 or 3.

4. Boolean Parameters

The parameters must be ON, OFF, 0 or 1. For example, in command "SYSTem:BEEPer:STATe".

5. ASCII String

The parameter should be a composition of ASCII strings. For example, the parameter of IP address query command ":UTILity:INTERface:LAN:IP" is a user-defined string.

Commands in this Manual

To meet the needs from different users, DM3058/DM3058E provides three command systems:

- **RIGOL** commands
- Compatible Agilent commands
- Compatible Fluke commands

To switch between commands listed above, use the command shown below:

Command Format:

```
CMDSET {RIGOL|AGILENT|FLUKE}  
CMDSET?
```

Function:

The commands set and query the command system.

Explanations:

The Agilent commands in this manual refers to Agilent 34401A, and the Fluke Commands refers to Fluke 45, except where noted.

The **RIGOL** commands is to be used by default when power-on.

Chapter 2 General Commands

The system applies to both DM3058/DM3058E commands and other compatible commands of Agilent and Fluke, which mainly include:

- IEEE 488 Commands
- STATus Commands
- SYSTem CommandsIEEE 48

IEEE 488 Commands

The commands query the basic equipment information or perform some common actions, which mainly include:

- *CLS
- *ESE
- *ESR?
- *IDN?
- *OPC
- *PSC
- *RST
- *SRE
- *STB?
- *TRG
- *TST?
- *WAI

1. ***CLS**

Command Format:

*CLS

Function:

The command resets the values in all Event Registers and clears the Error Queue information.

2. ***ESE**

Command Format:

*ESE <enable_value>

*ESE?

Function:

The commands set and query the enable value of Event Status Register (ESR).

Explanations:

*ESE <enable_value> - Sets the desired enable value of ESR.

*ESE? - Queries the current enable value of ESR.

<enable_value> - Ranging from 0 to 189.

Return Format:

The query returns the enable value of ESR.

3. ***ESR?**

Command Format:

*ESR?

Function:

The command queries the event value of Event Status Register (ESR).

Return Format:

The query returns the current event value of ESR.

4. *IDN?

Command Format:

*IDN?

Function:

The command queries the equipment ID.

Return Format:

The query returns a string which denotes the instrument ID, and composed of at least 35 characters.

5. *OPC

Command Format:

*OPC

*OPC?

Function:

*OPC - Sets the "Operation Complete" (bit 0) of Event Status Register to 1 after the current operation has been completed.

*OPC? - Queries whether the current operation is finished or not.

Return Format:

The query returns "1" , which denotes the current operation has been finished.

6. *PSC

Command Format:

*PSC {0|1}

*PSC?

Function:

The commands set and query the value of "power-on status clear".

Explanations:

*PSC {0|1} - Enables or disables the clear operation of register when power-on;

thereinto, “*PSC 0” indicates disable - the enable value of each register would be LAST STATE; “*PSC 1” indicates enable - the enable value of each register would be resetted.

*PSC? – Queries the value of “power-on status clear”.

Return Format:

The query returns 0 or 1.

7. *RST**Command Format:**

*RST

Function:

The command resets the instrument.

8. *SRE**Command Format:**

*SRE <enable_value>

*SRE?

Function:

The commands set and query the enable value of Status Byte Register (STB).

Explanations:

*SRE <enable_value> - Sets the desired enable value of STB.

*SRE? - Queries the enable value of STB.

<enable_value> - ranging from 0 to 188.

Return Format:

The query returns the current enable value of STB.

9. *STB?**Command Format:**

*STB?

Function:

The command queries the condition value of Status Byte Register (STB).

Return Format:

The query returns the current condition value of STB.

10. *TRG**Command Format:**

*TRG

Function:

The command generates a trigger signal when the instrument is in "Wait-for-trigger" state.

11. *TST?**Command Format:**

*TST?

Function:

The command queries the self-test result.

Return Format:

The query returns 0 or 1. Thereinto, 0 denotes pass, and 1 denotes failure.

12. *WAI**Command Format:**

*WAI

Function:

The command waits until all pending operations complete.

STATus Commands

The commands set and query both the Questionable Status Register and Operation Status Register, which mainly include:

- STATus:OPERation:CONDition?
- STATus:OPERation:ENABLE
- STATus:OPERation[:EVENT]?
- STATus:PRESet
- STATus:QUEStionable:CONDition?
- STATus:QUEStionable:ENABLE
- STATus:QUEStionable[:EVENT]?

The principle of Status Register is shown in Figure 2-1, which contains Questionable Status Register, Operation Status Register, Event Status Register and Status Byte Register as well as Output Buffer and Error Queue. The status commands set or query the Questionable Status Register and Operation Status Register in Status Register. About the detailed operations to the Event Status Register and Status Byte Register as well as Output Queue and Error Queue on the basis of IEEE488 commands, please refer to the above section.

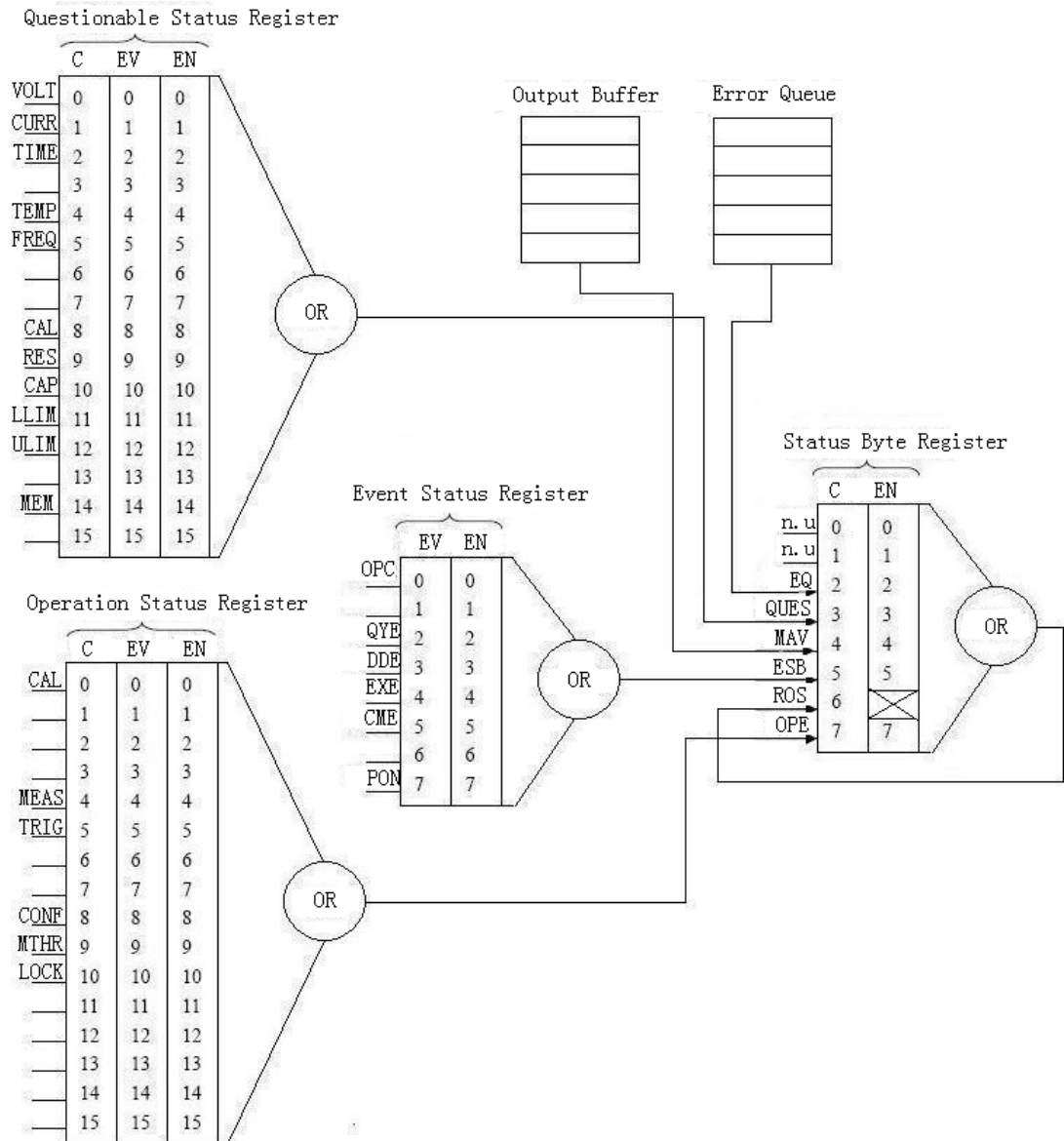


Figure 2-1 The Status Register diagram

1. STATus:OPERation:CONDition?

Command Format:

STATus:OPERation:CONDition?

Function:

The command queries the status of Condition Register in the Operation Status Register queue.

Return Format:

The query returns the current status of Condition Register from Operation Status Register.

2. STATus:OPERation:ENABLE**Command Format:**

STATus:OPERation:ENABle <enable_value>
STATus:OPERation:ENABle?

Function:

The commands set or query the value of Enable Register in the Operation Status Register queue.

Explanations:

STATus:OPERation:ENABle <enable_value> - Sets the value of Enable Register from Operation Status Register.

<enable_value> - Ranging from 0 to 1841.

STATus:OPERation:ENABle? - Queries the value of Enable Register from Operation Status Register.

Return Format:

The query returns the current value of Enable Register in the Operation Status Register queue.

3. STATus:OPERation[:EVENT]?**Command Format:**

STATus:OPERation[:EVENT]?

Function:

The command queries the value of Event Register in the Operation Status Register queue.

Return Format:

The query returns the current value of Event Register in the Operation Status Register queue.

4. STATus:PRESet**Command Format:**

STATus:PRESet

Function:

The command resets the value of Enable Register in both the Operation Status Register and Questionable Status Register queue.

5. STATus:QUESTionable:CONDition?**Command Format:**

STATus:QUESTionable:CONDition?

Function:

The command queries the value of Condition Register in the Questionable Status Register queue.

Return Format:

The query returns the current value of Condition Register in the Questionable Status Register queue.

6. STATus:QUESTionable:ENABle**Command Format:**

STATus:QUESTionable:ENABle <enable value>

STATus:QUESTionable:ENABle?

Function:

The commands set and query the value of Enable Register in the Questionable Status queue.

Explanations:

STATus:QUEStionable:ENABle <enable value> - Sets the Enable Register value from Questionable Status Register.

<enable_value> - Ranging from 0 to 24375.

STATus:QUEStionable:ENABle? - Queries the Enable Register value of Questionable Status Register.

Return Format:

The query returns the current value of Enable Register in the Questionable Status Register queue.

7. STATus:QUEStionable[:EVENT]?**Command Format:**

STATus:QUEStionable[:EVENT]?

Function:

The command queries the value of Event Register in the Questionable Status Register queue.

Return Format:

The query returns the current value of Event Register in the Questionable Status Register queue.

SYSTEM Commands

The commands query and set the beeper, error messages and SCPI edition, which mainly include:

- SYSTEM:BEEPer
- SYSTEM:BEEPer:STATe
- SYSTEM:ERRor?
- SYSTEM:VERSion?

1. **SYSTem:BEEPer**

Command Format:

SYSTem:BEEPer

Function:

The command tests the beeper.

Explanations:

The command issues a single beep immediately from the instrument. Note that the beeper must be opened before using this command.

2. **SYSTem:BEEPer:STATe**

Command Format:

SYSTem:BEEPer:STATe?

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

Function:

The commands set and query the status of the beeper.

Explanations:

SYSTem:BEEPer:STATe? – Queries if the beeper is open.

SYSTem:BEEPer:STATe {ON|OFF|1|0} – Sets the beeper state. ON (1) is used to open the beeper, and OFF (0) is for close. If the command “SYSTem:BEEPer:STATe OFF” has been used, **SYSTem:BEEPer** would be invalid when next use.

Return Format:

The query returns the current beeper state, 1 denotes ON and 0 denotes OFF.

Example

Opening the beeper.

SYSTem:BEEPer:STATe ON

3. **SYSTem:ERRor?**

Command Format:

SYSTem:ERRor?

Function:

The command queries the errors in the Error queue.

Return Format:

The query returns the error number in connection with error description. If no error, the query returns: 0,"No error".

4. **SYSTem:VERSion?**

Command Format:

SYSTem:VERSion?

Function:

The command queries the SCPI (Standard Commands for Programmable Instruments) version of the instrument.

Return Format:

The query returns the current SCPI version of the instrument. For example, "1999.0".

Chapter 3 RIGOL Command System

All the **RIGOL** commands in connection with the return values are ASCII characters with case-insensitive.

The system mainly includes the following command subsystems:

- :CALCulate Commands
- :FUNCTion Commands
- :FUNCTion2 Commands
- :MEASure Commands
- :RATE Commands
- :SYSTem Commands
- :TRIGger Commands
- :UTILity Commands

:CALCulate Commands

The commands set the parameters relate to math operations, which mainly include:

- :CALCulate:FUNction
- :CALCulate:STATistic:MIN?
- :CALCulate:STATistic:MAX?
- :CALCulate:STATistic:AVERage?
- :CALCulate:STATistic:COUNt?
- :CALCulate:STATistic:STATe
- :CALCulate:REL:OFFSet
- :CALCulate:REL:STATe
- :CALCulate:DB?
- :CALCulate:DB:REFErence
- :CALCulate:DB:STATe
- :CALCulate:DBM?
- :CALCulate:DBM:REFErence
- :CALCulate:DBM:STATe
- :CALCulate:PF?
- :CALCulate:PF:LOWEr
- :CALCulate:PF:UPPEr
- :CALCulate:PF:STATe

1. :CALCulate:FUNCTION

Command Format:

:CALCulate:FUNCTION?

:CALCulate:FUNCTION {NONE|REL|DB|DBM|MIN|MAX|AVERAGE|TOTAL|PF}

Function:

The commands set and query the math function.

Explanations:

:CALCulate:FUNCTION? – Queries the current selected math operation, the default is NONE (Math function is disabled).

:CALCulate:FUNCTION {NONE|REL|DB|DBM|MIN|MAX|AVERAGE|TOTAL|PF} – Selects the operation to be used. For the available math operations, see table below.

Figure 3-1 Available math operations

Parameters	Description
NONE	Turn off all the math functions
REL	Relative operation
DB	dB operation
DBM	dBm operation
MIN	Minimum operation
MAX	Maximum operation
AVERAGE	Average operation
TOTAL	Turn on all the statistics which include MIN, MAX and AVERAGE
PF	Limit operation

Return Format:

The query returns the current selected operation, such as REL, DB, DBM, MIN, MAX, AVERAGE, TOTAL or PF. If more than one operation are used, the query may return a combination such as REL+PF; if all the operations are disabled, the query returns NONE.

2. :CALCulate:STATistic:MIN?

Command Format:

:CALCulate:STATistic:MIN?

Function:

The command queries the minimum of current statistic.

Explanations:

The command is valid only when MIN operation is enabled.

Return Format:

The query returns the calculated minimum.

3. :CALCulate:STATistic:MAX?

Command Format:

:CALCulate:STATistic:MAX?

Function:

The command queries the maximum of current statistic.

Explanations:

The command is valid only when MAX operation is enabled.

Return Format:

The query returns the calculated maximum.

4. :CALCulate:STATistic:AVERage?

Command Format:

:CALCulate:STATistic:AVERage?

Function:

The command queries the average of current statistic.

Explanations:

The command is valid only when AVERAGE operation is enabled.

Return Format:

The query returns the calculated average.

5. :CALCulate:STATistic:COUNT?**Command Format:**

:CALCulate:STATistic:COUNT?

Function:

The command queries the number of current measurement calculated.

Explanations:

The command is only valid for current measurement. If measurement function is changed, it will restart the counting.

Return Format:

The command queries the calculated number of measurement.

6. :CALCulate:STATistic:STATE**Command Format:**

:CALCulate:STATistic:STATE?

:CALCulate:STATistic:STATE {ON|OFF|1|0}

Function:

The commands query and set the statistic state.

Explanations:

:CALCulate:STATistic:STATE? – Queries the current statistic state.

:CALCulate:STATistic:STATE {ON|OFF|1|0} – Sets the desired statistic state.

Return Format:

The query returns the current statistic state ON (1) or OFF (0).

Example:

Turn off the statistic function.
:CALCulate:STATistic:STATe OFF

7. :CALCulate:REL:OFFSet

Command Format:

:CALCulate:REL:OFFSet?
:CALCulate:REL:OFFSet {<range>|MIN|MAX|DEF|CURR}

Function:

The commands query and set the offset of REL operation.

Parameter:

Name	Type	Range	Default
<range>	Consecutive real number	See Table 3-2	0

Explanations:

:CALCulate:REL:OFFSet? – Queries the REL offset of current measurement.
:CALCulate:REL:OFFSet {<range>|MIN|MAX|DEF|CURR} – Sets the desired REL offset for current measurement.

The value of <range> varies with measurement type and range. See table below, every parameter could be a value with sixth decimals. All the set value is only valid for the current measurement and the value should be less than the upper limit of current range.

Table 3-2 Offset range of REL operation

Measurement items	Range	DEF	Unit
DC Voltage	±1200	0	V
AC Voltage	±900	0	V
DC Current	±12	0	A
AC Current	±12	0	A
Resistance	±1.2e+08	0	Ω
Capacitance	±1.2e-02	0	F
Frequency	±1.2e+06	0	Hz

Return Format:

The query returns the offset relates to REL operation.

8. :CALCulate:REL:STATe**Command Format:**

:CALCulate:REL:STATe?

:CALCulate:REL:STATe {ON|OFF|1|0}

Function:

The commands query and set the REL state.

Explanations:

:CALCulate:REL:STATe? – Queries the current REL state.

:CALCulate:REL:STATe {ON|OFF|1|0} – Sets the desired REL state.

Return Format:

The query returns the current REL state, ON (1) or OFF (0).

Example:

Disables the REL operation.

:CALCulate:REL:STATe OFF

9. :CALCulate:DB?**Command Format:**

:CALCulate:DB?

Function:

The command queries the dB value of current measurement.

Explanations:

The command is valid only when dB operation is enabled.

Return Format:

The query returns the calculated dB value.

10. :CALCulate:DB:REFerence**Command Format:**

:CALCulate:DB:REFerence?

:CALCulate:DB:REFerence {<range>|MIN|MAX|DEF}

Function:

The commands query and set the dB reference value of current measurement.

Parameter:

Name	Type	Range	Default
<range>	Consecutive real numbe	-120 dBm ~ +120 dBm	0

Explanations:

:CALCulate:DB:REFerence? – Queries the dB reference value.

:CALCulate:DB:REFerence {<range>|MIN|MAX|DEF} – Sets the desired dB reference value.

The command is valid only when dB operation is enabled.

The reference value should be an integer within +120 dBm and -120 dBm, MIN is equal to -120 dBm, MAX is equal to +120 dB m and DEF is 0.

Return Format:

The query returns the current dB reference value.

11. :CALCulate:DB:STATe**Command Format:**

:CALCulate:DB:STATe?

:CALCulate:DB:STATe {ON|OFF|1|0}

Function:

The commands query and set the dB state.

Explanations:

:CALCulate:DB:STATe? - Queries the current dB state.

:CALCulate:DB:STATe {ON|OFF|1|0} - Sets the desired dB state.

Return Format:

The query returns the current dB state, ON (1) or OFF (0).

Example:

Turn off the dB operation:

```
:CALCulate:DB:STATe OFF
```

12. :CALCulate:DBM?**Command Format:**

```
:CALCulate:DBM?
```

Function:

The command queries the dBm value of current measurement.

Explanations:

The command is valid only when dBm operation is enabled.

Return Format:

The query returns the calculated dBm value.

13. :CALCulate:DBM:REFErence**Command Format:**

```
:CALCulate:DBM:REFErence?
```

```
:CALCulate:DBM:REFErence {<range>|MIN|MAX|DEF}
```

Function:

The commands query and set the dBm reference resistance.

Parameter:

Name	Type	Range	Default
<range>	Consecutive real numbe	2~8000	600

Explanations:

:CALCulate:DBM:REFErence? – Queries the reference resistance of dBm.

:CALCulate:DBM:REFerence {<range>|MIN|MAX|DEF} – Sets the desired reference resistance of dBm.

The command is valid only when dBm operation is enabled.

The reference resistance should be an integer within 2 and 8000, the unit is Ω . MIN is equal to 2 Ω , MAX is equal to 8000 Ω and DEF is 600 Ω .

Return Format:

The query returns the current reference resistance of dBm.

14. :CALCulate:DBM:STATe

Command Format:

:CALCulate:DBM:STATe?

:CALCulate:DBM:STATe {ON|OFF|1|0}

Function:

The commands query and set the dBm state.

Explanations:

:CALCulate:DBM:STATe? – Queries the current dBm state.

:CALCulate:DBM:STATe {ON|OFF|1|0} – Sets the desired dBm state.

Return Format:

The query returns the current dBm state, ON (1) or OFF (0).

Example:

Turn off the dBm operation.

:CALCulate:DBM:STATe OFF

15. :CALCulate:PF?

Command Format:

:CALCulate:PF?

Function:

The command queries the result of current PF operation.

Explanations:

When the measurement result is within the maximum and minimum, the PF operation is success.

Return Format:

The query returns the PF operation: PASS, HI or LO.

16. :CALCulate:PF:LOWEr**Command Format:**

:CALCulate:PF:LOWEr?

:CALCulate:PF:LOWEr {<range>|MIN|MAX|DEF}

Function:

The comands query and set the lower limit of P/F operation.

Parameter:

Name	Type	Range	Default
<range>	Consecutive real numbe	See Table 3-3	0

Explanations:

:CALCulate:PF:LOWEr? – Queries the lower limit of P/F operation

:CALCulate:PF:LOWEr {<range>|MIN|MAX|DEF} – Sets the lower limit of P/F operation. See table below for more details.

Table 3-3 Ranges of P/F operation

Measurent items	Range	Unit
DC Voltage	±1200	V
AC Voltage	0~900	V
DC Current	±12	A
AC Current	0~12	A
Resistance	0~1.2e+08	Ω
Capacitance	0~1.2e-02	F
Period	1.0e-06~100	s
Frequency	0~1.2e+06	Hz

Return Format:

The query returns the current lower limit.

17. :CALCulate:PF:UPPER**Command Format:**

:CALCulate:PF:UPPER?

:CALCulate:PF:UPPER {<range>|MIN|MAX|DEF}

Function:

The commands query and set the upper limit of P/F operation.

Parameter:

Name	Type	Range	Default
<range>	Consecutive real numbe	See Table 3-3	1

Explanations:

:CALCulate:PF:UPPER? – Queries the upper limit of P/F operation.

:CALCulate:PF:UPPER {<range>|MIN|MAX|DEF} – Sets the upper limit of P/F operation. For more detail, refer to Table 3-3.

Return Format:

The query returns the current upper limit.

18. :CALCulate:PF:STATE**Command Format:**

:CALCulate:PF:STATE?

:CALCulate:PF:STATE {ON|OFF|1|0}

Function:

The comands query and set the current P/F state.

Explanations:

:CALCulate:PF:STATE? – Queries the current P/F state.

:CALCulate:PF:STATe {ON|OFF|1|0} – Sets the desired P/F state.

Return Format:

The query returns the current P/F state: ON (1) or OFF (0).

Example:

Turn off the P/F function:

:CALCulate:PF:STATe OFF

:FUNCTION Commands

The commands enable the measurement function to be used, which are equal to the corresponding buttons at the front panel, including:

- :FUNCTION?
- :FUNCTION:VOLTage:DC
- :FUNCTION:VOLTage:AC
- :FUNCTION:CURREnt:DC
- :FUNCTION:CURREnt:AC
- :FUNCTION:RESistance
- :FUNCTION:FRESistance
- :FUNCTION:FREQuency
- :FUNCTION:PERiod
- :FUNCTION:CONTInuity
- :FUNCTION:DIODE
- :FUNCTION:CAPacitance

1. :FUNction?

Command Format:

:FUNction?

Function:

The command queries the current measurement function. If double-display is using, the command queries the function of main display.

Return Format:

The query returns the current measurement function, such as DCV, ACV, DCI, ACI, RESISTANCE, CAPACITANCE, CONTINUITY, FRESISTANCE, DIODE, FREQUENCY, PERIOD.

2. :FUNction:VOLTage:DC

Command Format:

:FUNction:VOLTage:DC

Function:

The command enables the DC voltage measurement.

Explanations:

The query **:FUNction?** will return DCV.

3. :FUNction:VOLTage:AC

Command Format:

:FUNction:VOLTage:AC

Function:

The command enables the AC voltage measurement.

Explanations:

The query **:FUNction?** will return ACV.

4. **:FUNction:CURRent:DC**

Command Format:

:FUNction:CURRent:DC

Function:

The command enables the DC current measurement.

Explanations:

The query **:FUNction?** will return DCI.

5. **:FUNction:CURRent:AC**

Command Format:

:FUNction:CURRent:AC

Function:

The command enables the AC current measurement.

Explanations:

The query **:FUNction?** will return ACI.

6. **:FUNction:RESistance**

Command Format:

:FUNction:RESistance

Function:

The command enables the 2-wire resistance measurement.

Explanations:

The query **:FUNction?** will return 2WR.

7. **:FUNction:FRESistance**

Command Format:

:FUNction:FRESistance

Function:

The command enables the 4-wire resistance measurement.

Explanations:

The query **:FUNction?** will return 4WR.

8. :FUNction:FREQuency**Command Format:**

:FUNction:FREQuency

Function:

The command enables the frequency measurement.

Explanations:

The query **:FUNction?** will return FREQ.

9. :FUNction:PERiod**Command Format:**

:FUNction:PERiod

Function:

The command enables the period measurement.

Explanations:

The query **:FUNction?** will return PERI.

10. :FUNction:CONTInuity**Command Format:**

:FUNction:CONTInuity

Function:

The command enables the continuity measurement.

Explanations:

The query **:FUNction?** will return CONT.

11. :FUNction:DIODE

Command Format:

:FUNction:DIODE

Function:

The command enables the diode measurement.

Explanations:

The query **:FUNction?** will return DIODE.

12. :FUNction:CAPacitance

Command Format:

:FUNction:CAPacitance

Function:

The command enables the capacitance measurement.

Explanations:

The query **:FUNction?** will return CAP.

:FUNCTION2 Commands

The commands set and query the parameters relate to double-display function, which mainly include:

- :FUNCTION2?
- :FUNCTION2:VALUE1?
- :FUNCTION2:VALUE2?
- :FUNCTION2:VOLTage:DC
- :FUNCTION2:VOLTage:AC
- :FUNCTION2:CURREnt:DC
- :FUNCTION2:CURREnt:AC
- :FUNCTION2:FREQuency
- :FUNCTION2:PERiod
- :FUNCTION2:RESistance
- :FUNCTION2:FRESistance
- :FUNCTION2:CAPacitance
- :FUNCTION2:ON?
- :FUNCTION2:CLEar

1. :FUNction2?

Command Format:

:FUNction2?

Function:

The comand queries the current measurement of vice-display.

Explanations:

The command is valid only when vice-display is enabled.

Return Format:

The query returns the current measurement of vice-display, such as DCV, ACV, DCI, ACI, 2WR, CAP, 4WR, FREQ, PERI.

2. :FUNction2:VALUe1?

Command Format:

:FUNction2:VALUe1?

Function:

The command queries the measured value of the main-display.

Explanations:

The command is valid only when vice-display is enabled.

Return Format:

The command returns the measured value of the main-display.

3. :FUNction2:VALUe2?

Command Format:

:FUNction2:VALUe2?

Function:

The command queries the measured value of the vice-display.

Explanations:

The command is valid only when vice-display is enabled.

Return Format:

The command returns the measured value of the vice-display.

4. :FUNCTION2:VOLTage:DC**Command Format:**

:FUNCTION2:VOLTage:DC

Function:

The command sets the vice-display to DC voltage measurement.

Explanations:

The available measurements to main-display could only be DCV, DCI, ACV or ACI.

5. :FUNCTION2:VOLTage:AC**Command Format:**

:FUNCTION2:VOLTage:AC

Function:

The command sets the vice-display to AC voltage measurement.

Explanations:

The available measurements to main-display could only be DCV, DCI, ACV, ACI, FREQUENCY, PERIOD after this command.

6. :FUNCTION2:CURREnt:DC**Command Format:**

:FUNCTION2:CURREnt:DC

Function:

The command sets the vice-display to DC current measurement.

Explanations:

The available measurements to main-display could only be DCV, DCI, ACV, ACI after this command.

7. :FUNction2:CURRent:AC

Command Format:

:FUNction2:CURRent:AC

Function:

The command sets the vice-display to AC current measurement.

Explanations:

The available measurements to main-display could only be DCV, DCI, ACV, ACI, FREQUENCY, PERIOD after this command.

8. :FUNction2:FREQuency

Command Format:

:FUNction2:FREQuency

Function:

The command sets the vice-display to frequency measurement.

Explanations:

The available measurements to main-display could only be ACV, FREQUENCY, PERIOD after this command.

9. :FUNction2:PERiod

Command Format:

:FUNction2:PERiod

Function:

The command sets the vice-display to period measurement.

Explanations:

The available measurements to main-display could only be ACV, FREQUENCY, PERIOD after this command.

10. :FUNction2:RESistance**Command Format:**

:FUNction2:RESistance

Function:

The command sets the vice-display to 2-wire resistance measurement.

Explanations:

The available measurements to main-display could only be RESISTANCE after this command.

11. :FUNction2:FRESistance**Command Format:**

:FUNction2:FRESistance

Function:

The command sets the vice-display to 4-wire resistance measurement.

Explanations:

The available measurements to main-display could only be FRESISTANCE after this command.

12. :FUNction2:CAPacitance**Command Format:**

:FUNction2:CAPacitance

Function:

The command sets the vice-display to capacitance measurement.

Explanations:

The available measurements to main-display could only be CAPACITANCE after this command.

13. :FUNction2:ON?

Command Format:

:FUNction2:ON?

Function:

The command queries the current vice-display function.

14. :FUNction2:CLEar

Command Format:

:FUNction2:CLEar

Function:

The command disables the vice-display.

:MEASure Commands

The commands set the measurement parameters or query the measured results, including:

- :MEASure?
- :MEASure
- :MEASure:VOLTage:DC?
- :MEASure:VOLTage:DC
- :MEASure:VOLTage:DC:RANGe?
- :MEASure:VOLTage:DC:IMPEdance
- :MEASure:VOLTage:DC:FILTer[:STATe]
- :MEASure:VOLTage:AC?
- :MEASure:VOLTage:AC
- :MEASure:VOLTage:AC:RANGe?
- :MEASure:CURRent:DC?
- :MEASure:CURRent:DC
- :MEASure:CURRent:DC:RANGe?
- :MEASure:CURRent:DC:FILTer[:STATe]
- :MEASure:CURRent:AC?
- :MEASure:CURRent:AC
- :MEASure:CURRent:AC:RANGe?
- :MEASure:RESistance?
- :MEASure:RESistance
- :MEASure:RESistance:RANGe?
- :MEASure:FRESistance?
- :MEASure:FRESistance
- :MEASure:FRESistance:RANGe?
- :MEASure:FREQuency?
- :MEASure:FREQuency
- :MEASure:FREQuency:RANGe?
- :MEASure:PERiod?
- :MEASure:PERiod
- :MEASure:PERiod:RANGe?
- :MEASure:CONTInuity?
- :MEASure:CONTInuity
- :MEASure:DIODE?

- :MEASure:CAPacitance?
- :MEASure:CAPacitance
- :MEASure:CAPacitance:RANGe?

1. :MEASure?

Command Format:

:MEASure?

Function:

The command queries if a new data has been acquired under current trigger setting.

Return Format:

The query returns TRUE or FALSE. Thereinto, TRUE indicates a new data has been acquired.

2. :MEASure

Command Format:

:MEASure {AUTO|MANU}

Function:

The command selects the measurement type as Auto or Manual.

Example:

Sets the measurement type to Manual.

:MEASure MANU

3. :MEASure:VOLTage:DC?

Command Format:

:MEASure:VOLTage:DC?

Function:

The command queries the current measured DC voltage value.

Explanations:

The command is unavailable in double-display.

Return Format:

The command returns the measured DC voltage value in scientific notation, such as: 8.492853e-05, the unit is V.

4. :MEASure:VOLTage:DC

Command Format:

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

Function:

The command sets the range and resolution of DC voltage measurement.

Parameter:

Name	Type	Range	Default
<range>	Discrete	{0 1 2 3 4}	2

Explanations:

The corresponding resolution will be set automatically after you set the range. The measurement type will change into "Manual" automatically as you set the range.

For the parameter range and the corresponding resolution, see table below.

Table 3-4 DC voltage range and the corresponding resolution

Parameter	Range	Resolution
0	200 mV	100 nV
1	2 V	1 μ V
2	20 V	10 μ V
3	200 V	100 μ V
4	1000 V	1 mV
MIN	200 mV	100 nV
MAX	1000 V	1 mV
DEF	20 V	10 μ V

Example:

Sets the DC voltage range to 200V.

```
:MEASure:VOLTage:DC 3
```

Sets the DC voltage range to the minimum.

:MEASure:VOLTage:DC MIN or :MEASure:VOLTage:DC 0

5. :MEASure:VOLTage:DC:RANGe?

Command Format:

:MEASure:VOLTage:DC:RANGe?

Function:

The command queries the current DC voltage range.

Explanations:

The DC voltage measurement has to be used at least once before using this command.

Return Format:

The command returns: 0, 1, 2, 3 or 4 (see Table 3-4).

6. :MEASure:VOLTage:DC:IMPEdance

Command Format:

:MEASure:VOLTage:DC:IMPEdance?

:MEASure:VOLTage:DC:IMPEdance {10M|10G}

Function:

The commands query and set the DC impedance.

Explanations:

:MEASure:VOLTage:DC:IMPEdance? – Queries the current DC impedance value.

:MEASure:VOLTage:DC:IMPEdance {10M|10G} – Sets the desired DC impedance value to 10 M Ω or >10 G Ω .

Note: " >10 G" is available only when the DC voltage range is 200mV or 2V.

Return Format:

The query returns 10M or 10G (that is >10G).

Example:

Sets the DC impedance to 10G Ω .

:MEASure:VOLTage:DC:IMPEdance 10G

7. :MEASure:VOLTage:DC:FILTer[:STATe]

Command Format:

:MEASure:VOLTage:DC:FILTer[:STATe]?

:MEASure:VOLTage:DC:FILTer[:STATe] {ON|OFF|1|0}

Function:

The commands query and set the AC filter state under current DC voltage measurement.

Explanations:

:MEASure:VOLTage:DC:FILTer[:STATe]? – Queries the filter state.

:MEASure:VOLTage:DC:FILTer[:STATe] {ON|OFF} – Opens or closes the filter.

Return Format:

The query returns ON (1) or OFF (0).

Example:

Opens the filter.

:MEASure:VOLTage:DC:FILTer ON

8. :MEASure:VOLTage:AC?

Command Format:

:MEASure:VOLTage:AC?

Function:

The command queries the measured AC current value.

Explanations:

The command is unavailable in double-display.

Return Format:

The command queries the measured AC voltage value in scientific notation, such as: 3.941713e-01, the unit is V.

9. :MEASure:VOLTage:AC

Command Format:

:MEASure:VOLTage:AC {<range>|MIN|MAX|DEF}

Function:

The command sets the range of AC voltage measurement.

Parameter:

Name	Type	Range	Default
<range>	Discrete	{0 1 2 3 4}	2

Explanations:

For the parameter range, see table below.

Table 3-5 AC voltage range

Parameter	Range
0	200 mV
1	2 V
2	20 V
3	200 V
4	750 V
MIN	200 mV
MAX	750 V
DEF	20 V

Example:

Sets the AC voltage range to 750V.

:MEASure:VOLTage:AC MAX or :MEASure:VOLTage:AC 4

10. :MEASure:VOLTage:AC:RANGe?

Command Format:

:MEASure:VOLTage:AC:RANGe?

Function:

The command queries the current range of AC voltage measurement.

Return Format:

The query returns: 0, 1, 2, 3 or 4 (see Table 3-5).

11. :MEASure:CURRent:DC?

Command Format:

:MEASure:CURRent:DC?

Function:

The command queries the measured DC current value.

Explanations:

The command is unavailable in double-display.

Return Format:

The command queries the measured DC current value in scientific notation, such as: 9.67441e-05, the unit is A.

12. :MEASure:CURRent:DC

Command Format:

:MEASure:CURRent:DC {<range>|MIN|MAX|DEF}

Function:

The command sets the range and resolution of DC current measurement.

Parameter:

Name	Type	Range	Default
< range>	Discrete	{0 1 2 3 4 5}	0

Explanations:

The corresponding resolution will be set automatically after you set the range.

The measurement type will change into "Manual" automatically once you set the range.

For the parameter range and the corresponding resolution, see table below.

Table 3-6 DC current range and the corresponding resolution

Parameter	Range	Resolution
0	200 μ A	1 nA
1	2 mA	10 nA
2	20 mA	100 nA
3	200 mA	1 μ A
4	2 A	10 μ A
5	10 A	100 μ A
MIN	200 μ A	1 nA
MAX	10 A	100 μ A
DEF	200 mA	1 μ A

Example:

Sets the DC current range to the maximum (10A).

:MEASure:CURRent:DC MAX or :MEASure:CURRent:DC 5

13. :MEASure:CURRent:DC:RANGe?**Command Format:**

:MEASure:CURRent:DC:RANGe?

Function:

The command queries the DC current range.

Return Format:

The query returns: 0, 1, 2, 3, 4 or 5 (see Table 3-6).

14. :MEASure:CURRent:DC:FILTer[:STATe]**Command Format:**

:MEASure:CURRent:DC:FILTer[:STATe]?

:MEASure:CURRent:DC:FILTer[:STATe] {ON|OFF|1|0}

Function:

The commands query and set the AC filter state under the DC current

measurement.

Explanations:

:MEASure:CURRent:DC:FILTer[:STATe]? – Queries the filter state.

:MEASure:CURRent:DC:FILTer[:STATe] {ON|OFF|1|0} – Opens or closes the filter.

Return Format:

The query returns ON (1) or OFF (0).

Example:

Opens the filter.

:MEASure:CURRent:DC:FILTer ON

15. :MEASure:CURRent:AC?**Command Format:**

:MEASure:CURRent:AC?

Function:

The command queries the measured AC current value.

Explanations:

The command is unavailable in double-display.

Return Format:

The command queries the measured AC current value in scientific notation, such as: 9.29379e-05, the unit is A.

16. :MEASure:CURRent:AC**Command Format:**

:MEASure:CURRent:AC {<range>|MIN|MAX|DEF}

Function:

The command sets the AC current range.

Parameter:

Name	Type	Range	Default
------	------	-------	---------

<range>	Discrete	{0 1 2 3}	1
---------	----------	-----------	---

Explanations:

:MEASure:CURRent:AC <value> - Sets the AC current range.

The measurement type will change into "Manual" automatically when you use this command.

For the parameter range, see table below.

Table 3-7 AC current range

Parameter	Range
0	20 mA
1	200 mA
2	2 A
3	10 A
MIN	20 mA
MAX	10 A
DEF	200 mA

Example:

Sets the AC current range to the maximum (10A).

:MEASure:CURRent:AC MAX or :MEASure:CURRent:AC 3

17. :MEASure:CURRent:AC:RANGe?**Command Format:**

:MEASure:CURRent:AC:RANGe?

Function:

The command queries the AC current range.

Explanations:

The command is valid only when AC current measurement is enabled.

Return Format:

The command returns: 0, 1, 2, 3 or 4 (see Table 3-7).

18. :MEASure:RESistance?

Command Format:

:MEASure:RESistance?

Function:

The command queries the measured 2-wire resistance value.

Explanations:

The command is unavailable in double-display.

Return Format:The command queries the measured 2-wire resistance value in scientific notation, such as: 8.366031e-05, the unit is Ω .**19. :MEASure:RESistance****Command Format:**

:MEASure:RESistance {<range>|MIN|MAX|DEF}

Function:

The command sets the desired 2-wire resistance range.

Parameter:

Name	Type	Range	Default
<range>	Discrete	{0 1 2 3 4 5 6}	3

Explanations:

For the parameter range, see table below.

Table 3-8 2-wire resistance range

Parameter	Range
0	200 Ω
1	2 k Ω
2	20 k Ω
3	200 k Ω
4	1 M Ω
5	10 M Ω
6	100 M Ω

MAX	100 M Ω
MIN	200 Ω
DEF	200 k Ω

Example:

Sets the 2-wire resistance range to 200 Ω .

:MEASure:RESistance MIN or :MEASure:RESistance 0

20. :MEASure:RESistance:RANGe?**Command Format:**

:MEASure:RESistance:RANGe?

Function:

The command queries the current 2-wire resistance range.

Return Format:

The query returns: 0, 1, 2, 3, 4, 5 or 6 (see Table 3-8).

21. :MEASure:FRESistance?**Command Format:**

:MEASure:FRESistance?

Function:

The command queries the measured 4-wire resistance value.

Explanations:

The command is unavailable in double-display.

Return Format:

The command queries the measured 4-wire resistance value in scientific notation, such as: 8.822946e-05, the unit is Ω .

22. :MEASure:FRESistance**Command Format:**

:MEASure:FRESistance {<range>|MIN|MAX|DEF}

Function:

The command sets the desired 4-wire resistance range.

Parameter:

Name	Type	Range	Default
<range>	Discrete	{0 1 2 3 4 5 6 }	3

Explanations:

For the parameter range, refer to Table 3-8.

Example:

Sets the 4-wire resistance range to 200Ω.

:MEASure:FRESistance MIN or :MEASure:FRESistance 0

23. :MEASure:FRESistance:RANGe?

Command Format:

:MEASure:FRESistance:RANGe?

Function:

The command queries the current 4-wire resistance range.

Return Format:

The query returns: 0, 1, 2, 3, 4, 5 or 6 (see Table 3-8).

24. :MEASure:FREQuency?

Command Format:

:MEASure:FREQuency?

Function:

The command queries the measured frequency value.

Explanations:

The available frequency range is 20Hz~1MHz.

The command is unavailable in double-display.

Return Format:

The command queries the measured frequency value of AC signal in scientific notation, such as: 8.485240e-05, the unit is Hz.

25. :MEASure:FREQuency**Command Format:**

:MEASure:FREQuency {<range>|MIN|MAX|DEF}

Function:

The command sets the voltage range of the input signal under frequency measurement.

Parameter:

Name	Type	Range	Default
<range>	Discrete	{0 1 2 3 4}	2

Explanations:

The available frequency range is 20Hz~1MHz.

For the parameter range, refer to Table 3-5.

Example:

Sets the voltage range under frequency measurement to 20 V.

:MEASure:FREQuency DEF

26. :MEASure:FREQuency:RANGe?**Command Format:**

:MEASure:FREQuency:RANGe?

Function:

The command queries the AC voltage range used under frequency measurement.

Explanations:

The range here is the same with the range of AC voltage, see Table 3-5.

Return Format:

The query returns: 0, 1, 2, 3 or 4 (see Table 3-5).

27. :MEASure:PERiod?**Command Format:**

:MEASure:PERiod?

Function:

The command queries the measured period value.

Explanations:

The command is unavailable in double-display.

Return Format:

The command queries the measured period value of AC signal in scientific notation, such as: 9.18543e-05, the unit is s.

28. :MEASure:PERiod**Command Format:**

:MEASure:PERiod {<range>|MIN|MAX|DEF}

Function:

The command sets the voltage range under period measurement.

Parameter:

Name	Type	Range	Default
<range >	Discrete	{0 1 2 3 4}	2

Explanations:

The available period range is 1 μ s~50ms.

For the parameter range, refer to Table 3-5.

Example:

Sets the voltage range to 20V under period measurement.

:MEASure:PERiod DEF or :MEASure:PERiod 2

29. :MEASure:PERiod:RANGe?

Command Format:

:MEASure:PERiod:RANGe?

Function:

The command queries the AC voltage range used under period measurement.

Explanations:

The range here is the same with the range of AC voltage, see Table 3-5.

Return Format:

The query returns: 0, 1, 2, 3 or 4 (see Table 3-5).

30. :MEASure:CONTInuity?

Command Format:

:MEASure:CONTInuity?

Function:

The command queries the measured result of continuity.

Return Format:

The command queries the measured resistance value under continuity measurement in scientific notation, such as: 8.888000e+03, the unit is Ω .

31. :MEASure:CONTInuity

Command Format:

:MEASure:CONTInuity {<range>|MIN|MAX|DEF}

Function:

The command sets the resistance limit under continuity measurement.

Parameter:

Name	Type	Range	Default
<range>	Consecutive Integer	1 Ω ~2000 Ω	10

Explanations:

The parameter is a consecutive integer ranging from 1 Ω to 2000 Ω . The default resistance is 10 Ω .

Example:

Sets the resistance limit under continuity measurement to 1k Ω .

:MEASure:CONTInuity 1000

32. :MEASure:DIODE?**Command Format:**

:MEASure:DIODE?

Function:

The command queries the voltage of the ends of diode.

Explanations:

The beep condition under diode measurement is $1\text{ V} \leq V_{\text{measured}} \leq 2.4\text{ V}$ by default.

Return Format:

The query returns the measured voltage on the diode in scientific notation, such as: 4.492510e-04, the unit is V.

33. :MEASure:CAPacitance?**Command Format:**

:MEASure:CAPacitance?

Function:

The command queries the measured capacitance value.

Explanations:

The command is unavailable in double-display.

Return Format:

The query returns the measured capacitance value in scientific notation, such as: 8.889030e-05, the unit is F.

34. :MEASure:CAPacitance**Command Format:**

:MEASure:CAPacitance {<range>|MIN|MAX|DEF}

Function:

The command sets the capacitance range.

Parameter:

Name	Type	Range	Default
<range>	Discrete	{0 1 2 3 4 5}	2

Explanations:

For the parameter range, see table below.

Table 3-9 Capacitance range

Parameter	Range
0	2 nF
1	20 nF
2	200 nF
3	2 μ F
4	200 μ F
5	10000 μ F
MIN	2 nF
MAX	10000 μ F
DEF	200 nF

Example:

Sets the capacitance range to 2 μ F.

:MEASure:CAPacitance 3

35. :MEASure:CAPacitance:RANGe?**Command Format:**

:MEASure:CAPacitance:RANGe?

Function:

The command queries the capacitance range.

Return Format:

The query returns: 0, 1, 2, 3, 4 or 5 (see Table 3-9).

:RATE Commands

The commands sets the desired rate of various measurement to such as Slow, Medium and Fast, which mainly include:

- :RATE:VOLTage:DC
- :RATE:VOLTage:AC
- :RATE:CURRent:DC
- :RATE:CURRent:AC
- :RATE:RESistance
- :RATE:FRESistance
- :RATE:SENSor

1. :RATE:VOLTage:DC

Command Format:

:RATE:VOLTage:DC?

:RATE:VOLTage:DC {F|M|S}

Function:

The commands query and set the rate of DC voltage measurement.

Explanations:

:RATE:VOLTage:DC? - Queries the current measuring rate of DC voltage. The command is valid only when DCV function is enabled.

:RATE:VOLTage:DC {F|M|S} – Sets the desired measuring rate of DC voltage. For the range and the explanation of each parameter, see table below.

Table 3-10 The parameter range and explanations

Parameter	Explanation	Mark	Rate	Refresh rate
F (FAST)	Fast measure	F	123 reading/s	50 Hz
M (MEDIUM)	Medium measure	M	20 reading/s	20 Hz
S (SLOW)	Slow measure	S	2.5 reading/s	2.5 Hz

Return Format:

The query returns the parameter related to current rate (see Table 3-10).

Example:

Sets the rate under DC voltage measurement to Medium.

:RATE:VOLTage:DC M

2. :RATE:VOLTage:AC

Command Format:

:RATE:VOLTage:AC?

:RATE:VOLTage:AC {F|M|S}

Function:

The commands query and set the rate of AC voltage measurement.

Explanations:

:RATE:VOLTage:AC? - Queries the current measuring rate of AC voltage. The command is valid only when ACV function is enabled.

:RATE:VOLTage:AC {F|M|S} - Sets the desired measuring rate of AC voltage. For the range and the explanation of each parameter, see Table 3-10.

Return Format:

The query returns the parameter related to current rate (see Table 3-10).

Example:

Sets the rate under AC voltage measurement to Medium.

:RATE:VOLTage:AC M

3. :RATE:CURRent:DC

Command Format:

:RATE:CURRent:DC?

:RATE:CURRent:DC {F|M|S}

Function:

The commands query and set the rate of DC current measurement.

Explanations:

:RATE:CURRent:DC? - Queries the current measuring rate of DC current. The command is valid only when DC current function is enabled.

:RATE:CURRent:DC {F|M|S} Sets the desired measuring rate of DC current. For the range and the explanation of each parameter, see Table 3-10.

Return Format:

The query returns the parameter related to current rate (see Table 3-10).

Example:

Sets the rate under DC current measurement to Medium.

:RATE:CURRent:DC M

4. :RATE:CURRent:AC**Command Format:**

:RATE:CURRent:AC?

:RATE:CURRent:AC {F|M|S}

Function:

The commands query and set the rate of AC current measurement.

Explanations:

:RATE:CURRent:AC? - Queries the current measuring rate of AC current. The command is valid only when AC current function is enabled.

:RATE:CURRent:AC {F|M|S} - Sets the desired measuring rate of AC current. For the range and the explanation of each parameter, see Table 3-10.

Return Format:

The query returns the parameter related to current rate (see Table 3-10).

Example:

Sets the rate under AC current measurement to Medium.

:RATE:CURRent:AC M

5. :RATE:RESistance**Command Format:**

:RATE:RESistance?

:RATE:RESistance {F|M|S}

Function:

The commands query and set the rate of 2-wire resistance measurement.

Explanations:

:RATE:RESistance? - Queries the current measuring rate of 2-wire resistance. The command is valid only when 2-wire resistance function is enabled.

:RATE:RESistance {F|M|S} - Sets the desired measuring rate of 2-wire resistance. For the range and the explanation of each parameter, see Table 3-10.

Return Format:

The query returns the parameter related to current 2-wire resistance rate (see Table 3-10).

Example:

Sets the rate under 2-wire resistance measurement to Medium.

:RATE:RESistance M

6. :RATE:FRESistance**Command Format:**

:RATE:FRESistance?

:RATE:FRESistance {F|M|S}

Function:

The commands query and set the rate of 4-wire resistance measurement.

Explanations:

:RATE:FRESistance? - Queries the current measuring rate of 4-wire resistance. The command is valid only when 4-wire resistance function is enabled.

:RATE:FRESistance {F|M|S} - Sets the desired measuring rate of 4-wire resistance. For the range and the explanation of each parameter, see Table 3-10.

Return Format:

The query returns the parameter related to current 4-wire resistance rate (see Table 3-10).

Example:

Sets the rate under 4-wire resistance measurement to Medium.

:RATE:FRESistance M

7. :RATE:SENSor**Command Format:**

:RATE:SENSor?

:RATE:SENSor {M|S}

Function:

The commands query and set the rate of sensor measurement.

Explanations:

:RATE:SENSor? - Queries the current measuring rate of sensor. The command is valid only when sensor function is enabled.

:RATE:SENSor {M|S} - Sets the desired measuring rate of sensor. For the range and the explanation of each parameter, see Table 3-10.

Return Format:

The query returns the parameter related to current sensor rate (see Table 3-10).

Example:

Sets the rate under sensor measurement to Medium.

:RATE:SENSor M

:SYSTem Commands

The commands set the desired system parameters, which mainly include:

- :SYSTem:CONFigure:POWEron
- :SYSTem:CONFigure:DEFault
- :SYSTem:LANGuage
- :SYSTem:FORMat:DECImal
- :SYSTem:FORMat:SEPArate
- :SYSTem:DISPlay:BRIGht
- :SYSTem:DISPlay:CONTrast
- :SYSTem:DISPlay:INVErt

1. :SYSTem:CONFigure:POWEron**Command Format:**

:SYSTem:CONFigure:POWEron {LAST|DEF}

Function:

The command sets the power-on mode of the system.

Explanations:

The modes provided are Last and Default. If choose LAST, the configurations before last power cut would be used when the instrument is next started; if choose DEF (DEFAULT), the default configurations would be used.

2. :SYSTem:CONFigure:DEFault**Command Format:**

:SYSTem:CONFigure:DEFault

Function:

The command sets the system configuration as default.

3. :SYSTem:LANGuage**Command Format:**

:SYSTem:LANGuage?

:SYSTem:LANGuage {CHINESE|ENGLISH}

Function:

The commands query and set the system language to be used.

Explanations:

:SYSTem:LANGuage? – Queries the current using system language.

:SYSTem:LANGuage {CHINESE|ENGLISH} – Sets the desired system language.

Return Format:

The query returns the CHINESE or ENGLISH.

4. :SYSTem:FORMat:DECImal

Command Format:

:SYSTem:FORMat:DECImal?
:SYSTem:FORMat:DECImal {COMMA|DOT}

Function:

The commands query and set the decimal display format of system.

Explanations:

:SYSTem:FORMat:DECImal? – Queries the current decimal display format of system.

:SYSTem:FORMat:DECImal {COMMA|DOT} – Sets the desired decimal format.

Note: this command causes easily the format changes of data delimiter, please use it modestly.

Return Format:

The query returns the current decimal display format, COMMA or DOT.

5. :SYSTem:FORMat:SEPARate

Command Format:

:SYSTem:FORMat:SEPARate?
:SYSTem:FORMat:SEPARate {ON|NONE|SPACE}

Function:

The commands query and set the delimiter display format of system data.

Explanations:

:SYSTem:FORMat:SEPARate? - Queries the current delimiter display format of system data.

:SYSTem:FORMat:SEPARate {ON|NONE|SPACE} - Sets the desired delimiter display format. ON denotes to display as default (","); NONE denotes the data will be displayed without delimiter; SPACE denotes to display with a space.

Return Format:

The query returns ON, NONE or SPACE.

6. :SYSTem:DISPlay:BRIGht

Command Format:

:SYSTem:DISPlay:BRIGht?

:SYSTem:DISPlay:BRIGht <value>

Function:

The commands query and set the screen brightness.

Parameter:

Name	Type	Range	Default
<value>	Consecutive Integer	0~32	22

Explanations:

:SYSTem:DISPlay:BRIGht? – Queries the current screen brightness.

:SYSTem:DISPlay:BRIGht <value> - Sets the desired screen brightness within 0 and 32.

Return Format:

The query returns the current screen brightness.

7. :SYSTem:DISPlay:CONTrast

Command Format:

:SYSTem:DISPlay:CONTrast?

:SYSTem:DISPlay:CONTrast <value>

Function:

The commands query and set the screen contrast.

Parameter:

Name	Type	Range	Default
<value>	Consecutive Integer	0~32	19

Explanations:

:SYSTem:DISPlay:CONTrast? – Queries the current screen contrast.

:SYSTem:DISPlay:CONTrast <value> - Sets the desired screen contrast within 0 and 32.

Return Format:

The query returns the current screen contrast.

8. :SYSTem:DISPlay:INVErt**Command Format:**

:SYSTem:DISPlay:INVErt

Function:

The command enables the screen to be displayed inversely.

:TRIGger Commands

The commands set the parameters relate to tigger system, which mainly include:

- :TRIGger:SOURce
- :TRIGger:AUTO:INTERval
- :TRIGger:AUTO:HOLD
- :TRIGger:AUTO:HOLD:SENSitivity
- :TRIGger:SINGLE
- :TRIGger:SINGLE:TRIGgered
- :TRIGger:EXT
- :TRIGger:VMComplete:POLAr
- :TRIGger:VMComplete:PULSewidth

1. :TRIGger:SOURce**Command Format:**

:TRIGger:SOURce?

:TRIGger:SOURce {AUTO|SINGLE|EXT}

Function:

The commands query and set the trigger source.

Explanations:

:TRIGger:SOURce? – Queries the trigger source used currently.

:TRIGger:SOURce {AUTO|SINGLE|EXT} – Sets the trigger source to be used. The parameter AUTO, SINGLE, EXT denotes Auto trigger, Single trigger and External trigger, separately.

Return Format:

The query returns: AUTO, SINGLE or EXT.

2. :TRIGger:AUTO:INTERval**Command Format:**

:TRIGger:AUTO:INTERval?

:TRIGger:AUTO:INTERval <value>

Function:

The commands query and set the interval of auto trigger.

Parameter:

Name	Type	Range
<value>	Consecutive Integer	See Explanations below

Explanations:

:TRIGger:AUTO:INTERval? – Queries the interval of auto trigger.

:TRIGger:AUTO:INTERval <value> – Sets the desired interval of auto trigger.

Different rate has different intervals:

In Fast measurement, the default interval is 8 ms and the available range is within 8 ms and 2000 ms;

In Medium measurement, the default interval is 50 ms and the available range is within 50 ms and 2000 ms;

In Slow measurement, the default interval is 400 ms and the available range is within 400 ms and 2000 ms.

The default measurement rate is Slow, so the default interval of the multimeter is 400 ms.

Return Format:

The query returns the current interval of auto trigger (the unit is ms).

3. :TRIGger:AUTO:HOLD**Command Format:**

:TRIGger:AUTO:HOLD?

:TRIGger:AUTO:HOLD {ON|OFF|1|0}

Function:

The commands query and set the hold function under auto trigger.

Explanations:

:TRIGger:AUTO:HOLD? – Queries if the hold function under auto trigger is enabled.

:TRIGger:AUTO:HOLD {ON|OFF|1|0} – Sets the desired hold state under auto trigger.

Return Format:

The query returns the ON (1) or OFF (0).

4. :TRIGger:AUTO:HOLD:SENSitivity**Command Format:**

:TRIGger:AUTO:HOLD:SENSitivity?

:TRIGger:AUTO:HOLD:SENSitivity {<value>|MIN|MAX|DEF}

Function:

The commands query and set the delay sensitive of auto trigger.

Explanations:

:TRIGger:AUTO:HOLD:SENSitivity? – Queries the current delay sensitive of auto trigger.

:TRIGger:AUTO:HOLD:SENSitivity {<value>|MIN|MAX|DEF} Sets the desired delay sensitive of auto trigger. For the parameter range, see table below:

Table 3-11 Delay sensitive of auto trigger

Parameter	Sensitive
0 (MIN)	0.01%
1	0.1%
2 (DEF)	1%
3 (MAX)	10%

Return Format:

The query returns: 0, 1, 2 or 3 (see table 3-11).

5. :TRIGger:SINGLE**Command Format:**

:TRIGger:SINGLE?

:TRIGger:SINGLE {<value>|MIN|MAX|DEF}

Function:

The commands query and set the number of sample in single trigger mode.

Explanations:

:TRIGger:SINGLE? – Queries the number of sample under current single trigger.

:TRIGger:SINGLE {<value>|MIN|MAX|DEF} – Sets the required sample number in single trigger mode.

Parameter:

Name	Type	Range	Default
<value>	Consecutive Integer	1~2000	1

Return Format:

The query returns the number of sample under current single trigger.

6. :TRIGger:SINGle:TRIGgered**Command Format:**

:TRIGger:SINGle:TRIGgered

Function:

The command enables the multimeter trigger once manually.

Explanations:

The command is equal to execute a single trigger manually through front panel.

7. :TRIGger:EXT**Command Format:**

:TRIGger:EXT?

:TRIGger:EXT {RISE|FALL|HIGH|LOW}

Function:

The commands query and set the external trigger type.

Explanations:

:TRIGger:EXT? – Queries the current external trigger type, the default is Rise trigger.

:TRIGger:EXT {RISE|FALL|HIGH|LOW} – Sets the desired trigger type. The parameters provided are rise trigger, fall trigger, high-level trigger, low-level trigger.

Return Format:

The query returns: RISE, FALL, HIGH or LOW.

8. :TRIGger:VMComplete:POLAr**Command Format:**

:TRIGger:VMComplete:POLAr?

:TRIGger:VMComplete:POLAr {POS|NEG}

Function:

The commands query and set the VMC output polar.

Explanations:

:TRIGger:VMComplete:POLAr? – Queries the current VMC output polar, the default is POS (positive).

:TRIGger:VMComplete:POLAr {POS|NEG} – Sets the VMC output polar to be used. The parameters provided are positive and negative.

Return Format:

The query returns the current VMC output polar, POS or NEG.

9. :TRIGger:VMComplete:PULSewidth**Command Format:**

:TRIGger:VMComplete:PULSewidth?

:TRIGger:VMComplete:PULSewidth <value>

Function:

The commands query and set the VMC output pulsewidth.

Parameter:

Name	Type	Range	Default
<value>	Consecutive Integer	See Explanations below	100

Explanations:

:TRIGger:VMComplete:PULSewidth? – Queries the current VMC output pulsewidth, the default is 100ms.

:TRIGger:VMComplete:PULSewidth <value> - Sets the desired VMC output pulsewidth, the unit is ms.

Note the ranging of pulsewidth will vary with sample rate. When the sample rate is S, the range is 1~399(ms); when the sample rate is M, the range is 1~49(ms); and when the sample rate is F, the range is 1~7(ms).

Return Format:

The query returns the VMC output pulsewidth time.

:UTILity Commands

The commands set the communication parameters. Please make sure that communication interface has been connected stably to avoid errors or abnormal phenomena.

The commands mainly include:

- :UTILity:INTERface:LAN:DHCP*
- :UTILity:INTERface:LAN:AUTOip*
- :UTILity:INTERface:LAN:MANUip*
- :UTILity:INTERface:LAN:IP*
- :UTILity:INTERface:LAN:MASK*
- :UTILity:INTERface:LAN:GATEway*
- :UTILity:INTERface:LAN:DNS*
- :UTILity:INTERface:GPIB:ADDRes*
- :UTILity:INTERface:RS232:BAUD
- :UTILity:INTERface:RS232:PARItY

Note*: The GPIB and LAN interfaces are only supported by DM3058.

1. **:UTILity:INTERface:LAN:DHCP**

Command Format:

:UTILity:INTERface:LAN:DHCP?

:UTILity:INTERface:LAN:DHCP {ON|OFF|1|0}

Function:

The commands query and set the DHCP state.

Explanations:

:UTILity:INTERface:LAN:DHCP? – Queries if the DHCP is opened.

:UTILity:INTERface:LAN:DHCP {ON|OFF|1|0} – Sets the DHCP state to be used.

Return Format:

The query returns ON (1) or OFF (0).

2. **:UTILity:INTERface:LAN:AUTOip**

Command Format:

:UTILity:INTERface:LAN:AUTOip?

:UTILity:INTERface:LAN:AUTOip {ON|OFF|1|0}

Function:

The commands query and set the state of Auto IP.

Explanations:

:UTILity:INTERface:LAN:AUTOip? – Queries if Auto IP is enabled.

:UTILity:INTERface:LAN:AUTOip {ON|OFF|1|0} – Sets the state of Auto IP to be used.

Return Format:

The query returns ON (1) or OFF (0).

3. **:UTILity:INTERface:LAN:MANUip**

Command Format:

:UTILity:INTERface:LAN:MANUip?
:UTILity:INTERface:LAN:MANUip {ON|OFF|1|0}

Function:

The commands query and set the state of Manual IP.

Explanations:

:UTILity:INTERface:LAN:MANUip? – Queries if Manual IP is enabled.
:UTILity:INTERface:LAN:MANUip {ON|OFF|1|0} – Sets the state of Manual IP to be used.

Return Format:

The query returns ON (1) or OFF (0).

4. :UTILity:INTERface:LAN:IP**Command Format:**

:UTILity:INTERface:LAN:IP?
:UTILity:INTERface:LAN:IP <ip_address>

Function:

The commands query and set the IP address for LAN connection.

Parameter:

Name	Type	Range	Default
<ip_address>	String	User-defined	168.254.0.238

Explanations:

:UTILity:INTERface:LAN:IP? – Queries the current IP address.
:UTILity:INTERface:LAN:IP <string> - Sets the IP address of the multimeter.
Parameter <ip_address> is for user-defined.

Return Format:

The query returns the current IP address.

5. :UTILity:INTERface:LAN:MASK

Command Format:

:UTILity:INTERface:LAN:MASK?

:UTILity:INTERface:LAN:MASK <ip_address>

Function:

The commands query and set the IP mask for LAN connection.

Parameter:

Name	Type	Range	Default
<ip_address>	String	User-defined	255.255.255.0

Explanations:

:UTILity:INTERface:LAN:MASK? – Queries the current IP mask.

:UTILity:INTERface:LAN:MASK <ip_address> - Sets the IP mask of the multimeter.

Parameter<ip_address> is for user-defined.

Return Format:

The query returns the the current IP mask.

6. :UTILity:INTERface:LAN:GATEway

Command Format:

:UTILity:INTERface:LAN:GATEway?

:UTILity:INTERface:LAN:GATEway <ip_address>

Function:

The commands query and set the gateway for LAN connection.

Parameter:

Name	Type	Range	Default
<ip_address>	String	User-defined	172.16.3.1

Explanations:

:UTILity:INTERface:LAN:GATEway? – Queries the current gateway.

:UTILity:INTERface:LAN:GATEway <ip_address> – Ses the desired gateway.

Parameter <ip_address> is for user-defined.

Return Format:

The query returns the current gateway.

7. :UTILity:INTERface:LAN:DNS**Command Format:**

:UTILity:INTERface:LAN:DNS?

:UTILity:INTERface:LAN:DNS <ip_address>

Function:

The commands query and set the DNS server address for LAN connection.

Parameter:

Name	Type	Range	Default
<ip_address>	String	User-defined	0.0.0.0

Explanations:

:UTILity:INTERface:LAN:DNS? – Queries the current DNS server address.

:UTILity:INTERface:LAN:DNS <ip_address> - Sets the desired DNS server address. Parameter <ip_address> is for user-defined.

Return Format:

The query returns the current DNS server address.

8. :UTILity:INTERface:GPIB:ADDRESS**Command Format:**

:UTILity:INTERface:GPIB:ADDRESS?

:UTILity:INTERface:GPIB:ADDRESS <value>

Function:

The commands query and set the GPIB address.

Parameter:

Name	Type	Range	Default
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<value>	Consecutive Integer	0~30	7
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Explanations:

:UTILity:INTERface:GPIB:ADDRes? – Queries the current GPIB address.

:UTILity:INTERface:GPIB:ADDRes <value> - Sets the desired GPIB address within 0 and 30.

Return Format:

The query returns the current GPIB address.

9. :UTILity:INTERface:RS232:BAUD**Command Format:**

:UTILity:INTERface:RS232:BAUD?

:UTILity:INTERface:RS232:BAUD <value>

Function:

The commands query and set the baud rate of RS232 port.

Parameter:

Name	Type	Range
<value>	Discrete	{1200 2400 4800 9600 19200 38400 57600 115200}

Explanations:

:UTILity:INTERface:RS232:BAUD? – Query the current baud rate.

:UTILity:INTERface:RS232:BAUD <value> - Sets the desired interface baud rate

Return Format:

The query returns the current baud rate.

10. :UTILity:INTERface:RS232:PARItY**Command Format:**

:UTILity:INTERface:RS232:PARItY?

:UTILity:INTERface:RS232:PARItY {NONE|ODD|EVEN}

Function:

The commands query and set the parity bit.

Explanations:

:UTILity:INTERface:RS232:PARItY? – Queries the current parity bit setting.

:UTILity:INTERface:RS232:PARItY {NONE|ODD|EVEN} – Sets the desired parity bit. NONE, ODD, EVEN denotes “no even-odd check, 8 digits of data bit”, “odd check, 7 digits of data bit” and “even check, 7 digits of data bit”, separately.

Return Format:

The query returns: NONE8BITS, ODD7BITS or EVEN7BITS.

Chapter 4 Compatible Agilent Commands

In this commands system, all the commands and the return format are ASCII characters. Before using them, send the command **CMDSET** - CMDSET AGILENT firstly to enable the compatible Agilent commands. The system is case insensitive, and supports the key words abbreviation (the abbreviated letters are capitalized to separate from the whole key words). The compatible commands must follow the syntax strictly, for instance, unwanted characters are not allowed in command trees; command trees and parameters should be separated by a space, unwanted characters are also not allowed to follow parameters, or else the instrument will beep to alarm for an execution error.

The system mainly includes the following sub commands:

- CALCulate Commands
- CONFigure Commands
- DATA Commands
- DISPlay Commands
- FETCh? Commands
- INITiate Commands
- INPut Commands
- MEASure Commands
- READ? Commands
- ROUTe Commands
- SENSE Commands
- SAMPlE Commands
- TRIGger Commands

CALCulate Commands

The commands set the calculation operations, which mainly include:

- CALCulate:FUNction
- CALCulate:STATe
- CALCulate:LIMit:LOWer
- CALCulate:LIMit:UPPer
- CALCulate:DB:REFerence
- CALCulate:DBM:REFerence
- CALCulate:NULL:OFFSet
- CALCulate:AVERage:AVERage?
- CALCulate:AVERage:COUNt?
- CALCulate:AVERage:MAXimum?
- CALCulate:AVERage:MINimum?

1. CALCulate:FUNCTION

Command Format:

CALCulate:FUNCTION {NULL|DB|DBM|AVERAge|LIMit}

CALCulate:FUNCTION?

Function:

The commands set and query the calculation function.

Explanations:

The subsystem must be enabled through CALCulate:STATe {OFF|ON} before using this comamnd.

CALCulate:FUNCTION {NULL|DB|DBM|AVERAge|LIMit} – Selects the calculation function to be used, the default is NULL.

CALCulate:FUNCTION? – Queries the current calculation function.

Table 4-1 Function abbreviation and explanation

Items	Explanation
NULL	Null operation (REL)
DB	dB operation
DBM	dBm operation
AVERAGE	Average operation
LIMIT	Limit operation (PF operation)

Note: The operation NULL and LIMIT in Agilent commands system is equal to REL and PF operation in DM3058/DM3058E, separately.

Return Format:

The query returns NULL, DB, DBM, AVER or LIM.

2. CALCulate:STATe

Command Format:

CALCulate:STATe {OFF|ON}

CALCulate:STATe?

Function:

The commands set and query the calculation state.

Explanations:

CALCulate:STATe {OFF|ON} - Sets the desired calculation state.

CALCulate:STATe? - Queries the current calculation state.

Return Format:

The query returns: 1 (ON) or 0 (OFF).

3. CALCulate:LIMit:LOWer

Command Format:

CALCulate:LIMit:LOWer {<value>|MINimum|MAXimum}

CALCulate:LIMit:LOWer? [MINimum|MAXimum]

Function:

The commands set and query the lower limit of current measurement.

Parameter:

Name	Type	Range	Default
<value>	Consecutive Integer	±120% of MAX range	0

Explanations:

The command is valid only when the LIMIT function (CALCulate:FUNCTion LIMIT) is enabled under calculation is active (CALCulate:STATe ON).

CALCulate:LIMit:LOWer {<value>|MINimum|MAXimum} - Sets the desired lower limit under current measurement.

CALCulate:LIMit:LOWer? [MINimum|MAXimum] - Queries the lower limit under current measurement.

MIN denotes the minimum range (-120% of MAX range) of current measurement.

MAX denotes the maximum range (120% of MAX range) of current measurement.

Return Format:

The query returns the lower limit of current measurement.

4. CALCulate:LIMit:UPPer

Command Format:

CALCulate:LIMit:UPPer {<value>|MINimum|MAXimum}

CALCulate:LIMit:UPPer? [MINimum|MAXimum]

Function:

The commands set and query the upper limit of current measurement.

Parameter:

Name	Type	Range	Default
<value>	Consecutive Integer	±120% of MAX range	0

Explanations:

The command is valid only when the LIMIT function (CALCulate:FUNCTION LIMIT) is enabled under calculation is active (CALCulate:STATE ON).

CALCulate:LIMit:UPPer {<value>|MINimum|MAXimum} - Sets the desired upper limit under current measurement.

CALCulate:LIMit:UPPer? [MINimum|MAXimum] - Queries the upper limit under current measurement.

MIN denotes the minimum range (-120% of MAX range) of current measurement.
MAX denotes the maximum range (120% of MAX range) of current measurement.

Return Format:

The query returns the upper limit of current measurement.

5. CALCulate:DB:REfERENCE

Command Format:

CALCulate:DB:REfERENCE {<value>|MINimum|MAXimum}

CALCulate:DB:REfERENCE? [MINimum|MAXimum]

Function:

The command commands set and query the dB reference value.

Parameter:

Name	Type	Range	Default
<value>	Consecutive Integer	-120 dB~+120 dB	0

Explanations:

The command is valid only when the dB function (CALCulate:FUNCTION DB) is enabled under calculation is active (CALCulate:STATE ON).

CALCulate:DB:REFErence {<value>|MINimum|MAXimum} - Sets the desired dB reference value.

CALCulate:DB:REFErence? [MINimum|MAXimum] - Queries the current dB reference value.

MIN = -120 dB; MAX = 120 dB; DEF = 0 dB.

Return Format:

The query returns the dB reference value.

6. CALCulate:DBM:REFErence

Command Format:

CALCulate:DBM:REFErence {<value>|MINimum|MAXimum}

CALCulate:DBM:REFErence? [MINimum|MAXimum]

Function:

The commands set and query the dBm reference value.

Parameter:

Name	Type	Range	Default
<value>	Consecutive Integer	2-8000	600

Explanations:

The command is valid only when the dB function (CALCulate:FUNCTION DBM) is enabled under calculation is active (CALCulate:STATE ON).

CALCulate:DB:REFErence {<value>|MINimum|MAXimum} - Sets the desired dBm reference value.

CALCulate:DB:REFErence? [MINimum|MAXimum] - Queries the current dBm reference value.

MIN = 2Ω; MAX = 8000Ω; DEF = 600Ω.

Return Format:

The query returns the current dBm reference value.

7. CALCulate:NULL:OFFSet

Command Format:

CALCulate:NULL:OFFSet {<value>|MINimum|MAXimum}

CALCulate:NULL:OFFSet? [MINimum|MAXimum]

Function:

The command commands set and query the offset of NULL operation.

Parameter:

Name	Type	Range
<value>	Consecutive Integer	±120% of MAX range

Explanations:

The command is valid only when the NULL function (CALCulate:FUNCTION NULL) is enabled under calculation is active (CALCulate:STATE ON).

CALCulate:NULL:OFFSet {<value>|MINimum|MAXimum} - Sets the desired NULL offset.

CALCulate:NULL:OFFSet? [MINimum|MAXimum] - Queries the current NULL offset.

MIN denotes the minimum range (-120% of MAX range) of current measurement.

MAX denotes the maximum range (120% of MAX range) of current measurement.

Return Format:

The query returns the current NULL offset.

8. CALCulate:AVERage:AVERage?

Command Format:

CALCulate:AVERage:AVERage?

Function:

The command queries the average of all data after calculation.

Explanations:

The command is valid only when the calculation function (CALCulate:FUNCTION AVERage) is enabled under calculation is active (CALCulate:STATE ON).

Note the average value could be read any time.

Return Format:

The query returns the average of all data after calculation.

9. CALCulate:AVERage:COUNT?

Command Format:

CALCulate:AVERage:COUNT?

Function:

The command queries the number of data calculated.

Explanations:

The command is valid only when the calculation function (CALCulate:FUNCTION AVERage) is enabled under calculation is active (CALCulate:STATe ON).

Note the number of data could be read any time.

Return Format:

The query returns the number of data calculated.

10. CALCulate:AVERage:MAXimum?

Command Format:

CALCulate:AVERage:MAXimum?

Function:

The command queries the maximum statistic value of current measurement.

Explanations:

The command is valid only when the calculation function (CALCulate:FUNCTION AVERage) is enabled under calculation is active (CALCulate:STATe ON).

Note the maximum data could be read any time.

Return Format:

The query returns the maximum statistic value of current measurement.

11. CALCulate:AVERage:MINimum?

Command Format:

CALCulate:AVERage:MINimum?

Function:

The command queries the minimum statistic value of current measurement.

Explanations:

The command is valid only when the calculation function (CALCulate:FUNCTION AVERage) is enabled under calculation is active (CALCulate:STATe ON).

Note the minimum data could be read any time.

Return Format:

The query returns the minimum statistic value of current measurement.

CONFigure Commands

The commands set the basic measurement functions and related parameters, such as range and accuracy, which mainly include:

- CONFigure:VOLTage:DC
- CONFigure:VOLTage:AC
- CONFigure:CURRent:DC
- CONFigure:CURRent:AC
- CONFigure:RESistance
- CONFigure:FRESistance
- CONFigure:FREQuency
- CONFigure:PERiod
- CONFigure:CONTinuity
- CONFigure:DIODE
- CONFigure?

1. CONFigure:VOLTage:DC

Command Format:

CONFigure:VOLTage:DC

{<range>|MIN|MAX|DEF},{<resolution>|MIN|MAX|DEF}

Function:

The command presets the multimeter as specified range and resolution for DC voltage measurement, but does not start the measurement.

Parameter:

Name	Type	Range	Default
<range>	Discrete	{200 mV 2 V 20 V 200 V 1000 V AUTO}	AUTO
<resolution>	Discrete	Refer to Table 4-2	1ppm x range

Explanations:

The unit is V.

For <range>: MIN = 0.2 (200 mV), MAX = 1000, DEF=AUTO.

<resolution> relates to both the measurement rate and integration time, see table below.

Table 4-2 Resolution ranges

Resolution	Measurement rate	Integration time
100ppm x range	F	0.02 NPLC*
10ppm x range	M	0.2 NPLC
3ppm x range	M	1 NPLC
1ppm x range	S	10 NPLC
0.3ppm x range	S	100 NPLC

*Note: 1PLC is equal to 0.02s.

2. CONFigure:VOLTage:AC

Command Format:

CONFigure:VOLTage:AC

{<range>|MIN|MAX|DEF},{<resolution>|MIN|MAX|DEF}

Function:

The command presets the multimeter as specified range and resolution for AC voltage measurement, but does not start the measurement.

Parameter:

Name	Type	Range	Default
<range>	Discrete	{200 mV 2 V 20 V 200 V 750 V AUTO}	AUTO
<resolution>	Discrete	Refer to Table 4-2	1ppm x range

Explanations:

The unit is V.

For <range>: MIN = 0.2 (200 mV), MAX = 750; DEF=AUTO.

<resolution> relates to both the measurement rate and integration time, see Table 4-2.

3. CONFIGure:CURRENT:DC

Command Format:

CONFIGure:CURRENT:DC

{<range>|MIN|MAX|DEF},{<resolution>|MIN|MAX|DEF}

Function:

The command presets the multimeter as specified range and resolution for DC current measurement, but does not start the measurement.

Parameter:

Name	Type	Range	Default
<range>	Discrete	{200 μ A 2 mA 20 mA 200 mA 2 A 10 A AUTO}	AUTO
<resolution>	Discrete	Refer to Table 4-2	1ppm x range

Explanations:

The unit is A.

For <range>: MIN = 0.0002 (200Ma); MAX = 10, DEF=AUTO.

<resolution> relates to both the measurement rate and integration time, see Table 4-2.

4. CONFigure:CURRent:AC

Command Format:

CONFigure:CURRent:AC

{<range>|MIN|MAX|DEF},{<resolution>|MIN|MAX|DEF}

Function:

The command presets the multimeter as specified range and resolution for AC current measurement, but does not start the measurement.

Parameter:

Name	Type	Range	Default
<range>	Discrete	{20 mA 200 mA 2 A 10 A AUTO}	AUTO
<resolution>	Discrete	Refer to Table 4-2	1ppm x range

Explanations:

The unit is A.

For <range>: MIN = 0.02 (20mA); MAX = 10, DEF=AUTO.

<resolution> relates to both the measurement rate and integration time, see Table 4-2.

5. CONFigure:RESistance

Command Format:

CONFigure:RESistance

{<range>|MIN|MAX|DEF},{<resolution>|MIN|MAX|DEF}

Function:

The command presets the multimeter as specified range and resolution for 2-wire resistance measurement, but does not start the measurement.

Parameter:

Name	Type	Range	Default
<range>	Discrete	{200 Ω 2 kΩ 20 kΩ 200 kΩ 2 MΩ 10 MΩ 100 MΩ AUTO}	AUTO
<resolution>	Discrete	Refer to Table 4-2	1ppm x range

Explanations:

The unit is Ω .

For <range>: MIN = 200; MAX = 100 000 000, DEF=AUTO.

<resolution> relates to both the measurement rate and integration time, see Table 4-2.

6. CONFigure:FRESistance**Command Format:**

CONFigure:FRESistance

{<range>|MIN|MAX|DEF},{<resolution>|MIN|MAX|DEF}

Function:

The command presets the multimeter as specified range and resolution for 4-wire resistance measurement, but does not start the measurement.

Parameter:

Name	Type	Range	Default
<range>	Discrete	{200 Ω 2 k Ω 20 k Ω 200 k Ω 2 M Ω 10 M Ω 100 M Ω AUTO}	AUTO
<resolution>	Discrete	Refer to Table 4-2	1ppm x range

Explanations:

The unit is Ω .

For <range>: MIN = 200; MAX = 100 000 000, DEF=AUTO.

<resolution> relates to both the measurement rate and integration time, see Table 4-2.

7. CONFigure:FREQuency**Command Format:**

CONFigure:FREQuency

{<range>|MIN|MAX|DEF},{<resolution>|MIN|MAX|DEF}

Function:

The command presets the multimeter as specified range and resolution for

frequency measurement, but does not start the measurement.

Parameter:

Name	Type	Range	Default
<range>	Consecutive Real Number	20 Hz~1 MHz	AUTO
<resolution>	Discrete	{MIN MAX DEF}	1ppm x range

Explanations:

All the units are Hz.

The <range> may be 20 Hz~1 MHz, thereinto, MAX = 1 000 000, MIN = 20, DEF is auto range. Note that the multimeter uses one "range" for all inputs between 20Hz-1MHz.

8. CONFIGure:PERiod

Command Format:

CONFIGure:PERiod {<range>|MIN|MAX|DEF},{<resolution>|MIN|MAX|DEF}

Function:

The command presets the multimeter as specified range and resolution for period measurement, but does not start the measurement.

Parameter:

Name	Type	Range	Default
<range>	Consecutive Real Number	1 μ s~50 ms	50 ms
<resolution>	Discrete	{MIN MAX DEF}	1ppm x range

Explanations:

The units is s.

The <range> may be 1 μ s~50 ms, thereinto, MAX = 0.05, MIN = 0.000001, DEF = 0.05. Note that the multimeter uses one "range" for all inputs between 1 μ s-50ms.

9. CONFigure:CONTInuity

Command Format:

CONFigure:CONTInuity

Function:

The command presets the multimeter for continuity measurement, but does not start the measurement.

Explanations:

The range is fixed at 2 k Ω .

10. CONFigure:DIODE

Command Format:

CONFigure:DIODE

Function:

The command presets the multimeter for diode measurement, but does not start the measurement.

11. CONFigure?

Command Format:

CONFigure?

Function:

The command queries the current configuration of instrument, but does not start the measurement.

Return Format:

The query returns a string with quotes, by a composition of <function>, <range> and <resolution>, for example: "VOLT:DC 2.000000E-01,2.000000E-07"

DATA Commands

The commands access the data from non-volatile memory, and do some operations such as query and delete, which mainly include:

- DATA:FEED RDG_STORE, {"CALCulate"|""}
- DATA:FEED?
- DATA:POINTs?

1. DATA:FEED RDG_STORE, {"CALCulate"|""} }**Command Format:**

DATA:FEED RDG_STORE, {"CALCulate"|""} }

Function:

The command selects whether readings taken using the INITiate command are stored in the multimeter's internal memory (default) or not stored at all. Note that the command does not execute any actual operation as restricted by working principle.

2. DATA:FEED?**Command Format:**

DATA:FEED?

Function:

The command queries the storage state of readings, the returned value is "CALC" or "". Note that the query only returns "CALC" as restricted by working principle.

3. DATA:POINts?**Command Format:**

DATA:POINts?

Function:

The command queries the number of readings in the internal memory of the multimeter.

DISPlay Commands

The commands control the screen, including:

- DISPlay:TEXT
- DISPlay:TEXT:CLEAr
- DISPlay

1. DISPlay:TEXT

Command Format:

DISPlay:TEXT <quoted string>
DISPlay:TEXT?

Function:

The commands display and query the strings specified by <quoted string>.

2. DISPlay:TEXT:CLEAr

Command Format:

DISPlay:TEXT:CLEAr

Function:

The command clears the information shown by sending command **DISPlay:TEXT <quoted string>**.

3. DISPlay

Command Format:

DISPlay {OFF|ON}
DISPlay?

Function:

DISPlay {OFF|ON} – Enables or disables the display.
DISPlay? – Queries the current display state.

FETCh? Commands

1. FETCh?

Command Format:

FETCh?

Function:

The command transfers the readings stored in internal memory to the output buffer.

INITiate Commands

1. INITiate

Command Format:

INITiate

Function:

The command switches the trigger state "Idle" into "Wait-for-trigger". When the command is received, the multimeter will start measuring if the trigger condition is met. The readings are stored in internal memory (up to 512 readings).

INPut Commands

1. INPut:IMPedance

Command Format:

INPut:IMPedance:AUTO {OFF|ON}

INPut:IMPedance:AUTO?

Function:

The command enables or disables the auto resistance function.

Explanations:

Being restricted by working principle, command INPut:IMPedance:AUTO {OFF|ON} is only responded without practical operation; command INPut:IMPedance:AUTO? Only returns "0".

MEASure Commands

Presets the multimeter as specified range and resolution and executes corresponding measurement, and then sends the readings to the output buffer. The query returns the data stored in output buffer.

- MEASure:VOLTage:DC?
- MEASure:VOLTage:AC?
- MEASure:CURRent:DC?
- MEASure:CURRent:AC?
- MEASure:RESistance?
- MEASure:FRESistance?
- MEASure:FREQuency?
- MEASure:PERiod?
- MEASure:CONTInuity?
- MEASure:DIODe?

1. MEASure:VOLTage:DC?**Command Format:**

MEASure:VOLTage:DC?

{<range>|MIN|MAX|DEF},{<resolution>|MIN|MAX|DEF}

Function:

The command presets the multimeter as specified range and resolution and executes DC voltage measurement, and then sends the readings to the output buffer. For the parameter range and other related information, refer to **CONFigure:VOLTage:DC**.

Return Format:

The query returns the data stored in output buffer.

2. MEASure:VOLTage:AC?**Command Format:**

MEASure:VOLTage:AC?

{<range>|MIN|MAX|DEF},{<resolution>|MIN|MAX|DEF}

Function:

The command presets the multimeter as specified range and resolution and executes AC voltage measurement, and then sends the readings to the output buffer. For the parameter range and other related information, refer to **CONFigure:VOLTage:AC**.

Return Format:

The query returns the data stored in output buffer.

3. MEASure:CURRent:DC?**Command Format:**

MEASure:CURRent:DC?

{<range>|MIN|MAX|DEF},{<resolution>|MIN|MAX|DEF}

Function:

The command presets the multimeter as specified range and resolution and executes DC current measurement, and then sends the readings to the output buffer. For the parameter range and other related information, refer to **CONFigure:CURRENT:DC**.

Return Format:

The query returns the data stored in output buffer.

4. MEASure:CURRENT:AC?**Command Format:**

MEASure:CURRENT:AC?

{<range>|MIN|MAX|DEF},{<resolution>|MIN|MAX|DEF}

Function:

The command presets the multimeter as specified range and resolution and executes AC current measurement, and then sends the readings to the output buffer. For the parameter range and other related information, refer to **CONFigure:CURRENT:AC**.

Return Format:

The query returns the data stored in output buffer.

5. MEASure:RESistance?**Command Format:**

MEASure:RESistance?

{<range>|MIN|MAX|DEF},{<resolution>|MIN|MAX|DEF}

Function:

The command presets the multimeter as specified range and resolution and executes 2-wire resistance measurement, and then sends the readings to the output buffer. For the parameter range and other related information, refer to **CONFigure:RESistance**.

Return Format:

The query returns the data stored in output buffer.

6. MEASure:FRESistance?**Command Format:**

MEASure:FRESistance?

{<range>|MIN|MAX|DEF},{<resolution>|MIN|MAX|DEF}

Function:

The command presets the multimeter as specified range and resolution and executes 4-wire resistance measurement, and then sends the readings to the output buffer. For the parameter range and other related information, refer to **CONFigure:FRESistance**.

Return Format:

The query returns the data stored in output buffer.

7. MEASure:FREQuency?**Command Format:**

MEASure:FREQuency?

{<range>|MIN|MAX|DEF},{<resolution>|MIN|MAX|DEF}

Function:

The command presets the multimeter as specified range and resolution and executes frequency measurement, and then sends the readings to the output buffer. For the parameter range and other related information, refer to **CONFigure:FREQuency**.

Return Format:

The query returns the data stored in output buffer.

8. MEASure:PERiod?**Command Format:**

MEASure:PERiod? {<range>|MIN|MAX|DEF},{<resolution>|MIN|MAX|DEF}

Function:

Presets the multimeter as specified range and resolution and executes period

measurement, and then sends the readings to the output buffer. For the parameter range and other related information, refer to **CONFigure:PERiod**.

Return Format:

The query returns the data stored in output buffer.

9. MEASure:CONTInuity?**Command Format:**

MEASure:CONTInuity?

Function:

The command presets and executes the continuity test and then sends the readings to the output buffer.

Explanations:

Enable the continuity measurement. The range is 2 k Ω .

Return Format:

The query returns the data stored in output buffer.

10. MEASure:DIODE?**Command Format:**

MEASure:DIODE?

Function:

The command presets and execute the diode measurement and then sends the readings to the output buffer.

Return Format:

The query returns the data stored in output buffer.

READ? Commands

1. READ?

Command Format:

READ?

Function:

The command switches the trigger state "Idle" into "Wait-for-trigger". When the command is received, the multimeter will start measuring if the trigger condition is met. The readings are transferred to the output buffer.

ROUTE Commands

1. ROUTe:TERMinals?

Command Format:

ROUTe:TERMinals?

Function:

The command queries the terminal (the port at the front or rear panel) under using. Being restricted by the terminal requirements, the query only returns "FRON".

SENSe Commands

The commands set the measurement parameters such as measurement function, range, precision, integration time, and the bandwidth of AC filter, including:

- [SENSe:]FUNctIon
- [SENSe:]VOLTage:DC:RANGe
- [SENSe:]VOLTage:AC:RANGe
- [SENSe:]CURRent:DC:RANGe
- [SENSe:]CURRent:AC:RANGe
- [SENSe:]RESistance:RANGe
- [SENSe:]FRESistance:RANGe
- [SENSe:]FREQuency:VOLTage:RANGe
- [SENSe:]PERiod:VOLTage:RANGe
- [SENSe:]VOLTage:DC:RANGe:AUTO
- [SENSe:]VOLTage:AC:RANGe:AUTO
- [SENSe:]CURRent:DC:RANGe:AUTO
- [SENSe:]CURRent:AC:RANGe:AUTO
- [SENSe:]RESistance:RANGe:AUTO
- [SENSe:]FRESistance:RANGe:AUTO
- [SENSe:]FREQuency:VOLTage:RANGe:AUTO
- [SENSe:]PERiod:VOLTage:RANGe:AUTO
- [SENSe:]VOLTage:DC:RESolution
- [SENSe:]VOLTage:AC:RESolution
- [SENSe:]CURRent:DC:RESolution
- [SENSe:]CURRent:AC:RESolution
- [SENSe:]RESistance:RESolution
- [SENSe:]FRESistance:RESolution
- [SENSe:]VOLTage:DC:NPLC
- [SENSe:]CURRent:DC:NPLC
- [SENSe:]RESistance:NPLC
- [SENSe:]FRESistance:NPLC
- [SENSe:]FREQuency:APERture
- [SENSe:]PERiod:APERture
- [SENSe:]DETEctor: BANDwidth
- [SENSe:]ZERO:AUTO

1. [SENSe:]FUNctIon

Command Format:

[SENSe:]FUNctIon "<function>"

[SENSe:]FUNctIon?

Function:

The commands set and query the current measurement function.

Parameter:

Name	Type	Range	Default
<function>	Discrete	Refer to Table 4-3	—

Explanations:

[SENSe:]FUNctIon "<function>" – Selects the measurement function to be used. Note this comand has no default value and <function> must be set, see table below.

[SENSe:]FUNctIon? – Queries the current measurement function.

Table 4-3 Parameters and explanations

Parameter	Meaning	Parameter	Meaning
VOLTage:DC	DC voltage	PERiod	Period
VOLTage:AC	AC voltage	RESistance	2WR
CURRent:AC	AC current	FRESistance	4WR
CURRent:DC	DC current	CONTinuity	Continuity
FREQuency	Frequency	DIODE	Diode

Return Format:

The query returns the current measurement function.

2. [SENSe:]VOLTage:DC:RANGe

Command Format:

[SENSe:]VOLTage:DC:RANGe {<range>|MINimum|MAXimum}

[SENSe:]VOLTage:DC:RANGe? [MINimum|MAXimum]

Function:

The commands set and query the range of DC voltage measurement.

Parameter:

Name	Type	Range	Default
<range>	Discrete	{200 mV 2 V 20 V 200 V 1000 V}	20 V

Explanations:

[SENSe:]VOLTage:DC:RANGe {<range>|MINimum|MAXimum} - Sets the desired range of DC voltage measurement from {200mV|2V|20V|200V|1000V}; thereinto, MIN = 200 mV, MAX = 1000 V and the unit is V. If a 200 mV range is required, enter 0.2 as its parameter.

[SENSe:]VOLTage:DC:RANGe? [MINimum|MAXimum] – Queries the range of DC voltage measurement.

Return Format:

The query returns the range of DC voltage measurement.

3. [SENSe:]VOLTage:AC:RANGe

Command Format:

[SENSe:]VOLTage:AC:RANGe {<range>|MINimum|MAXimum}

[SENSe:]VOLTage:AC:RANGe? [MINimum|MAXimum]

Function:

The commands set and query the range of AC voltage measurement.

Parameter:

Name	Type	Range	Default
<range>	Discrete	{ 200 mV 2 V 20 V 200 V 750 V }	20 V

Explanations:

[SENSe:]VOLTage:AC:RANGe {<range>|MINimum|MAXimum} - Sets the desired range of AC voltage measurement from {200 mV|2 V|20 V|200 V|750 V}; thereinto, MIN = 200 mV, MAX = 750 V and the unit is V. If a 200 mV range is required, enter 0.2 as its parameter.

[SENSe:]VOLTage:AC:RANGe? [MINimum|MAXimum] – Queries the range of AC voltage measurement.

Return Format:

The query returns the range of AC voltage measurement.

4. [SENSe:]CURRent:DC:RANGe

Command Format:

[SENSe:]CURRent:DC:RANGe {<range>|MINimum|MAXimum}
 [SENSe:]CURRent:DC:RANGe? [MINimum|MAXimum]

Function:

The commands set and query the range of DC current measurement

Parameter:

Name	Type	Range	Default
<range>	Discrete	{ 200 μ A 2 mA 20 mA 200 mA 2 A 10 A }	200 mA

Explanations:

[SENSe:]CURRent:DC:RANGe {<range>|MINimum|MAXimum} - Sets the desired range of DC current measurement from {200 μ A|2 mA|20 mA|200 mA|1 A|10 A}; thereinto, MIN = 200 μ A, MAX = 10 A and the unit is A. If a 200 mA range is required, enter 0.2 as its parameter.

[SENSe:]CURRent:DC:RANGe? [MINimum|MAXimum] – Queries the range of DC current measurement.

Return Format:

The query returns the range of DC current measurement.

5. [SENSe:]CURRent:AC:RANGe

Command Format:

[SENSe:]CURRent:AC:RANGe {<range>|MINimum|MAXimum}
 [SENSe:]CURRent:AC:RANGe? [MINimum|MAXimum]

Function:

The commands set and query the range of AC current measurement.

Parameter:

Name	Type	Range	Default
<range>	Discrete	{ 20 mA 200 mA 2 A 10 A }	200 mA

Explanations:

[SENSe:]CURRent:AC:RANGe {<range>|MINimum|MAXimum} - Sets the desired range of AC current measurement from {20 mA|200 mA|2 A|10 A }; thereinto, MIN = 20 mA, MAX = 10 A and the unit is A. If a 200 mA range is required, enter 0.2 as its parameter.

[SENSe:]CURRent:AC:RANGe? [MINimum|MAXimum] - Queries the current range of AC current measurement.

Return Format:

The query returns the range of AC current measurement.

6. [SENSe:]RESistance:RANGe**Command Format:**

[SENSe:]RESistance:RANGe {<range>|MINimum|MAXimum}

[SENSe:]RESistance:RANGe? [MINimum|MAXimum]

Function:

The commands set and query the range of 2-wire resistance measurement.

Parameter:

Name	Type	Range	Default
<range>	Discrete	{200 Ω 2 kΩ 20 kΩ 200 kΩ 2 MΩ 10 MΩ 100 MΩ}	200 kΩ

Explanations:

[SENSe:]RESistance:RANGe {<range>|MINimum|MAXimum} - Sets the desired range of 2-wire resistance measurement from {200 Ω|2 kΩ|20 kΩ|200 kΩ|2 MΩ|10 MΩ|100 MΩ}; thereinto, MIN = 200 Ω, MAX = 100 MΩ and the unit is Ω. If a 2 kΩ range is required, enter 2000 as its parameter.

[SENSe:]RESistance:RANGe? [MINimum|MAXimum] – Queries the current range of 2-wire resistance measurement.

Both 2-wire and 4-wire resistance measurements are influenced by this command. All the commands of 2-wire and 4-wire resistance will have influence over the setting of resistance.

Return Format:

The query returns the range of 2-wire resistance measurement.

7. [SENSe:]FRESistance:RANGe

Command Format:

[SENSe:]FRESistance:RANGe {<range>|MINimum|MAXimum}

[SENSe:]FRESistance:RANGe? [MINimum|MAXimum]

Function:

The commands set and query the range of 4-wire resistance measurement.

Parameter:

Name	Type	Range	Default
<range>	Discrete	{200 Ω 2 kΩ 20 kΩ 200 kΩ 2 MΩ 10 MΩ 100 MΩ}	200 kΩ

Explanations:

[SENSe:]FRESistance:RANGe {<range>|MINimum|MAXimum} - Sets the desired range of 4-wire resistance measurement from {200 Ω|2 kΩ|20 kΩ|200 kΩ|2 MΩ|10 MΩ|100 MΩ}; thereinto, MIN = 200 Ω, MAX = 100 MΩ and the unit is Ω. If a 2 kΩ range is required, enter 2000 as its parameter.

[SENSe:]FRESistance:RANGe? [MINimum|MAXimum] – Queries the current range of 4-wire resistance measurement.

Both 2-wire and 4-wire resistance measurements are influenced by this command. All the commands of 2-wire and 4-wire resistance will have influence over the setting of resistance.

Return Format:

The query returns the range of 4-wire resistance measurement.

8. [SENSe:]FREQuency:VOLTage:RANGe

Command Format:

[SENSe:]FREQuency:VOLTage:RANGe {<range>|MINimum|MAXimum}
 [SENSe:]FREQuency:VOLTage:RANGe? [MINimum|MAXimum]

Function:

The commands set and query the voltage range under frequency measurement.

Parameter:

Name	Type	Range	Default
<range>	Discrete	{200 mV 2 V 20 V 200 V 750 V}	20 V

Explanations:

[SENSe:]FREQuency:VOLTage:RANGe {<range>|MINimum|MAXimum} - Sets the desired voltage range under frequency measurement from {200 mV|2 V|20 V|200 V|750 V}; thereinto, MIN = 200 mA, MAX = 750 V and the unit is V. If a 200 mV range is required, enter 0.2 as its parameter.

[SENSe:]FREQuency:VOLTage:RANGe? [MINimum|MAXimum] - Queries the current voltage range under frequency measurement.

Return Format:

The query returns the voltage range under frequency measurement.

9. [SENSe:]PERiod:VOLTage:RANGe

Command Format:

[SENSe:]PERiod:VOLTage:RANGe {<range>|MINimum|MAXimum}
 [SENSe:]PERiod:VOLTage:RANGe? [MINimum|MAXimum]

Function:

The commands set and query the voltage range under period measurement.

Parameter:

Name	Type	Range	Default
<range>	Discrete	{200 mV 2 V 20 V 200 V 750 V}	20 V

Explanations:

[SENSe:]PERiod:VOLTage:RANGe {<range>|MINimum|MAXimum} - Sets the desired voltage range under period measurement from {200 mV|2 V|20 V|200 V|750 V}; thereinto, MIN = 200 mV, MAX = 750 V and the unit is V. If a 200 mV range is required, enter 0.2 as its parameter.

[SENSe:]PERiod:VOLTage:RANGe? [MINimum|MAXimum] -Queries the current voltage range under period measurement.

Return Format:

The query returns the voltage range under period measurement.

10. [SENSe:]VOLTage:DC:RANGe:AUTO**Command Format:**

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

Function:

The commands set and query the auto range state of DC voltage measurement.

Explanations:

[SENSe:]VOLTage:DC:RANGe:AUTO {ON|OFF} - Sets the desired auto range state. If choose ON, the instrument will select a measurement range according to the signal inputted.

[SENSe:]VOLTage:DC:RANGe:AUTO? - Queries the current auto range state of DC voltage measurement.

Return Format:

The query returns auto range state.

11. [SENSe:]VOLTage:AC:RANGe:AUTO

Command Format:

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

Function:

The commands set and query the auto range state of AC voltage measurement.

Explanations:

[SENSe:]VOLTage:AC:RANGe:AUTO {ON|OFF} - Sets the desired auto range state. If choose ON, the instrument will select a measurement range according to the signal inputted.

[SENSe:]VOLTage:AC:RANGe:AUTO? – Queries the current auto range state of AC voltage measurement, the maximum range is 750 V.

Return Format:

The query returns the auto range state of AC voltage measurement.

12. [SENSe:]CURRent:DC:RANGe:AUTO

Command Format:

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

Function:

The commands set and query the auto range state of DC current measurement.

Explanations:

[SENSe:]CURRent:DC:RANGe:AUTO {ON|OFF} - Sets the desired auto range state. If choose ON, the instrument will select a measurement range according to the signal inputted.

[SENSe:]CURRent:DC:RANGe:AUTO? – Queries the current auto range state of DC current measurement.

Return Format:

The query returns the auto range state of DC current measurement.

13. [SENSe:]CURRent:AC:RANGe:AUTO

Command Format:

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

Function:

The commands set and query the auto range state of AC current measurement.

Explanations:

[SENSe:]CURRent:AC:RANGe:AUTO {ON|OFF}} - Sets the desired auto range state. If choose ON, the instrument will select a measurement range according to the signal inputted.

[SENSe:]CURRent:AC:RANGe:AUTO? – Queries the current auto range state of AC current measurement.

Return Format:

The query returns the auto range state of AC current measurement.

14. [SENSe:]RESistance:RANGe:AUTO

Command Format:

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

Function:

The commands set and query the auto range state of 2-wire resistance measurement.

Explanations:

[SENSe:]RESistance:RANGe:AUTO {ON|OFF} - Sets the desired auto range state of 2-wire resistance measurement. If choose ON, the instrument will select a measurement range according to the signal inputted.

[SENSe:]RESistance:RANGe:AUTO? – Queries the current auto range state of 2-wire resistance measurement.

Both 2-wire and 4-wire resistance measurements are influenced by this command. All the commands of 2-wire and 4-wire resistance will have influence over the setting of resistance.

Return Format:

The query returns the auto range state of 2-wire resistance measurement.

15. [SENSe:]FRESistance:RANGe:AUTO**Command Format:**

[SENSe:]FRESistance:RANGe:AUTO {ON|OFF}

[SENSe:]FRESistance:RANGe:AUTO?

Function:

The commands set and query the auto range state of 4-wire resistance measurement.

Explanations:

[SENSe:]FRESistance:RANGe:AUTO {ON|OFF} - Sets the desired auto range state of 4-wire resistance measurement. If choose ON, the instrument will select a measurement range according to the signal inputted.

[SENSe:]FRESistance:RANGe:AUTO? – Queries the current auto range state of 4-wire resistance measurement.

Both 2-wire and 4-wire resistance measurements are influenced by this command. All the commands of 2-wire and 4-wire resistance will have influence over the setting of resistance.

Return Format:

The query returns the auto range state of 4-wire resistance measurement.

16. [SENSe:]FREQuency:VOLTage:RANGe:AUTO**Command Format:**

[SENSe:]FREQuency:VOLTage:RANGe:AUTO {ON|OFF}

[SENSe:]FREQuency:VOLTage:RANGe:AUTO?

Function:

The commands set and query the auto range state of voltage for frequency measurement.

Explanations:

[SENSe:]FREQuency:VOLTage:RANGe:AUTO {ON|OFF} - Sets the desired auto range state of voltage under frequency measurement.

[SENSe:]FREQuency:VOLTage:RANGe:AUTO? – Queries the auto range state of voltage under frequency measurement. The maximum range is 750 V and the virtual value of voltage is decided by waveform.

Return Format:

The query returns the current auto range state of voltage under frequency measurement.

17. [SENSe:]PERiod:VOLTage:RANGe:AUTO

Command Format:

[SENSe:]PERiod:VOLTage:RANGe:AUTO {ON|OFF}

[SENSe:]PERiod:VOLTage:RANGe:AUTO?

Function:

The commands set and query the auto range state of voltage for period measurement.

Explanations:

[SENSe:]PERiod:VOLTage:RANGe:AUTO {ON|OFF} - Sets the desired auto range state of voltage under period measurement.

[SENSe:]PERiod:VOLTage:RANGe:AUTO? – Queries the current auto range state of voltage under period measurement.

The maximum range of AC voltage is 750 V (rms) and the virtual value of voltage is decided by waveform.

Return Format:

The query returns the current auto range state of voltage under period measurement.

18. [SENSe:]VOLTage:DC:RESolution

Command Format:

[SENSe:]VOLTage:DC:RESolution {<resolution>|MINimum|MAXimum}

[SENSe:]VOLTage:DC:RESolution? [MINimum|MAXimum]

Function:

The commands set and query the precision of DC voltage measurement.

Parameter:

Name	Type	Range	Default
<resolution>	Discrete	Refer to Table 4-2	1ppm x range

Explanations:

[SENSe:]VOLTage:DC:RESolution {<resolution>|MINimum|MAXimum} – Sets the desired precision of DC voltage measurement.

[SENSe:]VOLTage:DC:RESolution? [MINimum|MAXimum] – Queries the current precision of DC voltage measurement.

<resolution> relates to measurement rate and integration time, refer to Table 4-2.

Return Format:

The query returns the current precision of DC voltage measurement.

19. [SENSe:]VOLTage:AC:RESolution**Command Format:**

[SENSe:]VOLTage:AC:RESolution {<resolution>|MINimum|MAXimum}

[SENSe:]VOLTage:AC:RESolution? [MINimum|MAXimum]

Function:

The commands set and query the precision of AC voltage measurement.

Parameter:

Name	Type	Range	Default
<resolution>	Discrete	Refer to Table 4-2	1ppm x range

Explanations:

[SENSe:]VOLTage:AC:RESolution {<resolution>|MINimum|MAXimum} – Sets the desired precision of AC voltage measurement.

[SENSe:]VOLTage:AC:RESolution? [MINimum|MAXimum] – Queries the current precision of AC voltage measurement.

<resolution> relates to measurement rate and integration time, refer to Table

4-2.

Return Format:

The query returns the current precision of AC voltage measurement.

20. [SENSe:]CURRent:DC:RESolution

Command Format:

[SENSe:]CURRent:DC:RESolution {<resolution>|MINimum|MAXimum}

[SENSe:]CURRent:DC:RESolution? [MINimum|MAXimum]

Function:

The commands set and query the precision of DC current measurement.

Parameter:

Name	Type	Range	Default
<resolution>	Discrete	Refer to Table 4-2	1ppm x range

Explanations:

[SENSe:]CURRent:DC:RESolution {<resolution>|MINimum|MAXimum} – Sets the desired precision of DC current measurement.

[SENSe:]CURRent:DC:RESolution? [MINimum|MAXimum] – Queries the current precision of DC current measurement.

<resolution> relates to measurement rate and integration time, refer to Table 4-2.

Return Format:

The query returns the current precision of DC current measurement.

21. [SENSe:]CURRent:AC:RESolution

Command Format:

[SENSe:]CURRent:AC:RESolution {<resolution>|MINimum|MAXimum}

[SENSe:]CURRent:AC:RESolution? [MINimum|MAXimum]

Function:

The commands set and query the precision of AC current measurement.

Parameter:

Name	Type	Range	Default
<resolution>	Discrete	Refer to Table 4-2	1ppm x range

Explanations:

[SENSe:]CURRent:AC:RESolution {<resolution>|MINimum|MAXimum} – Sets the desired precision of AC current measurement

[SENSe:]CURRent:AC:RESolution? [MINimum|MAXimum] – Queries the current precision of AC current measurement.

<resolution> relates to measurement rate and integration time, refer to Table 4-2.

Return Format:

The query returns the current precision of AC current measurement.

22. [SENSe:]RESistance:RESolution**Command Format:**

[SENSe:]RESistance:RESolution {<resolution>|MINimum|MAXimum}

[SENSe:]RESistance:RESolution? [MINimum|MAXimum]

Function:

The commands set and query the precision of 2-wire resistance measurement.

Parameter:

Name	Type	Range	Default
<resolution>	Discrete	Refer to Table 4-2	3ppm x range

Explanations:

[SENSe:]RESistance:RESolution {<resolution>|MINimum|MAXimum} – Sets the desired precision of 2-wire resistance measurement

[SENSe:]RESistance:RESolution? [MINimum|MAXimum] – Queries the current precision of 2-wire resistance measurement.

<resolution> relates to measurement rate and integration time, refer to Table 4-2.

Both 2-wire and 4-wire resistance measurements are influenced by this command. All the commands of 2-wire and 4-wire resistance will have influence over the

setting of resistance.

Return Format:

The query returns the current precision of 2-wire resistance measurement.

23. [SENSe:]FRESistance:RESolution

Command Format:

[SENSe:]FRESistance:RESolution {<resolution>|MINimum|MAXimum}

[SENSe:]FRESistance:RESolution? [MINimum|MAXimum]

Function:

The commands set and query the precision of 4-wire resistance measurement.

Parameter:

Name	Type	Range	Default
<resolution>	Discrete	Refer to Table 4-2	3ppm x range

Explanations:

[SENSe:]FRESistance:RESolution {<resolution>|MINimum|MAXimum}– Sets the desired precision of 4-wire resistance measurement

[SENSe:]FRESistance:RESolution? [MINimum|MAXimum] – Queries the current precision of 4-wire resistance measurement.

<resolution> relates to measurement rate and integration time, refer to Table 4-2.

Both 2-wire and 4-wire resistance measurements are influenced by this command. All the commands of 2-wire and 4-wire resistance will have influence over the setting of resistance.

Return Format:

The query returns current precision of 4-wire resistance measurement.

24. [SENSe:]VOLTage:DC:NPLC

Command Format:

[SENSe:]VOLTage:DC:NPLC {0.02|0.2|1|10|100|MINimum|MAXimum}

[SENSe:]VOLTage:DC:NPLC? [MINimum|MAXimum]

Function:

The commands set and query the integration time for DC voltage measurement. The inputted and returned values are multiple of PLC.

Explanations:

[SENSe:]VOLTage:DC:NPLC {0.02|0.2|1|10|100|MINimum|MAXimum} – Sets the desired integration time integration time, MIN = 0.02 PLC, MAX = 100 PLC, and the default is 1 PLC.

[SENSe:]VOLTage:DC:NPLC? [MINimum|MAXimum] – Queries the current integration time.

The integration time relates to resolution and measurement rate, refer to Table 4-2.

Return Format:

The query returns the current integration time of DC voltage measurement.

25. [SENSe:]CURRENT:DC:NPLC**Command Format:**

[SENSe:]CURRENT:DC:NPLC {0.02|0.2|1|10|100|MINimum|MAXimum}

[SENSe:]CURRENT:DC:NPLC? [MINimum|MAXimum]

Function:

The commands set and query the integration time for DC current measurement. The inputted and returned values are multiple of PLC.

Explanations:

[SENSe:]CURRENT:DC:NPLC {0.02|0.2|1|10|100|MINimum|MAXimum} – Sets the desired integration time, MIN = 0.02 PLC, MAX = 100 PLC, and the default is 1 PLC.

[SENSe:]CURRENT:DC:NPLC? [MINimum|MAXimum] – Queries the current integration time of DC current measurement.

The integration time relates to resolution and measurement rate, refer to Table 4-2.

Return Format:

The query returns the current integration time of DC current measurement.

26. [SENSe:]RESistance:NPLC

Command Format:

```
[SENSe:]RESistance:NPLC {0.02|0.2|1|10|100|MINimum|MAXimum}  
[SENSe:]RESistance:NPLC? [MINimum|MAXimum]
```

Function:

The commands set and query the integration time for 2-wire resistance measurement. The inputted and returned values are multiple of PLC.

Explanations:

[SENSe:]RESistance:NPLC {0.02|0.2|1|10|100|MINimum|MAXimum} – Sets the desired integration time, MIN = 0.02 PLC, MAX = 100 PLC, and the default is 1 PLC.

[SENSe:]RESistance:NPLC? [MINimum|MAXimum] – Queries the current integration time of 2-wire resistance measurement

The integration time relates to resolution and measurement rate, refer to Table 4-2.

Both 2-wire and 4-wire resistance measurements are influenced by this command. All the commands of 2-wire and 4-wire resistance will have influence over the setting of resistance.

Return Format:

The query returns the current integration time of 2-wire resistance measurement.

27. [SENSe:]FRESistance:NPLC

Command Format:

```
[SENSe:]FRESistance:NPLC {0.02|0.2|1|10|100|MINimum|MAXimum}  
[SENSe:]FRESistance:NPLC? [MINimum|MAXimum]
```

Function:

The commands set and query the integration time for 4-wire resistance measurement. The inputted and returned values are multiple of PLC.

Explanations:

[SENSe:]FRESistance:NPLC {0.02|0.2|1|10|100|MINimum|MAXimum} – Sets the desired integration time, MIN = 0.02 PLC, MAX = 100 PLC, and the default is 1

PLC.

[SENSe:]FREStance:NPLC? [MINimum|MAXimum] – Queries the integration time of 4-wire resistance measurement.

The integration time relates to resolution and measurement rate, refer to Table 4-2.

Both 2-wire and 4-wire resistance measurements are influenced by this command. All the commands of 2-wire and 4-wire resistance will have influence over the setting of resistance.

Return Format:

The query returns the current integration time of 4-wire resistance measurement.

28. [SENSe:]FREQuency:APERture

Command Format:

[SENSe:]FREQuency:APERture {0.01|0.1|1|MINimum|MAXimum}

[SENSe:]FREQuency:APERture? [MINimum|MAXimum]

Function:

The commands set and query the aperture time (or gate time) of frequency measurement.

Explanations:

[SENSe:]FREQuency:APERture {0.01|0.1|1|MINimum|MAXimum} – Sets the desired aperture time for frequency measurement. The unit is s, MIN=10ms, MAX=1s, and the default is 100ms.

[SENSe:]FREQuency:APERture? [MINimum|MAXimum] – Queries the aperture time of frequency measurement.

Return Format:

The query returns the current aperture time of frequency measurement.

29. [SENSe:]PERiod:APERture

Command Format:

[SENSe:]PERiod:APERture {0.01|0.1|1|MINimum|MAXimum}

[SENSe:]PERiod:APERture? [MINimum|MAXimum]

Function:

The commands set and query the aperture time of period measurement.

Explanations:

[SENSe:]PERiod:APERture {0.01|0.1|1|MINimum|MAXimum} – Sets the desired aperture time for period measurement. The unit is s, MIN=10ms, MAX=1s, and the default is 100ms.

[SENSe:]PERiod:APERture? [MINimum|MAXimum] – Queries the aperture time of period measurement.

Return Format:

The query returns the current aperture time of period measurement.

30. [SENSe:]DETEctor:BANdwidth**Command Format:**

[SENSe:]DETEctor:BANdwidth {3|20|200|MINimum|MAXimum}

[SENSe:]DETEctor:BANdwidth? [MINimum|MAXimum]

Function:

The commands set and query the possible minimum frequency from signals inputted. The multimeter will select a measurement rate according to your frequency setting such as S, M (default) or F. Note that the command is only responded without practical operation.

Explanations:

[SENSe:]DETEctor:BANdwidth {3|20|200|MINimum|MAXimum} – Sets the desired minimum frequency for signals inputted. The unit is Hz, MIN=3Hz, MAX=200Hz.

[SENSe:]DETEctor:BANdwidth? [MINimum|MAXimum]? – Queries the minimum frequency from signals inputted.

Return Format:

The query returns "3", "20" or "200".

31. [SENSe:]ZERO:AUTO

Command Format:

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

Function:

The commands set and query the state of zero function.

Explanations:

[SENSe:]ZERO:AUTO {OFF|ONCE|ON} Sets the zero function state to be used. Note that the command is only responded without practical operation as restricted by working principle.

[SENSe:]ZERO:AUTO? – Queries the state of zero function. Note the query only returns "0" as restricted by working principle.

SAMPlE Commands

1. SAMPlE:COUNT

Command Format:

SAMPlE:COUNT {<value>|MINimum|MAXimum}

SAMPlE:COUNT? [MINimum|MAXimum]

Function:

The commands set and query the sample number of the multimeter.

Explanations:

<value> could be 1~2000. MIN=1, MAX=2000.

Return Format:

The query returns the sample number of the multimeter.

TRIGger Commands

The commands set the trigger parameters such as trigger times, delay time and others. Command "SENSe:<function>: RANGe:AUTO OFF" is suggested to be used for disabling auto range function, and the commands "SENSe:<function>:RANGe, CONFigure" or "MEASure?" is for setting range manually.

The trigger commands mainly include:

- TRIGger:COUNT
- TRIGger:DELay
- TRIGger:DELay:AUTO
- TRIGger:SOURce

1. TRIGger:COUNT

Command Format:

TRIGger:COUNT {<value>|MINimum|MAXimum|INFinite}

TRIGger:COUNT? [MINimum|MAXimum]

Function:

The commands set and query the trigger times used in multimeter.

Parameter:

Name	Type	Range of Values	Default
<value>	Consecutive Integer	1~2000	Parameters must be set

Explanations:

TRIGger:COUNT {<value>|MINimum|MAXimum|INFinite} - Sets the trigger times to be used.

TRIGger:COUNT? [MINimum|MAXimum] - Queries the current trigger times.

Return Format:

The query returns the trigger times used in multimeter.

2. TRIGger:DELAy

Command Format:

TRIGger:DELAy {<seconds>|MINimum|MAXimum}

TRIGger:DELAy? [MINimum|MAXimum]

Function:

The commands set and query the delay time from when the trigger signal occurred until the start of the measurement.

Parameter:

Name	Type	Range of Values	Default
<seconds>	Consecutive Integer	0~3600	Parameters must be set

Explanations:

TRIGger:DElay {<seconds>|MINimum|MAXimum} - Sets the desired delay time
TRIGger:DElay? [MINimum|MAXimum] - Queries the delay time between trigger and measurement.

Return Format:

The query returns the the delay time between trigger and measurement.

3. TRIGger:DElay:AUTO**Command Format:**

TRIGger:DElay:AUTO {ON|OFF}

TRIGger:DElay:AUTO?

Function:

The commands set and query the state of delay function in auto trigger mode.

Explanations:

TRIGger:DElay:AUTO {ON|OFF} - Sets the desired state of delay function in auto trigger mode.

TRIGger:DElay:AUTO? - Queries the current state of delay function in auto trigger mode.

Return Format:

The query returns the current state of delay function in auto trigger mode.

4. TRIGger:SOURce**Command Format:**

TRIGger:SOURce {IMMEDIATE|EXTernal|BUS}

TRIGger:SOURce?

Function:

The commands set and query the trigger source used by the instrument.

Explanations:

TRIGger:SOURce {IMMEDIATE|EXTernal|BUS} – Selects the trigger source to be used.

TRIGger:SOURce? – Queries the current trigger source.

The possible return value is IMMEDIATE, EXTERNAL and BUS; thereinto, IMMEDIATE denotes the trigger signal will be generated immediately; EXTERNAL denotes the external trigger source on the rear panel will be used; BUS (software trigger) denotes the command “*TRG” should be used when the instrument is in “waiting trigger”.

After the trigger source is selected, the instrument must be set to “waiting trigger” mode, or the trigger source will be refused. To set the trigger source to IMM mode, using command CONFIGure or MEASure?.

Command “SENSe:<function>:RANGe:AUTO OFF” is suggested to disable auto range function, the command “SENSe:<function>:RANGe”, “CONFigure” or “MEASure?” is for setting the range manually.

Return Format:

The query returns the current trigger source.

Chapter 5 Compatible Fluke Commands

In this system, all the parameters and the returned formats are ASCII characters with case insensitive.

The system mainly includes the following sub commands:

- Function Commands
- Function Regulation Commands
- Range and Rate Commands
- Measurement Commands
- Compare Commands
- Trigger Commands
- Format Commands
- Reading Commands

Function Commands

The commands enable the basic measurement functions of the instrument, which are equal to the corresponding buttons at the front panel, including:

- AAC
- ADC
- CLR2
- CONT
- DIODE
- FREQ
- FUNC
- OHMS
- VAC
- VDC

1. AAC

Command Format:

AAC
AAC2

Function:

The commands enable the AC current measurement for both main and vice display.

Explanations:

AAC - Enables the AC Current measurement function of main display.

AAC2 - Enables the AC Current measurement function of vice display.

2. ADC

Command Format:

ADC
ADC2

Function:

The commands enable the DC current measurement for both main and vice display.

Explanations:

ADC - Enables the DC Current measurement function of main display.

ADC2 - Enables the DC Current measurement function of vice display.

3. CLR2

Command Format:

CLR2

Function:

If the vice display is used, the command clears the measurement value on it and closes the vice display.

4. CONT

Command Format:

CONT

Function:

The command enables the Continuity test of main display.

5. DIODE

Command Format:

DIODE

Function:

The command enables the Diode test of main display.

6. FREQ

Command Format:

FREQ

FREQ2

Function:

The command enables the Frequency measurement function of both main and vice display.

Explanations:

FREQ - Enables the frequency measurement function of main display.

FREQ2 - Enables the frequency measurement function of vice display.

7. FUNC

Command Format:

FUNC1?

FUNC2?

Function:

The command queries the identifiers of selected function on the main or vice display.

Explanations:

FUNC1? - Queries the current measurement function of main display.

FUNC2? - Queries the current measurement function of vice display.

If the vice display is disabled, an error may be generated when using FUNC2?.

Return Format:

The query returns the identifiers of current measurement.

FUNC1? - The query may return: AAC, ADC, CONT, DIODE, FREQ, OHMS, VAC, VDC.

FUNC2? - The query may return: AAC, ADC, FREQ, OHMS, VAC, VDC.

8. OHMS**Command Format:**

OHMS

OHMS2

Function:

The command enables the resistance measurement of both main and vice display.

Explanations:

OHMS - Enables the resistance measurement function of main display.

OHMS2 - Enables the resistance measurement function of vice display.

9. VAC**Command Format:**

VAC

VAC2

Function:

The command enables the AC voltage measurement of both main and vice display.

Explanations:

VAC - Enables the AC voltage measurement function of main display.

VAC2 - Enables the AC voltage measurement function of vice display.

10. VDC

Command Format:

VDC

VDC2

Function:

The command enables the DC voltage measurement of both main and vice display.

Explanations:

VDC - Enables the DC voltage measurement function of main display.

VDC2 - Enables the DC voltage measurement function of vice display.

Function Regulation Commands

The commands enable the regulator of the multimeter, which are equal to the math function at the front panel, including:

- DB
- DBCLR
- DBREF
- HOLD
- HOLDCLR
- HOLDTHRESH
- MAX
- MAXSET
- MIN
- MINSET
- MMCLR
- MOD?
- REL
- RELCLR
- RELSET

1. DB

Command Format:

DB

Function:

The command enables dB operation.

Explanations:

The unit of the readings shown on the main display is dB.

2. DBCLR

Command Format:

DBCLR

Function:

The command disables dB operation.

3. DBREF

Command Format:

DBREF <value>

DBREF?

Function:

The commands query and set the reference impedance of dB.

Explanations:

The value should be within the <value> in table 5-1, or else, errors may occur.

Table 5-1 Reference impedance

Parameter	Reference impedance	Parameter	Reference impedance
1	2	12	150
2	4	13	250
3	8	14	300
4	16	15	500
5	50	16	600
6	75	17	800
7	93	18	900
8	110	19	1000
9	124	20	1200
10	125	21	8000
11	135		

Return Format:

The query returns the parameter relates to selected reference impedance.

4. HOLD**Command Format:**

HOLD

Function:

The command enables the multimeter enter Touch Hold mode.

Explanations:

If the multimeter has been in this mode when you send this command, a reading will be forced to display on the screen.

5. HOLDCLR**Command Format:**

HOLDCLR

Function:

The command enables the multimeter exit Touch Hold mode and back to its normal state.

6. HOLDTHRESH

Command Format:

HOLDTHRESH <threshold>
HOLDTHRESH?

Function:

The commands set and query the threshold for HOLD measurement.

Explanations:

HOLDTHRESH <threshold> - Sets the HOLD threshold to <threshold>, <threshold> should be 1, 2, 3 or 4 (which are 0.01%, 0.1%, 1%, 10%, respectively), or else errors may occur.

HOLDTHRESH? - Queries the threshold of HOLD measurement.

Return Format:

The query returns the HOLD threshold 1, 2, 3 or 4.

7. MAX

Command Format:

MAX

Function:

The command enables the multimeter enter MAX operation with current reading as maximum.

Explanations:

If the multimeter has been in MAX mode, the maximum value will be shown on the screen. Note the auto range function is disabled in this mode.

8. MAXSET

Command Format:

MAXSET <numeric value>

Function:

The command enables the multimeter enter MAX operation with <numeric value> as maximum.

Explanations:

<numeric value> could be a signed integer, a signed real number without exponent, or a signed real number with exponent, and the new value must be greater than last one. IF <numeric value> is overrange, an Execution Error may generate. The auto range function is disabled in this mode.

9. MIN

Command Format:

MIN

Function:

The command enables the multimeter enter MIN operation with current reading as minimum.

Explanations:

If the multimeter has been in MIN mode, the minimum value will be shown on the screen. Note the auto range function is disabled in this mode.

10. MINSET

Command Format:

MINSET <numeric value>

Function:

The command enables the multimeter enter MIN operation with <numeric value> as minimum.

Explanations:

<numeric value> could be a signed integer, a signed real number without exponent, or a signed real number with exponent, and the new value must be less than last one. IF <numeric value> is overrange, an Execution Error may generate. The auto range function is disabled in this mode.

11. MMCLR**Command Format:**

MMCLR

Function:

The command enables the multimeter exit the MIN MAX mode, meanwhile the stored minimum and maximum are lost.

Explanations:

The multimeter returns to the ranging mode and the range selected is the one prior to MIN MAX mode.

12. MOD?**Command Format:**

MOD?

Function:

The command queries the numeric value relates to current math operation.

Explanations:

The command returns a numeric value indicating math operation in use. 1=MIN, 2=MAX, 4=HOLD, 8=dB, 32=REL, 64=COMP. If more than one operation are used, the command returns the sum of the values of the selected operations. If no operation is selected, returns 0. For example, if dB and REL are selected, 40 is returned.

Return Format:

The query returns the numeric value relateds to current operation.

13. REL

Command Format:

REL

Function:

The command enables the multimeter enter the REL mode, using the value shown on the main display as the relative base.

14. RELCLR

Command Format:

RELCLR

Function:

The command enables the multimeter exit the REL mode and backs into ranging mode. The range selected is the one prior to REL.

15. RELSET

Command Format:

RELSET <relative base>
RELSET?

Function:

RELSET <relative base> - Enables the multimeter enter the REL mode, using the <relative base> as the relative base.

RELSET? – Queries the current relative base. If the REL operation is disabled, an Execute error is generated.

Explanations:

<relative base> could be a signed integer, a signed real number with exponent or a signed real number without exponent. If <numeric value> is overrange, an Execution Error may generate.

Return Format:

The query returns the relative base of REL operation.

Range and Rate Commands

The commands set and query the measuring range and the speed, which are equal to the corresponding buttons at the front panel, including:

- AUTO
- FIXED
- RANGE
- RATE

1. AUTO

Command Format:

AUTO
AUTO?

Function:

The commands set and query the auto range mode of the multimeter.

Explanations:

AUTO - Enables the multimeter enter the auto range mode. If the mode is forbidden to be selected (as the Diode and Continuity function are active), an Execute error may generate.

AUTO? – Queries if the multimeter is in auto range mode.

Return Format:

The query returns 1(Yes) or 0 (No).

2. FIXED

Command Format:

FIXED

Function:

The command enables the multimeter exit the auto range mode and switches into Manual mode, the current range is selected.

3. RANGE

Command Format:

RANGE <value range>
RANGE1?
RANGE2?

Function:

RANGE <value range> - Sets the range of main display, see table below, thereinto, the ranges relate to the functions (voltage, current, resistance and so

on) currently used.

RANGE1? – Queries the current range selected by main display.

RANGE2? – Queries the current range selected by vice display. If the display is disabled, an Execute error will generate.

Table 5-2 Range of every function

No.	DC V	ACV, Frequency, Period	Resistance	ACC	DCC	Capacitance
1	200 mV	200 mV	200Ω	20mA	200 μA	2nF
2	2 V	2 V	2 kΩ	200mA	2 mA	20nF
3	20 V	20 V	20 kΩ	2 A	20 mA	200nF
4	200 V	200 V	200 kΩ	10 A	200 mA	2μF
5	1000 V dc	750 V dc	2 MΩ	NA	2 A	200μF
6	NA	NA	20 MΩ	NA	10 A	10000μF
7	NA	NA	100 MΩ	NA	NA	NA

Return Format:

The query returns the values selected by both the two displays.

4. RATE

Command Format:

RATE <speed>

RATE?

Function:

The commands set and query the measuring speed.

Explanations:

RATE <speed> - Selects the measuring speed to be used from S (2.5 readings/s), M (20 readings/s) and F (123 readings/s), with case-insensitive. Any other letter may generate an Execute error.

RATE? – Queries the current measuring speed.

Return Format:

The query returns S, M or F.

Measurement Commands

The commands query the measured results shown on the main or vice display, including:

- MEAS
- VAL

1. MEAS**Command Format:**

MEAS?

MEAS1?

MEAS2?

Function:

MEAS? - Queries the measured value of the multimeter. If both the two displays are opened, the query returns 2 values, or else only the value on main display is returned.

MEAS1? - Queries the measured value from main display.

MEAS2? - Queries the measured value from vice display. If the display is disabled, an Execute error may generate.

2. VAL**Command Format:**

VAL?

VAL1?

VAL2?

Function:

VAL? - Queries the measured value of the multimeter. If both the two displays are opened, the query returns 2 values, or else only the value on main display is returned; if one of the display is empty, the query returns the next trigger value.

VAL1? - Queries the measured value from main display; if the display is empty, the query returns the next trigger value.

VAL2? - Queries the measured value from vice display; if the display is empty, the query returns the next trigger value; if the display is disabled, an Execute error may generate.

Compare Commands

The subcommands compare if the value measured by the multimeter is higher than, lower than or just within the specified range, which mainly include:

- COMP
- COMPCLR
- COMPHI
- COMPLO
- HOLDCLR

1. COMP

Command Format:

COMP
COMP?

Function:

COMP – Enables the multimeter enter COMP mode, the Touch-Hold is enabled automatically (or you can use HOLDCLR command to disable it).

COMP? - Queries the last comparison.

Return Format:

The query returns the last comparison. If the last COMP reading is higher than the upper limit, the query returns HI; if it is less than the lower limit, returns LO; if the result is within the range specified, returns PASS; if the measurement has not been completed, returns “—”.

2. COMPCLR

Command Format:

COMPCLR

Function:

The command enables the multimeter exit the COMP mode and Touch Hold function If it is active and backs into its normal work.

3. COMPHI

Command Format:

COMPHI <high value>

Function:

The command sets the upper limit of the COMP mode.

Explanations:

<high value> could be a signed integer or a signed real number.

4. COMPLO

Command Format:

COMPLO <low value>

Function:

The command sets the lower limit of COMP mode.

Explanations:

<low value> could be a signed integer or a signed real number.

5. HOLDCLR

Command Format:

HOLDCLR

Function:

The command enables the multimeter exit the Touch Hold function and back to its normal work, but not exit COMP mode.

Trigger Commands

1. TRIGGER

Command Format:

TRIGGER <type>

TRIGGER?

Function:

The commands set and query the trigger type.

Explanations:

Parameter <type> could only be type 1 and the query returns 1 only as restricted by working principle.

Format Commands

1. FORMAT

Command Format:

FORMAT <frmt>

FORMAT?

Function:

The commands set and query the output format.

Explanations:

<frmt> could be 1 or 2. 1 denotes a measured value without unit, 2 permits the unit following the value. For the relationship of each function and unit, see table below:

Table 5-3 Units of format 2

Function	Unit
DC voltage	VDC
AC voltage	VAC
DC current	ADC
AC current	AAC
Resistance	OHMS
Frequency	Hz
Diode	VDC
Continuity	OHMS

Note: Being restricted by working principle, command **FORMAT <frmt>** and **FORMAT?** are only responded without practical operation.

Reading Commands

1. SERIAL?

Command Format:

SERIAL?

Function:

The command reads the serial number of the multimeter.

Chapter 6 Application Examples

This chapter gives some measurement examples based on commands, which will help you use the multimeter effectively. These applications assume that you are familiar with the basic operations of the multimeter.

The serial number before each command is used to number the current command, not the content of command. The contents between “/ *” and “* /” after each command are explanations for helping users understand.

Before using these examples, connect the related test equipment and the tested device correctly.

Example 1: Reading Statistic

Purpose: To implement the maximum statistic through commands.

When the maximum statistic is enabled, the first reading is regarded as the maximum shown, and then, this value is updating continuously along with readings measured until the maximum value is captured, please perform with following procedures step by step:

The programming implementations—— RIGOL Commands

```
0  *RST                      /* Reset the instrument*/
1  cmdset rigol              /* Select RIGOL commands */
2  *IDN? /* Query the equipment ID and confirm if the multimeter works
normally */
3  /*Return  Format:RIGOL  Technologies,  DM3058,  DM3A020080808,
99.00.00.00.00.00*/
4  :function:voltage:DC      /* Enable the DC voltage measurement */
5  :measure AUTO             /* Select Auto measurement */
6  :calculate:function max   /* Enable the maximum statistic */
7  :calculate:statistic:max? /* Query the current maximum of DC voltage */
8  /*Return Format:5.000064e-02*/
9  :calculate:statistic:count? /* Query the current times of Auto measurement*/
10 /*Return Format:252*/
11 :calculate:function none  /* Exit the math function */
```

Explanations:

1. The returned value in line 7 is the current maximum DC voltage.
2. The returned value in line 9 is the measured times that have been completed.

The programming implementations—Agilent Commands

```
0  cmdset agilent          /* Select Agilent commands */
1  *CLS                    /* Clear the instrument state */
2  *IDN?
   /* Query the equipment ID and confirm if the multimeter works normally */
3  /*Return Format:
   RIGOL Technologies,DM3058,DM3A020080808,99.00.00.00.00.00*/
4  conf:volt:dc auto/*Enable the DCV measurement and select auto range */
5  calc:stat on           /* Enable the math function */
6  calc:func aver        /* Select statistic function */
7  calc:aver:max?       /* Query the current maximum of DCV measurement */
8  /*Return Format:5.000104e-02*/
9  calc:aver:coun?      /* Query the current times of Auto measurement */
10 /*Return Format:63*/
11 calc:stat OFF        /* Exit the math function */
```

Explanations:

1. The default measurement rate changes into “Fast” after the command in line 4 was executed, as it is directly corresponding to the resolution, which means you can get a desired rate by setting the precision. For example, sending “conf:volt:dc:auto,max” to change the rate to “slow”.
2. The command in line 7 returns the current measured maximum of DC voltage.
3. The command in line 9 returns the measured times that have been completed.

Example 2: Eliminating the Impedance Errors on Test leads

Purpose: To eliminate the impedance errors on test leads.

Larger deviation may be brought in when you measure the smaller resistance, it is necessary to eliminate the errors induced by impedance of test leads, please perform with following procedures step by step:

The programming implementations—RIGOL Commands

```
0  *RST                      /* Reset the instrument */
1  cmdset rigol              /* Select RIGOL commands */
2  *IDN?                     /* Query the equipment ID and confirm if the
multimeter works normally */
3  /*Return: RIGOL Technologies,DM3058,DM3A020080808,99.00.00.00.00.00*/
4  :function:resistance      /* Enable the resistance measurement*/
5  :measure:resistance MIN   /* Set the range of 2-wire resistance
measurement to 200 Ω*/
6  /*Short connect the red and black test lead pen for resistance measurement
with each other*/
7  :calculate:function AVERAGE /* Set the average operation */
8  :calculate:statistic:average? /* Query the current resistance average*/
9  /* The return value is 3.302198e-01 */
10 :calculate:function REL    /* Set the REL function*/
11 :calculate:REL:state ON    /* Enable the REL function*/
12 :calculate:REL:offset?    /* Query the current REL offset*/
13 /*The return value is 0 */
14 :calculate:REL:offset 0.330219 /* Set the offset measured before as the REL
offset*/
15 :calculate:REL:state ON    /*Execute RELOperation with new offset */
16 :calculate:function AVERAGE /* Set the average function */
17 :calculate:statistic:average? /* Query the current average resistance */
18 /* The return value is 3.173456e-04*/
```

Explanations:

1. The operation in line 6 must be done before the next.
2. From the return value in line 18, it is seen that the value is decreased 3 orders of

magnitude comparing with the result in line 9 after the REL operation has been completed, so, test succeed.

The programming implementations—Agilent Commands

```
0  cmdset agilent          /* Select Agilent commands */
1  *CLS                   /* Clear the instrument state */
2  *IDN?                  /* Query the equipment ID and confirm if the
multimeter works normally */
3  /* Return RIGOL Technologies, DM3058, DM3A020080808, 99.00.00.00.00*/
4  conf:res min           /* Enable the resistance measurement. */
5  /* Short connect the red and black test lead pen with each other */
6  calc:stat on          /* Enable the math function */
7  calc:func aver        /* Set the average operation */
8  calc:aver:aver?       /* Query the current average resistance*/
9  /* Return 3.079573e-03*/
10 calc:func null         /* Set the null operation */
11 calc:null:offs?       /* Query the current null offset */
12 /*Return 0.000000e+00 */
13 calc:null:offs 0.000379573 /* Set the average calculated before as the null
offset */
14 calc:func null        /* Execute the null operation with new offset */
15 calc:func aver        /* Set the average operation */
16 calc:aver:aver?       /* Query the current average resistance */
17 /*The return value is 3.313395e-07 */
```

Explanations:

1. The operation in line 6 must be done before the next.
2. From the returned value in line 17, it is seen that the value is decreased 4 orders of magnitude comparing with the result in line 9 after the REL operation has been completed, so, test succeed.

Example 3: dBm Measurement

Purpose: Execute the dBm measurement through command.
dBm is frequently used in Audio signal measurement and analysis.

The programming implementations—RIGOL Commands

```
0  *RST                      /* Reset the instrument */
1  cmdset rigol             /* Select Agilent commands */
2  *IDN?                    /* Query the equipment ID and confirm if the
multimeter works normally */
3  /* Return RIGOL Technologies,DM3058,DM3A020080808,99.00.00.00.00.00*/
4  :function:resistance     /* Enable resistance measuring function */
5  :measure AUTO           /* Set the measuring range to "AUTO" */
6  :measure:resistance?    /* Query the measured resistance */
7  /* The return value is used as the reference resistance for dBm measurement
*/
8  :function:voltage:AC    /* Enable AC voltage measuring function */
9  :measure AUTO           /* Set the measuring range to "AUTO"*/
10 :calculate:function DBM /* Enable dBm measuring function */
11 :calculate:DBM:reference <value> /* Set the reference voltage */
12 :calculate:DBM?        /* Query the measured result /
13 /* Return value */
```

Explanations:

1. The operation in line 6 must be done before the next.
2. Before sending the command in line 6, the instrument should be connected under resistance measure mode.
3. Parameter in command line 11 is the returned value of line 7.

The programming implementations—Agilent Commands

```
0  *cls                      /* Clear the instrument state */
1  cmdset agilent           /* Select Agilent commands */
2  *IDN?                    /* Query the equipment ID and confirm if the
multimeter works normally */
3  meas:res? auto          /* Enable the resistance measurement, auto
range; and return the measured value */
4  /* The returned value is used as the reference resistance for dBm measurement
*/
5  conf:volt:ac auto       /* Enable AC voltage measuring function and use
auto range */
6  calc:stat on            /* Enable math operation function */
7  calc:func dbm          /* Set the dBm measurement */
8  calc:dbm:ref <value>   /* Set the reference voltage */
9  calc:dbm:ref?          /* Query the measured result */
10 /* return value */
```

Explanations:

1. The instrument should be connected under resistance mode before sending the command in line 3.
2. The command parameter in line 9 is the return value of line 3.

Example 4: dB Measurement

Purpose: Use commands to perform dB measurement.

dB is a common measurement unit, which is frequently used in electrician, wireless, mechanics, oscillatory surge, mechanical power, acoustics and some other fields.

The programming implementations —RIGOL Commands

```

0  *RST                      /* Reset the instrument */
1  cmdset rigol             /* Select RIGOL commands */
2  *IDN?                   /* Query the equipment ID and confirm if the
multimeter works normally */
3  /* Connect the test leads under AC voltage measurement */
4  :function:voltage:AC     /* Enable the AC voltage measurement */
5  :measure:voltage:AC <range> /* Set the measuring range */
6  :calculate:function DB   /* Enable dB measurement */
7  :calculate:DB:reference <value> /* Set the "dB setting" value */
8  :calculate:DB?          /* Query the measured value */
9  /* Return value */

```

The programming implementations—Agilent Commands

```

0  *CLS                      /* Clear the instrument state */
1  cmdset agilent          /* Select Agilent commands */
2  *IDN?                   /* Query the equipment ID and confirm if the
multimeter works normally */
3  /* Connect the test leads for AC voltage measuring */
4  conf:volt:ac <range>    /* Enable the AC voltage measurement and set the
range */
5  calc:stat on            /* Enable the math function */
6  calc:func db            /* Enable the dB measurement*/
7  calc:db:ref <value>    /* Set the "dB setting" value */
8  calc:db:ref?           /* Query the measured value */
9  /* Return value */

```

Explanations:

1. When finish the setting of "dB reference value" in line 7, the measured result of dB will be shown on the screen, but the result can not be returned since there is

not corresponding query command.

2. The return value of command in line 8 is "dB reference value", not the dB measured result.
3. Use RIGOL commands if both the dB measurement function and returned value are required.

Example 5: P/F Testing

Purpose: Use commands to perform a P/F test.

P/F operation prompts for the over range voltage signal according to upper/lower limits, and gives a beep (if the beeper is open).

The programming implementations——RIGOL Commands

```

0   *RST                               /* Reset the instrument */
1   cmdset rigol                       /* Select RIGOL commands */
2   *IDN?                               /* Query the equipment ID and confirm if the
multimeter works normally */
3   /* Connect the test leads for DC voltage measurement */
4   :function:voltage:DC               /* Enable the DC voltage measurement */
5   :measure:voltage:DC <range>       /* Set the measurement range */
6   :calculate:pf:lower <value1>       /* Set the lower limit to value1*/
7   :calculate:pf:upper <value2>      /* Set the upper limit to value2*/
8   :calculate:function pf             /* Enable the pf operation */
9   :calculate:pf?                     /* Query the measurement result */
10  /* Returned value */
11  :calculate:function none           /* Exit calculation function */

```

Explanations:

1. The instrument should be connected under DC voltage mode before sending the command in line 4.
2. Parameters in line 6 and 7 should be: $\text{value2} > \text{value1}$, and both are within the range.
3. The command in line 9 returns "PASS" if the input voltage is within the scope of the upper and lower limits, or returns "FAIL" and a beeper is emitted if it is on.

The programming implementations—Agilent Commands

```
0  *CLS                                /* Clear the instrument state */
1  cmdset agilent                      /**Select Agilent commands */
2  *IDN?                                /* Query the equipment ID and confirm if the
multimeter works normally */
3  /* Connect the test leads for DC voltage measurement */
4  conf:volt:dc <range>                /* Set the DC voltage measuring function and the
range */
5  calc:stat on                        /* Enable the math function */
6  calc:lim:low <value1>               /* Set the lower limit to value1*/
7  calc:lim:upp <value2>               /* Set the upper limit to value2*/
8  calc:func lim                        /* Enable the limit operation */
9  calc:stat OFF                       /* Exit math function */
```

Explanations:

1. The instrument should be connected under DC voltage mode before sending the command in line 4.
2. Parameters in line 6 and 7 should be: value2 > value1, and both are within the range.
3. Command in line 8 enables limit operation without return value, as no corresponding command is provided in this system. If the parameter input is not within the scope of the upper and lower limits, a beep tone will be emitted (when the beeper is on).
4. Use RIGOL commands if both the P/F measurement function and returned value are required.

Example 6: Reading Hold

“Reading Hold” function can get a stable reading and hold it on the screen even when test lead pens are removed.

The programming implementations—RIGOL Commands

```
0  *RST                      /* Reset the instrument */
1  cmdset rigol              /* Select RIGOL commands */
2  *IDN? /* Query the equipment ID and confirm if the multimeter works
normally */
3  /* Connect the test leads for DC voltage measurement */
4  :function:voltage:DC      /* Enable the DC voltage measurement */
5  :measure:voltage:DC <range> /* Set the measurement range */
6  :trigger:auto:hold on    /* Enable the reading hold function */
7  :trigger:auto:hold:sensitivity 1 /* Set the holding range to "0.1%"*/
```

Explanations:

Command in line 7 permits multiple threshold ranges, for details, refer to Chapter 3.

Example 7: Querying the Status Register

The status register provided enables user to diagnose the current error operation on the basis of its query function, searching the error reason. For the detailed commands, refer to Chapter 2. The commands system of status register is in common use in all RIGOL, Fluke and Agilent, take RIGOL commands for example.

The programming implementations——RIGOL Commands:

```
0  *RST                               /* Reset the instrument */
1  cmdset rigol                       /* Select RIGOL commands */
2  *cls                               /* Clear the instrument state */
3  status:questionable:enable 24375 /* Set the enable register of the questionable
status register */
4  status:operation:enable 1841      /* Set the enable register of the operation
status register */
5  *ESE 189                          /* Set the enable register of the event status register */
6  *SRE 188                          /* Set the enable register of the status byte register */
7  :status:questionable:enable?     /* Query the enable register of the
questionable status register */
8  Return 24375
9  :status:operation:enable?        /* Query the enable register of the operation
status register */
10 Return 1841
11 *ESE?                             /* Query the enable register of the event
status register */
12 Return 189
13 *SRE?                             /* Query the enable register of the status
byte register */
14 Return 188
15 :function:voltage:AC            /* Enable the AC voltage measurement */
16 *STB?                             /* Query the condition register of the status
byte register */
17 Return 192
18 :status:questionable:condition? /* Query the condition register of the
questionable status register */
19 Return 0
20 :status:operation:condition?     /* Query the condition register of the
```

```
operation status register */
21 Return 256
22 *ESR? /* Query the event register of the event status register */
23 Return 0
24 :status:questionable? /* Query the event register of the
questionable status register */
25 Return 0
26 :status:operation?/* Query the event register of the operation status register */
27 Return 256
28 *cls /* Clear the status */

29 :measure:voltage:dc? /* Enable DC voltage function and make measurements */
30 Return -1.180686E+00
31 *STB?
32 Return 0
33 :status:questionable:condition?
34 Return 0
35 :status:operation:condition?
36 Return 256
37 *ESR?
38 Return 0
39 :status:questionable?
40 Return 0
41 :status:operation?
42 Return 272 /* Change status and make measurements */
43 *cls /* Clear the status */
44 :trigger:single:triggered /*Execute the single trigger once*/
45 *STB?
46 Return 0
47 :status:questionable:condition?
48 Return 0
49 :status:operation:condition?
50 Return 256
51 *ESR?
52 Return 0
53 :status:questionable?
54 Return 0
55 :status:operation?
```

```
56 Return 288          /* change status, execute the single trigger once and  
enter "wait to trigger" status */
```

Explanations:

1. Commands in line 2, 28 and 43 clear the current status (the value of the event status register and the error queue) of the status register. By using it every time when you query the register status, the interferences by existing information may be suppressed
2. Commands in line 3~6 set the enable register of each register. As is shown in Figure 2-1, each register has a relationship with the status byte register.
3. Commands in line 16, 31 and 45 query the condition register of the status byte register. They are suggested to be executed before querying the status register, since every time the value of the register is changed, the condition register would be updated.
4. Command in line 27 returns 256, indicating the "event" was changed; line 42 returns 272, indicating the setting has been changed, the measurement "event" happend; line 56 returns 288, it indicates the setting has been changed, the instrument is waiting to trigger.
5. "*ESR", ":status:questionable?" and ":status:operation?" query the each event register, and the value of them would be cleared every time after the query .
6. The first colon ":" in ":status:operation?" command can be omitted for being compatible with RIGOL and Agilent commands.

Example 8: Querying the Error Information

The status register provided enables user to diagnose the current error operation on the basis of its query function, searching the error reason. For the detailed commands, refer to Chapter 2. As the commands system of status register is in common use in all RIGOL, Fluke and Agilent, take RIGOL commands for example.

The programming implementations——RIGOL Commands:

```

0  *RST                                /* Reset the instrument */
1  cmdset rigol                        /* Select Agilent commands */

2  *cls                                /* Clear the instrument state */
3  :measure?
4  :measure?                          /* Beeping */
5  SYST:ERR?
6  Return "query interrupted"
7  *esr?
8  Return 4

9  *cls
10 * *cls                              /*Beeping*/
11 SYST:ERR?
12 Return "syntax error"
13 *esr?
14 Return 32

15 *cls
16 cmdset                              /*Beeping*/
17 SYST:ERR?
18 Return "Parameter error"
19 *esr?
20 Return 16

21 *cls
22 SYST:ERR?                          /* Read data forcibly and emit beep once */
23 Return "Query Unterminated"
24 *esr?

```

```
25 Return 4

26 *cls
27 :function:diode
28 :calculate:statistic:min?          /*Beeping*/
29 SYST:ERR?
30 Return "setting unacceptable"
31 *esr?
32 Return 8
```

Explanations:

1. Commands in line 2, 9, 15, 21 and 26 clear the current status of the status register, the value of the event status register and the error queue. Execute “*cls” every time when you input new command for querying the register status, in order to suppress interference by information existed in register.
2. Commands in line 4, 10, 16, 22, 28 with beeping indicate the wrong operation.
3. SYST:ERR? is used to query the current error information.
4. *esr? is for query the error type, refer to Figure 2-1.
5. For line 4, the data returned covers the data in the last time and generate a “query interrupted” error. It is a query error.
6. For line 10, the character “*” attached before the command may cause a “syntax error” error. It is a command error.
7. For line 16, the parameters should only be {RIGOL|AGILENT|FLUKE}, so null parameter is invalid, a “Parameter error” is generated. It is an execution error.
8. For line 22, the command has no data returned. If read the data forcibly, a “Query Unterminated” error will generate. It is a query error.
9. The command in line 28 queries the calculated minimum value, it should not be used in continuity test and diode measurement. Therefore, this command is wrong and which may disable the instrument and generate a “setting unacceptable” error. It is a device error.

Appendix

Incompatible Agilent Commands

MEASure:VOLTage:DC:RATio {<range>|MIN|MAX|DEF},{<resolution>|MIN|MAX|DEF}
CONFigure:VOLTage:DC:RATio {<range>|MIN|MAX|DEF},{<resolution>|MIN|MAX|DEF}
[SENSe:]FUNction "VOLTage:DC:RATio"
CALibration?
CALibration:COUNT?
CALibration:SECure:CODE <new code>
CALibration:SECure:STATe {OFF|ON},<code>
CALibration:SECure:STATe?
CALibration:STRing <quoted string>
CALibration:STRing?
CALibration:VALue <value>

Incompatible Fluke Commands

AACDC*
VACDC*
DBPOWER
DIODE2
^C (CNTRL C)
LOCS
LWLS
REMS
RWLS