2438
Series Microwave Power Meter
Programming Manual

China Electronics Technology Instruments Co., Ltd

This manual is applicable to the following types of microwave power meters based on firmware version 1.0 and above.

- 2436 Series Microwave Power Meter
- 2348 Series Microwave Power Meter

Options:

- English options: English menu, English panel, etc.

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Foreword

Thank you for choosing the 2348 series microwave power meter developed and manufactured by China Electronics Technology Instruments Co., Ltd. (CETI). Our product is high-end, precise and sophisticated, and embraces a high cost performance among the competitors of the same class.

We are devoted to providing for you high-quality products and first-class after-sales service with your most concerns and demands in mind. Our consistent aim is providing excellent quality and good service, and this is our sincere commitment for all users.

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Manual Authorization

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Product Warranty

The warranty period of this product is 18 months from the date of delivery. Instrument manufacturer will repair or replace the damaged parts according to the user's requirements and actual situation in the warranty period. The specific maintenance matters should be subject to the contract.

Product Quality Certification

This product is certified to fulfill the standards indicated in this manual from the day of delivery. Calibration measurements have been carried out based on national standards. Related information is available to the user for reference.

Quality/Environmental Management

The quality and environmental management systems have always been implemented during development, manufacturing and test of this product. China Electronics Technology Instruments Co., Ltd. is properly qualified and certified by ISO 9001 and ISO 14001 management system standards.

Safety Precautions

CAUTION

CAUTION indicates an important information rather than danger. It reminds the user to be cautious of a certain operation process, operation method or the similar. Failure to follow the rules or operate correctly may cause the damage to the instrument or loss of important data. The conditions indicated by CAUTION should be fully understood and met before the next operation.

NOTE

NOTE indicates an information prompt. It reminds the user to pay attention to the instrument or a certain operation process, operation method or the similar, so as to guide the instrument operator to correctly use the instrument.

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Table of Contents

1 About This Manual

This chapter introduces the function, compositions and main content of the Programming Manual of the 2438 series microwave power meter as well as other related documents provided to the user.

1.1 About This Manual

This manual introduces the remote control and the SCPI operation method of the 2438 series microwave power meter, as well as the programming examples and the basic concept of the I/O function library to facilitate the user to quickly master the programming method. To facilitate your familiarity with the instrument, please read this manual carefully before operating the instrument, and then follow the instructions of manual.

SCPI (Standard Commands for Programmable Instruments) defines standards and methods for remote control of the instruments, and it is also the programming language for programmable instruments for electronic test and measurement. The SCPI is based on the specifications and types in IEEE-488.2. For details, please visit http://www.scpiconsortium.org.

This manual describes in detail the SCPIs of the 2438 series microwave power meter.

The chapters of the Programming Manual include:

- **Remote Control**

This chapter introduces the remote control methods of the instrument so that the user can rapidly master the method to control the instrument in a remote way. It is further divided into the following three sections: remote control basis, which introduces the concepts related to remote control, software configuration, remote interface, SCPI, etc.; instrument interface configuration method, which introduces the connection method and software configuration method of the remote interface of the 2438 series microwave power meter; the I/O function library, which introduces the basic concept of the instrument driver and the basic installation and configuration of the IVI-COM/IVI-C driver.

- **SCPI**

The common command, instrument command and compatibility command are introduced by category, and functions, parameters, and examples of the SCPI are described one by one.

- **Programming Examples**

The basic programming examples and advanced programming examples are given and described in the form of explanatory note and example code, so as to facilitate the user to quickly master the programming method of the microwave power meter.

- **Error Description**

This chapter includes error information description and repair methods.

- **Appendixes**

This chapter provides the necessary remote control reference information of the 2438 series microwave power meter, including the SCPI lookup table.

1.2 Related Documents

The documents associated with the 2438 series microwave power meter include:

- Quick Start Guide
- User Manual
- Programming Manual

Quick Start Guide

This manual introduces the settings of the instrument as well as the basic operating methods of

1.2 Related Documents

measurement with the aim of enabling users to quickly understand the features and operational procedures of the instrument. Main chapters included in this manual are as follows::

- Preparation before Use
- Typical Applications
- Getting Help

User Manual

This manual describes in detail the functions and operational protocols of the instrument, including set-up, measurement, program control, maintenance, etc. so as to provide users with an all-round understanding of the features of the instrument and aid users in learning the most common measurement procedures. Main chapters included in this manual are as follows::

- About This Manual
- Overview
- Start Guide
- Operation Guide
- Menu
- Remote Control
- Fault Diagnosis and Repair
- Specifications and Test Methods
- Appendixes

Programming Manual

This manual describes in detail the basics of remote programming, SCPI basics, SCPI, programming examples, I/O driver library, etc. for the purpose of guiding the user to master the SCPIs and methods of the instrument quickly and comprehensively. Main chapters included in this manual are as follows::

- Remote Control
- SCPI
- Programming Examples
- Error Description
- Appendixes

2 Remote Control

This chapter introduces the remote control basis as well as the remote interface and its configuration method of the 2438 series microwave power meter, and also briefly describes the concept and classification of the I/O driver library so that the user can have a preliminary knowledge about the remote control of this instrument. The specific content includes:

2.1 Remote control basis

2.1.1 Remote interface

The instrument with remote control functions generally supports two kinds of remote interfaces:LAN and GPIB. The type of port supported by the instrument will be determined by its own functions.

The description of the remote interface and associated VISA addressing string is as shown in the following table:

2.1 Remote control basis

Table2.1 Type of the Remote Interface and VISA Addressing String

Remote Interface	VISA Addressing String	Description
LAN (Local Area Network)	**VXI-11 protocol:** TCPIP::host_address[::LAN_device_name][::INSTR] **Raw socket protocol:** TCPIP::host_address::port::SOCKET	Controller realizes remote control by connecting the instrument via the network port on the rear panel of the instrument. For the specific protocol, please refer to: 2.1.1.1 LAN interface
GPIB (IEC/IEEE Bus Interface)	GPIB::primary address[::INSTR]	Controller realizes remote control by connecting the instrument via the port on the rear panel of the instrument. The IEC 625.1/IEEE 418 bus interface standard is observed. For details, please refer to: 2.1.1.2 GPIB interface
RS-232 (RecommendedStandard-232)		Instrument's rear panel port For details, please refer to: 2.1.1.3 RS-232 interface
USB (Universal Serial Bus)	USB::<vendor ID>::<product_ID>::<serial_number>[::INSTR]	Instrument's rear panel port For details, please refer to: 2.1.1.4 USB interface

2.1.1.1 LAN interface

The microwave power meter is available for remote control through the 10Base-T and 100Base-T LAN computers. The instruments can be combined into a system within the LAN, and uniformly controlled by the LAN computers. In order to realize the remote control within the LAN, the microwave power meter shall be preinstalled with the port connector, network card and relevant network protocol, and configured with relevant network service. And, the controller computer within the LAN shall also be preinstalled with the instrument control software and VISA library. The three working modes of the network card include:

- 10 Mbit/s Ethernet IEEE802.3;
- 100Mbit/s Ethernet IEEE802.3u;
- 1 Gbit/s Ethernet IEEE802.3ab.

The controller computer and the microwave power meter shall be connected with a common TCP/IP protocol network through the network port. The cable between the computer and the microwave power meter is a commercial RJ45 cable (shielded or unshielded CAT 5 twisted pair). During data transmission, data packet transmission will be adopted, and LAN transmission is faster. Generally, the cable between the computer and the microwave power meter shall not be longer than 100 m (100Base-T and 10Base-T). For more information about the LAN communication, please refer to: http://www.ieee.org.

The knowledge of LAN interface is introduced hereinafter.

1) IP address

When remote control of the microwave power meter is achieved through LAN, unblocked physical connection of the network should be guaranteed. It can be completed by setting the address to the subnetwork where the main control computer is located through the menu "Local IP" of the microwave power meter. For example, if the IP address of the main control computer is 192.168.12.0, the IP address of the microwave power meter shall be set to 192.168.12.XXX, and XXX is between 1 and 255.

Only the IP address is required to establish a network connection. The VISA addressing string is as follows:

TCPIP::host address[::LAN device name][::INSTR] or

TCPIP::host address::port::SOCKET

Where,

- TCPIP - network protocol used;
- host address - IP address or host name of the instrument, for identification and control of the controlled instrument;
- The LAN device name defines the handle number of the protocol and sub-device (optional);
- The VXI-11 protocol is adopted for the 0# device;
- The newer high speed LAN instrument protocol is adopted for the 0# high speed LAN instrument;
- The INSTR represents the instrument resource type (optional);
- The port represents the socket port number;
- SOCKET - raw socket resource class.

Example:

- The IP address of the instrument is 192.1.2.3, and the valid resource string of the VXI-11 protocol is:

TCPIP::192.1.2.3::INSTR

- When the raw socket connection is created, the following addressing string can be used:

TCPIP::192.1.2.3::5000::SOCKET

NOTE

Method for identification of multiple instruments in the remote control system

If multiple instruments are connected to the network, they can be identified by their individual IP address and associated resource string. The main control computer uses the respective VISA resource string for instrument identification.

2) VXI-11 protocol

The VXI-11 standard is based on the ONC RPC (Open Network Computing Remote Procedure Call) protocol, which is the network/transport layer of the TCP/IP protocol. The TCP/IP network protocol and relevant network service have been configured in advance. During communication, this connection-oriented communication can follow a sequential exchange and identify the interruption of the connection, thus ensuring no information loss.

3) Socket communication

The TCP/IP protocol connects the microwave power meter in the network through the LAN socket. As a basic computer network programming method, the socket enables applications with different hardware and operating systems to communicate in the network, which achieves two-way communication between the microwave power meter and the computer through the port.

The socket is a special software class that defines the necessary information for network communication such as IP address and device port number and integrates some basic network programming operations. Sockets can be used in the operating system installed with a packaged library. UNIX Berkeley socket and Winsock are commonly used.

Berkeley socket and Winsock are compatible in the microwave power meter through the application program interface (API). In addition, other standard sockets are also compatible through the API. When the microwave power timing is controlled by the SCPI, the socket program will give a command. Before

using the LAN socket, the socket port number of the microwave power meter shall be set in advance. The socket port number of the microwave power meter is 5000.

2.1.1.2 GPIB interface

The GPIB interface is a widely-used instrument remote interface currently, which can be connected with different kinds of instruments through the GPIB cable and can establish the test system with the main control computer. To realize remote control, the main control computer shall be preinstalled with the GPIB bus card, driver and VISA library. During communication, the main control computer will address the controlled instrument through the GPIB bus address firstly. The user can set the GPIB address and ID for querying strings, and the GPIB communication language can be set to the SCPI form by default.

The operation of the GPIB and its relevant interface is defined and described in details in the ANSI/IEEE standard 488.1-2003 and the ANSI/IEEE standard 488.2-1992. For details of the standard, please refer to the IEEE website: http://www.ieee.org.

As the GPIB processes information in bytes and the data transmission rate can reach 8 MBps, the GPIB data transmission is faster. As the data transmission speed is restricted by the distance between the device/system and the computer, attention shall be paid to the followings during the GPIB connection:

- Up to 15 instruments may be set up through the GPIB interface;
- The total length of the transmission cable shall not exceed 15 m, or shall not exceed twice of number of instruments in the system. Generally, the maximum length of the transmission cable between the device shall not exceed 2 m;
- If several instruments are connected in parallel, the “Or” connecting line shall be used;
- The terminal of the IEC bus cable shall be connected with the instrument or the controller computer.

2.1.1.3 RS-232 interface

The RS-232 is a traditional remote control method. As only one bit of data is sent and received at a time, the transmission rate is slower than that of the GPIB or the LAN, which is rarely used currently. Similar to the GPIB and the LAN, the instrument parameters, such as baud rate, shall be set when establishing communication, so as to match the parameters of the main control computer. The RS-232 transmits the SCPI character in the form of the ASCII code.

2.1.1.4 USB interface

To achieve remote control through the USB interface, the computer and the microwave power meter should be connected via a USB B-type interface, and the VISA library should be installed in advance. VISA automatically tests and configures the instrument to establish a USB connection, without the necessity of entry of the instrument address string or installation of an individual driver.

USB address:

Addressing string format: USB::<vendor ID>::<product ID>::<serial number>[::INSTR]

Where,

- <vendor ID> ID of vendor;
- <product ID> ID of instrument;
- <serial number> Serial number of instrument.

Example:

USB::0x0AAD::0x00C6::100001::INSTR

0x0AAD: ID of vendor;

0xC6: ID of instrument;

100001: Serial number of instrument.

2.1.2 Message

Messages transmitted by data cable fall into the following two categories:

1) Interface message

During communication between the instrument and the main control computer, it is necessary to pull down the attention line and then the interface message can be transmitted to the instrument through the data line. Only the instrument with the GPIB bus functions can send the interface message.

2) Device message

For the structure and syntax of device massage, refer to Section "2.1.3 SCPI". Device massage can be divided into command and instrument response according to the different transmission directions. All remote control interfaces use device massage in the same method unless otherwise status.

a) Commands:

A command (program message) is a message transmitted from the main control computer to the instrument for remote control of instrument functions and query of status information. It falls into the following two categories:

➢ Based on the impact on the instrument:

- Setting command: Change the instrument setting status, e.g. reset the instrument or set the frequency.

- Query command: Query and return the data, e.g. identify the instrument or query the parameter values. The query command is always ended with a question mark.

➢ Based on the definition in the standard:

- Common commands: Functions and syntax defined by IEEE488.2 for all types of instruments (if implemented)

Used to implement: manage standard status registers, resets and self-tests.

- Instrument control command: Instrument-specific command, for realization of instrument functions. For example: set the frequency.

The syntax also follows SCPI specification.

b) Instrument response:

The instrument response (response message and service request) is the query result information sent by the instrument to the computer. This information includes measurement result and instrument status.

2.1.3 SCPI

2.1.3.1 Brief introduction to SCPI

SCPI (Standard Commands for Programmable Instruments) is a set of commands established for all instruments based on IEEE488.2 mainly to achieve the universality of SCPI, i.e. the same SCPI is generated and issued for the same function.

The SCPI consists of a command header and one or more parameters which are separated by a space. The command header contains one or more key fields. The command with question mark as postfix is a query command. Commands are divided into common commands and instrument-specific commands that are different in syntactic structure. SCPI has the following features:

1) The SCPI is established for the test functions rather than instrument operation description.

2) The SCPI reduces the repetition of the realization process of similar test functions, thus ensuring the programming compatibility;

3) The program message is defined in a sub-layer irrelated with hardware of the communication physical layer;

2.1 Remote control basis

4) The SCPI is irrelated with the programming methods and languages, and the SCPI test program is easy to be transplanted;

5) The SCPI has scalability, and can adapt to control of different scales of measurement;

6) Scalability makes SCPI a “Live” standard.

If you are interested in learning more about SCPI, please refer to:

IEEE Standard 488.1-2003, IEEE Standard Digital Interface for Programmable Instrumentation. New York, NY, 1998.

IEEE Standard 488.2-1992, IEEE Standard Codes, Formats, Protocols and Comment Commands for Use with ANSI/IEEE Std488.1-2003. New York, NY, 1998

Standard Commands for Programmable Instruments(SCPI) VERSION 1999.0.

For details about the SCPI set, classification and description of the 2438 series microwave power meter , please refer to:

1) “3 SCPI” of this manual;

2) “Appendix A Lookup Table of the SCPI by Subsystem” of this manual.

2.1.3.2 SCPI description

1) General terms

For the purpose of this section, the following terms should apply. It is necessary to know about the exact definitions of these terms for a better understanding of the content in various chapters.

Controller

The controller is any computer used to communicate with the SCPI device. The controller may be a personal computer, a small computer or a card inserted onto a cage. Some artificial intelligence device can also be used as a controller.

Device

The device is any component that supports SCPI. Most devices are electronic measuring or excitation device and use the GPIB interface for communication.

Program message

The program message is a combination of one or more correctly formatted SCPIs. It guides the device to measure and output the signal.

Response message

The response message is a data set that specifies the SCPI format. It is always sent from the device to the controller or listener to remind the controller of the internal condition or measured value of the device.

Command

A command is an instruction in compliance with the SCPI standard. The combination of controller commands forms a message. In general, a command includes the keyword, parameter and punctuation.

Event command

An event-type SCPI can't be queried. An event command generally has no corresponding key settings on front panel. Its function is to trigger an event at a particular moment.

Query

Query is a special command. When the controller is queried, it is necessary to return to the response message in conformity with syntax requirement of the controller. The query statusment is always ended with a question mark.

2) Command type

There are two types of SCPIs: common commands and instrument-specific commands. Figure 2.1 shows the difference between two commands. Common commands are defined in IEEE 488.2 to manage macros, status registers, synchronization, and data storage. As the common command begins with a *, it can be easily distinguished. For example *IDN? , *OPC and *RST are common commands. Common commands don’t belong to any instrument-specific command. The instrument uses the same method to interpret them without consideration to the current path setting.

It is very easy to identify instrument-specific commands because they contain a colon (:). The colon is used between the beginning of a command expression and a keyword, for example: FREQuency[:CW?]. Instrument-specific commands are divided into command subsets of corresponding subsystem according to the functional block inside the instrument. For example, the power subsystem (:POWer) contains the power-related command while the status subsystem (:Status) contains the command for the status control register.

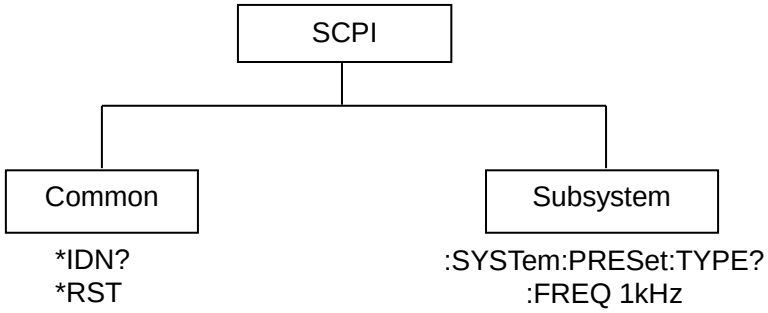

Fig.2.1 SCPI type

3) Instrument-specific command syntax

A typical command consists of keywords with colon as prefix.. These keywords are followed by parameters. An example of syntax statusment is shown below.

[:SENSe]:FREQuency[:CW|FIXed] MAXimum|MINimum

In the above example, the [:CW|FIXed] part of the command is closely followed by :FREQuency, and there is no space in the middle. The part closely following the [:LEVel]: The MINimum|MAXimum is the parameter part. There is a space between the command and the parameter. The description of other parts of the syntax expression is as shown in Table 2.2 and Table 2.3.

2.1 Remote control basis

Table2.2 Special Characters in the Command Syntax

Symbol	Meaning	Example
|	The vertical line between the keyword and the parameter represents a variety of options.	[:SENSe]:BANDwidth|BWIDth HIGH|LOWer BANDwidth and BWIDth are options, and HIGH and LOWer are options.
[]	Square brackets indicate that the included keywords or parameters are optional when they form a command. These implied keywords or parameters are executed even when they are ignored.	[:SENSe]:BANDwidth? SENSe is optional.
< >	The part inside the angle brackets can't be used literally in the command, instead, it represents the part that must be contained.	[:SENSe]:FREQency[:CW|FIXed] <val>[unit] In this command, <val> must be replaced by the actual frequency. [unit] means a unit that can be omitted. For example: FREQ 3.5GHz FREQ 3.5e+009
{ }	The part inside the braces indicates that the parameter is optional.	MEMory:TABLe:FREQuency <val>{,<val>} For example: MEM:TABL:FREQ 5e7

Table2.3 Command Syntax

Character, Keyword and Syntax	Example
Capitalized characters represent the minimum character set required to execute the command.	[:SENSe]:FREQuency[:CW|FIXed]?, FREQ is the short-format part of the command.
The lowercase character part of the command is optional; this flexible format is called “Flexible Listening”. For more information, please refer to the section “Command parameter and response”.	:FREQuency :FREQ, :FREQuency or :FREQUENCY, any of which is correct.
A colon between two command mnemonics moves the current path in the command tree downwards by one layer. For more information, please refer to the command path part in the section “Command tree”.	:TRIGger:MODE? TRIGger is the topmost keyword of this command.
If the command contains multiple parameters, the adjacent parameters will be separated by commas. The parameter isn't a part of the command path, so it doesn't affect the path layer.	MEMory:TABLe:FREQuency <val>{,<val>}
The semicolon separates two adjacent commands but doesn't affect the current command path.	:FREQ 2.5GHZ;:POW 10DBM
Blank characters such as <space> or <tab> are usually ignored as long as they don't appear between the keywords or in the keyword. However, the command and parameter must be separated by a blank character, without affecting the current path.	:FREQ uency or :POWer :LEVel6.2 is not allowed. :LEVel and 6.2 must be separated by a space.

	i.e. :POWer:LEVel 6.2

The simplified syntax specification is as shown in Figure 2.2:

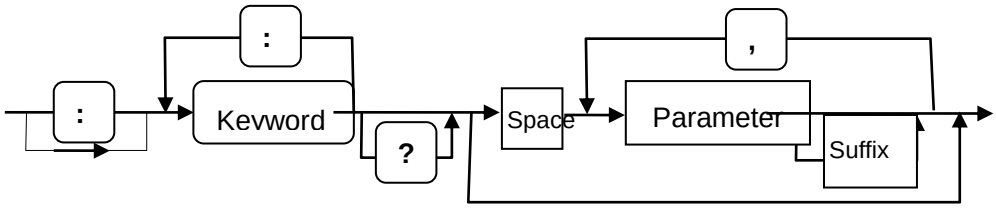

Fig.2.2 SCPI type

For example, the syntax expression of "[:SENSe[1]|2]:FREQuency[:CW|FIXed] <Numeric Data>" can be expressed as follows.

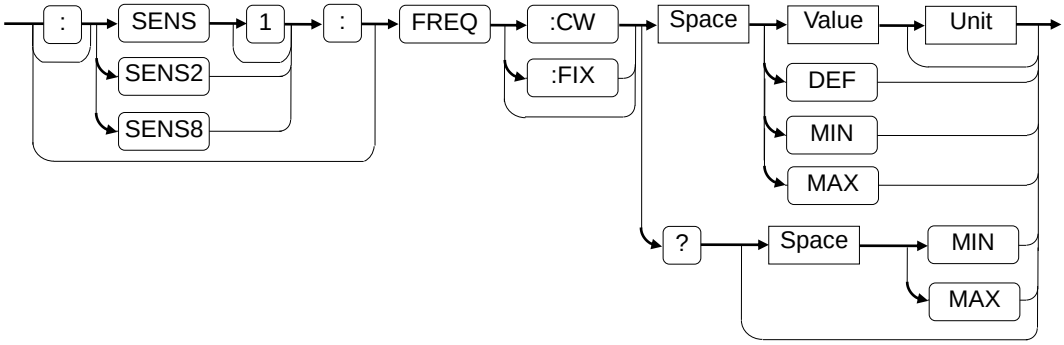

Fig.2.3 SCPI type

Remarks:

1) The space can't be added in the above Figure unless otherwise indicated. There can be one or more spaces. If the unit is omitted, the standard unit of frequency and time is Hz and s respectively.

2) The rounded rectangle represents the actual characters required for a keyword or a command, such as ":", ",", "?", "1"; the right-angle rectangle represents that it shall be replaced with actual characters, numbers, etc. If the "Value" can't appear in the command, it shall be replaced with the actual value, such as 5e+007.

3) Regardless of the length format of the keyword, set the frequency of channel A to 50 MHz. The following several forms are displayed in the above Figure (only the short format of the keyword is taken. As there are a number of units of frequency, such as Hz, kHz, MHz, GHz, THz, they will not be given in details due to length limitations. It is only necessary to replace 5.0e+007 with corresponding units, such as 50 MHz, 5e+007 Hz, 0.05 GHz).

a) :SENS1:FREQ:CW 5.0e+007 — No keyword will be omitted

b) SENS1:FREQ:CW 5.0e+007 — The ":" in front of the SENS1 will be omitted.

c) SENS:FREQ:CW 5.0e+007 — The "1" will be omitted.

d) FREQ:CW 5.0e+007 — The SENS will be omitted.

e) :SENS1:FREQ:FIX 5.0e+007 — No keyword will be omitted

f) SENS1:FREQ:FIX 5.0e+007 — The ":" in front of the SENS1 will be omitted.

g) SENS:FREQ:FIX 5.0e+007 — The "1" will be omitted.

h) FREQ:FIX 5.0e+007 — The SENS will be omitted.

i) :SENS1:FREQ 5.0e+007 — The CW or the FIX will be omitted

j) SENS1:FREQ 5.0e+007 — The ":" and CW or FIX in front of the SENS1 will be omitted.

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k) SENS:FREQ 5.0e+007 The “1” and CW or FIX will be omitted.

l) FREQ 5.0e+007 The SENS and CW or FIX will be omitted.

4) For the frequency of channel B and channel 8, the SENS2 and the SENS8 can’t be omitted.

5) The MIN and the MAX can be used as parameters to set the command or to query the command. The DEF can only be used as a parameter to set the command. The specific values of the MIN, MAX and DEF are related to the instrument. In this case, the frequency range of channel A and channel B is the same. The minimum, maximum and default frequencies are 1 kHz, 1 THz and 1 GHz respectively, and the value of the USB channel is 1 kHz, 1 THz and 50 MHz accordingly.

a) FREQ DEF Set the frequency of channel A to the default value.

b) FREQ? MAX Query the maximum settable frequency of channel A, and a value without units is returned.

6) If consideration is given to the length form of the keyword but no consideration is given to the command with units, the command in the above Figure will have 1,632 forms totally. The user is unnecessary to care about all the forms, flexible use is enough. The following is a simple calculation, and the interested users can make calculation on themselves.

a) Firstly, calculate the default condition of the SENS, and record it as N1.
The FREQ/FREQuency has 2 forms, which is recorded as N11.
The CW/FIX/FIXed/omission has 4 forms, which is recorded as N12.
The parameters to set the command have 7 types, including value/DEF/DEFault/MIN/MINimum/MAX/MAXimum.
The parameters to query the command have 5 types, including MIN/MINimum/MAX/MAXimum/omission, namely, there are 12 parameter forms, which is recorded as N13, and $N1 = N11 \times N12 \times N13 = 2 \times 4 \times 12 = 96$

b) After that, calculate the non-default condition of the SENS, and record it as N2.
The first “:” has omission and no-omission types, which is recorded as N21.
The SENS/SENSe has 2 types. The affix has 4 types including 1/2/6/omission, namely, the SENS keyword has 2×4 types, 8 types totally, which is recorded as N22.
The SENS keyword and the following keyword form a combination relationship, $N2 = N21 \times N22 = 2 \times 8 \times N1 = 16 \times N1$

c) Including N types of forms totally, and $N = N1 + N2 = 17 \times N1 = 1632$

4) Command tree

Most remote control programming tasks involve instrument-specific commands. When such a command is parsed, the SCPI will use a structure similar to the file structure, and it is called as a command tree, as shown in Figure 2.4:

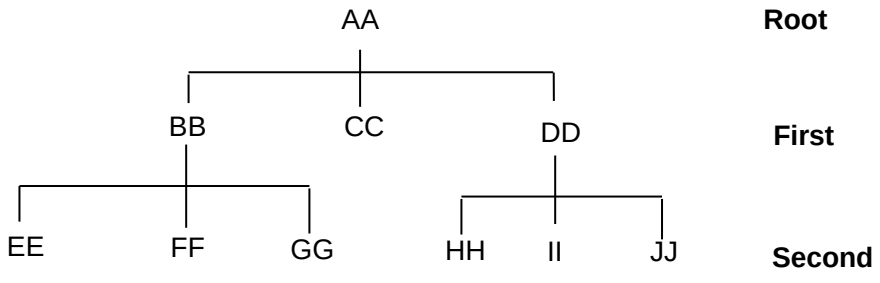


Fig.2.4 Schematic Diagram of the Simplified Command Tree

The top command is root command, or simply “root”. In the case of command parsing, the command at the next layer is reached by following a specific route based on the tree structure. For example::POWer:ALC:SOURce?, where, POWer stands for AA,: ALC stands for BB, :SOURce stands for GG, and the whole command path is (:AA:BB:GG).

A software module in the instrument software——**command interpreter** is used for parsing each received SCPI. The command interpreter breaks up the command into individual command element using a series of rules for identifying the command tree path. After the current command is parsed, the current command path remains unchanged. In this way, the subsequent commands can be parsed more quickly and efficiently because the same command keyword may appear in different paths. After the power-on*RST (reset) operation of the instrument, the current command path is reset as the root.

5) Command parameter and response

The SCPI defines different data formats in the use of the remote control and response messages to conform to the principles of "**flexible listening**" and "**accurate speaking**". For more information, please refer to IEEE 488.2. **"Flexible listening"** means that the formats of commands and parameters are flexible.

For example, the microwave power meter sets the frequency offset status command :FREQuency:OFFSet:Status ON|OFF|1|0.

The following command formats are used to set the frequency offset function on:

:FREQuency:OFFSet:Status ON，:FREQuency:OFFSet:Status 1，

:FREQ:OFFS:STAT ON，:FREQ:OFFS:STAT 1.

Each parameter type corresponding to one or more response data types. During query, a numeric data will return a data type, and the response data is accurate. Strictly speaking, it is called as "**accurate speaking**".

For example, if you query the power status (:POWer:ALC:Status?), when it is turned on, the response is always 1, regardless of whether you previously sent :POWer:ALC:Status 1 or :POWer:ALC:Status ON.

Table2.4 SCPI parameters and response type

Parameter Type	Response Data Type
Numeric	Real or Integer
Extended Numeric	Integer
Discrete	Discrete
Boolean	Numeric Boolean
String	String
Block	Definite Length Block
	Indefinite Length Block
Non-decimal numeric	Hexadecimal
	Octal
	Binary

Numeric parameter

Numeric parameters can be used in both instrument-specific commands and common commands. It receives all common decimal systems including signs, decimal point and scientific notation. If a certain piece of device only receives a specified type of numeric parameter such as an integer, it will automatically round off the received numeric parameter.

Examples of numeric parameter:

0	No decimal point
100	Optional decimal point
1.23	With a sign bit
4.56e<space>3	space allowed after exponent marker e

-7.89E-01	exponent marker e may be upper or lower case
+256	leading + allowed
.5	The decimal point can be prefixed

Extended numeric parameter

Most measurements related to Instrument-specific commands use extended numeric parameters to specify the physical quantities. Extended numeric parameters receive all numeric parameters and additional special values. All extended numeric parameters receive MAXimum and MINimum as parameter values。 Other special values, such as UP and DOWN are received by the instrument parsing capability. SCPI table will list all valid parameters.

Note: extended numeric parameters are not applicable to common commands or Status subsystem commands.

Examples of extended numeric parameters:

101	Numeric parameter
1.2 GHz	The GHz can be used as an exponent (E009)
200 MHz	The MHz can be used as an exponent (E006)
-100 mV	-100 millivolts
10DEG	10 degrees
MAXimum	Maximum valid setting
MINimum	Minimum valid setting
UP	Increase a step
DOWN	Decrease a step

Discrete parameter

When there are a finite number of parameter values to be set, discrete parameters are used for identification. A discrete parameter uses mnemonics to represent each valid setting. Same as the SCPI mnemonic, the discrete parameter mnemonic has long and short formats, and can be applied with mixed uppercase and lowercase letters.

The following example illustrates the combined use of discrete parameter and command.

:TRIGger[:SEQuence]:SOURce BUS|IMMediate|EXTernal

BUS	GPIB,LAN,RS-232 trigger
IMMediate	Immediate trigger
EXTernal	External trigger

Boolean parameter

Boolean parameters represent a single binary condition that is either true or false. There are only four possible representations for a Boolean parameter.

Samples of Boolean parameters:

ON	True
OFF	False
1	True
0	False

String parameter

A string parameter allows the ASCII string to be sent as a parameter. Single and double quotes are used as separators.

Examples of string parameter:

‘This is Valid’ “This is also Valid” ‘SO IS THIS’

Real response data

A large portion of measurement data are real. They are formatted as basic decimal notation or scientific notation. Most high-level remote control languages all support these two formats.

Examples of real response data:

1.23E+0

-1.0E+2

+1.0E+2

0.5E+0

0.23

-100.0

+100.0

0.5

Integer response data

The integer response data are a decimal expression of an integer with the sign bit. When the status register is queried, the integer response data will be mostly returned.

Examples of integer response data:

0	Optional sign bit
+100	Leading + allowed
-100	Leading - allowed
256	No decimal point

Discrete response data

The discrete response data and discrete parameters are basically the same. The main difference is that the discrete response data can only be returned in the short format with capitalized characters.

Examples of discrete response data:

INTernal	Internal amplitude stabilization
EXTernal	External amplitude stabilization
MMHead	Amplitude stabilization through MMW source module

Numeric Boolean response data

The Boolean response data returns a binary value of 1 or 0.

String response data

The string response data and string parameters are the same. The main difference is that the string response data use double quotes rather than single quotes as the separator. The string response data can also be inserted with double quotes inside which there can be no characters.

Examples of string response data:

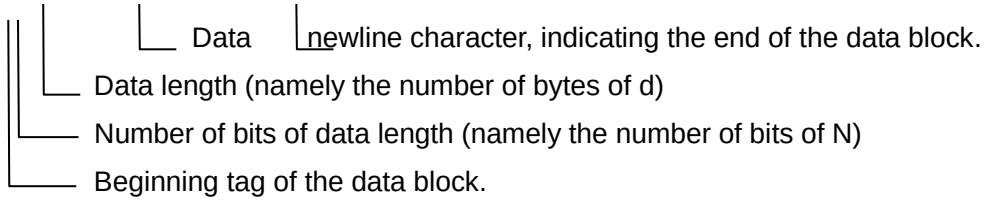
“This is a string”

“one double quote inside brackets: (“”)”

Arbitrary Block Data

<Arbitrary Block Data> See section 7.7.6 of the IEEE 488.2.

#nNNN...Nddd……ddd<LF>



For example: #42004…..<LF>, n = 4, N = 2,004.

6) Systems of Values in Commands

The value of the command can be entered in binary, decimal, hexadecimal or octal format. In the binary, hexadecimal, or octal format, a suitable identifier should be added in front of the value. In the decimal (default) format, an identifier isn't required. When the value without an indicator is entered, the device will ensure that it is entered in decimal format. The identifiers required in all formats are listed as follows:

- #B indicates a binary value;
- #H indicates a hexadecimal value;
- #Q indicates an octal number.

The representations of the decimal value 45 in the SCPI are given as follows:

#B101101

#H2D

#Q55

The following example shows setting of the RF output power as 10 dBm (or the value equivalent to the current selected unit including DBUV or DBUVEMF) with the hexadecimal value 000A.

:POW #H000A

In a non-decimal format, the measurement unit such as DBM or mV isn’t used together with the value.

7) Command line structure

A command line may contain multiple SCPIs. To indicate the end of the current command line, the following methods can be used:

- Newline;
- Newline and EOI;
- EOI and the last data byte.

Commands in command line are separated by semicolons, and commands for different subsystems begin with a colon. For example:

MMEM:COPY "Test1", "MeasurementXY";:HCOP:ITEM ALL

The command line contains two commands of which the first one belongs to the MMEM subsystem and the second one belongs to the HCOP subsystem. If the adjacent commands belong to the same subsystem, the command path will be partially repeated and the command can be abbreviated. For example: For example:

HCOP:ITEM ALL;:HCOP:IMM

The command line contains two commands both of which belong to the HCOP subsystem of first level. Therefore, the second command can begin with the subordinate to HCOP and may not begin with a colon, which can be abbreviated to the following command line:

HCOP:ITEM ALL;:HCOP:IMM

2.1.4 Command sequence and synchronization

IEEE488.2 defines the difference between overlapped commands and sequential commands:

- Sequential commands are sequences of commands that are executed continuously. Generally, the execution of each command is faster;
- Overlapped commands indicate that the previous command is not executed automatically before the next command is executed. Normally overlapped commands take longer to process and allows the program to process other events synchronously.

Even if multiple commands are set in a command line, they are not necessarily executed in the order in which they are received. In order to ensure that the commands are executed in a certain order, each command must be sent as a separate command line.

Example: Command line contains set and query commands

If multiple commands in a command line contain query commands, the query result is unpredictable. The following command returns a fixed value:

:FREQ:STAR 1GHZ;SPAN 100;:FREQ:STAR?

Returned value: 1000000000 (1GHz)

The following command returns an unfixed value:

:FREQ:STAR 1GHz;STAR?;SPAN 1000000

The returned result may be the current frequency start value, because the host program will delay execution of the command. If the host program executes the command after receiving it, the returned value may also be 1 GHz.

NOTE

Setting command and query command are sent separately

General rule: In order to ensure the correctness of the returned result from the query command, the setting command and the query command shall be sent in different program control messages.

2.1.4.1 Preventing overlapping execution of the command

In order to prevent the overlapped execution of commands, multiple threads or commands: *OPC, *OPC? or *WAI can be used. These three commands can be executed only after the hardware is set. While programming, the computer can be forced to wait for some time to synchronize certain events. The details are separately described below:

- **Controller program uses multiple threads**

Multi threads are used to wait for completion of the command and achieve synchronization of GUI and program control, that is, a single thread waits for completion of *OPC?, without impeding the execution of the GUI or remote control thread.

- **The methods for use of three commands during synchronous execution are given in the table below:**

Table2.5 Command Syntax

Method	Actions to be Executed	Programming Method
*OPC	Set the operation completion bit is set.	Set ESE BIT 0; Set SRE BIT 5; Send the overlapped command and *OPC; Wait for service request (SRQ) SRQ represents the completion of execution of the overlapped command
*OPC?	Stop executing the current	Terminate the processing of the current command

	command until the value 1 is returned. The command is returned only when the operation completion bit in the ESR is set, which indicates that the previous command is processed.	before executing other commands. Send this command directly after the current command.
*WAI	Before executing *WAI, wait until all commands are sent and continue processing the uncompleted commands.	Terminate the processing of the current command before executing other commands. Send this command directly after the current command.

If the processing time of the overlapped command is short, the command *WAI or *OPC can be used after use of the overlap command to achieve command synchronization. In order to synchronously execute other tasks when the computer or instrument is waiting for the completion of execution of overlapped commands, the following synchronization technologies can be adopted:

- **OPC and service request**

1) Set the ESE OPC mask bit (bit 0): *ESE 1;
2) Set the SRE bit 5: *SRE 32 and enable ESB service request;
3) Send the overlapped command and *OPC;
4) Wait for the service request signal.

SRQ represents the completion of execution of the overlapped command

- **OPC? and service request**

1) Set the SRE bit 4: *SRE 16 enables the MAV service request;
2) Send overlapped commands and *OPC? ;
3) Wait for the service request signal.

SRQ represents the completion of execution of the overlapped command

- **Event Status register (ESE)**

1) Set the ESE OPC mask bit (bit 0): *ESE 1;
2) Send the overlapped command only and do not send *OPC, *OPC or *WAI;
3) Send “*OPC;*ESR?” in the timer for cyclic query of completion status of operation.

If the return value (LSB) is equal to 1, this indicates that the overlap command has been executed.

- ***OPC? and short timeout**

1) Send the overlapped command only and do not send *OPC, *OPC or *WAI;
2) Send “<short timeout>; *OPC?” in the timer for cyclic query of completion status of operation;
3) If the return value (LSB) is equal to 1, this indicates that the overlap command has been executed. During timeout, during operation;
4) Reset the timeout value to the old value;
5) Send the command “SYSTem:ERRor?” clear the error queue, and delete the “-410 Query Interruption” information.

If the return value (LSB) is equal to 1, this indicates that the overlap command has been executed.

2.1.5 Status reporting system

The status reporting system will save all operation status information of the current instrument, including error information. Such information is stored in the status register and error queue respectively and can

be queried through the remote interface.

2.1.5.1 Structure of the status register

The register classification is described as follows:

1) STB, SRE

Status Byte (STB) register and its associated mask register, Service Request Enable (SRE) register, constitute the top-level register of the status reporting system. The STB saves the general working status of the instrument by collecting low-level register information.

2) ESR, SCPI status register

STB receives the information of the following registers:

- The value of Event Status register (ESR) and Event Status Enable (ESE) mask register.
- SCPI status registers include: Status:OPERation and Status:QUEStionable registers (SCPI definition) which contain the specific operating information of the instrument. All SCPI status registers have the same internal structure (please refer to Section 2.1.5.2 " Structure of SCPI status register" in the Programming Manual).

3) IST, PPE

Similar to the SRQ, an individual bit of the IST mark ("Individual Status") is a combination of all statuses of the instrument. The associated parallel query enable register (PPE) determines which data bits of the STB act on the IST mark.

4) Output buffer

The output buffer stores the message returned by the instrument to the controller. It doesn't belong to the status reporting system but determines the value of the MAV bit of STB.

For details of above register descriptions, please refer to "2.1.6 Status reporting system".

NOTE

SRE, ESE

The SRE can be used as an enable part of the STB. Similarly, the ESE can be used as an enable part of the ESR.

2.1.5.2 Structure of SCPI Status register

Each standard SCPI register consists of 5 parts. Each part contains 16 data bits and is functionally independent. For example, each hardware status will be assigned with a data bit, and it is valid for all 5 parts of the register. If the Bit 15 is set to 0, it means that the value of the register is a positive integer.

2.1 Remote control basis

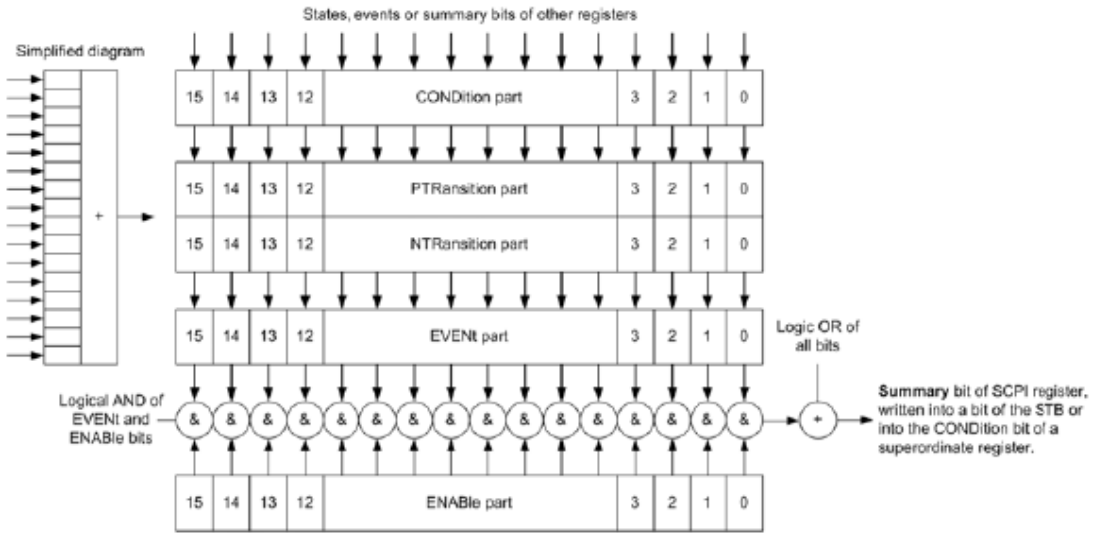


Fig.2.5 Structure of the status register

The above Figure shows that the status register is composed of 5 parts, which are described as follows:

- **Condition register**

This part will be directly written by hardware or low-level register digit, which will reflect the current working status of the instrument. This register is read-only and cannot be written. Reading will not clear any value.

- **Positive and negative transition register**

The two transition registers define the status transition bit of the condition register saved in the event register.

The positive transition register is similar to a transition filter. When a data bit of the condition register changes to 1 from 0, relevant PTR bit will determine whether the event bit is set to 1. The description is as follows:

—PTR bit=1: The event bit will be set.

—PTR bit=0: No event bit will be set.

This positive transition register is read-write, and no value will be cleared after reading.

The negative transition register is similar to a transition filter. When a data bit of the condition register changes to 0 from 1, relevant NTR bit will determine whether the event bit is set to 1. The description is as follows:

—NTR bit=1: The event bit will be set.

—NTR bit=0: No event bit will be set.

This positive transition register is read-write, and no value will be cleared after reading.

- **Event register**

This part indicates whether the event occurs after the last reading, and whether the content of the condition register is saved. It only represents the event transmitted by the transition register, which can only be changed by the instrument and read by the user. The value will be cleared after reading. The value of this part is equal to the value of whole register generally.

- **Enable register**

This part determines whether the associated event bit acts on the final data summary. The data bit of each enable part has a And relation with the associated enable bit. The logical operation result of this part has a OR relation with the data summary bit.

-Enable bit = 0: The associated event bit does not act on the data summary.

—Enable bit=1: The associated event bit acts on the data summary.

This part is read-write, and no value will be cleared after reading.

➢ **Data bit summary**

The data summary bit of each register consists of event and enable parts. The result gets into the condition part of the high level register. The instrument automatically generates data summary bit for each register so that events can cause different levels of service requests.

2.1.5.3 Status register Description

The status registers will be introduced in details as follows.

1) Status byte (STB) and service request enable register (SRE)

The IEEE488.2 defines the status byte (STB) that reflects the rough instrument status by collecting information from the low level registers. The bit 6 is equal to the data summary of other status byte bits. The result after comparing the status byte with the condition part of the SCPI register can be assumed to be the highest level in the SCPI level. The common command “*STB?” or the serial query can read the status byte value.

The status byte is connected with the service request enable register (SRE). Each data bit of the status byte corresponds to one bit in the SRE. The SRE bit 6 is ignored. If one data bit in the SRE is set and the associated STB bit changes to 1 from 0, a service request (SRQ) will be generated. The common command “*SRE” is used to set the SRE, and the common command “*SRE? ” is used to read the SRE. The status byte is described in the following Table 2.6 Description of the Status Byte:

Table2.6 Description of the Status Byte

Data Bit	Meaning
0..1	Not used.
2	The error queue is non-null Set the bit if a new error is inserted into the error queue. If the associated SRE bit enables the bit and a new error is generated in the error queue, a service request will be generated to identify the error and query the error information. This method effectively reduces the error in remote control.
3	Data summary bit of the status query register The bit can be set if the event bit of the status query register and the associated enable bit are set to 1. The bit represents a queriable status of the instrument, and the specific status information of the instrument can be obtained by querying the status query register of the status register.
4	MAV bit (message available) Set the bit if the output queue information is readable. Use the bit when the controller queries the instrument information.
5	ESB bit Data summary bit of the event status register. The bit can be set if one bit of the event status register is set and the enable event enables the corresponding bit in the register. If the position bit is 1, it means that the instrument has a severe error, and the specific error information can be obtained by querying the event status register.
6	MSS bit (master status summary bit) Set the bit if the instrument triggers the service request.
7	Data summary bit of the operation status register The bit can be set if the event bit of the operation status register and the corresponding enable bit are set to 1. This bit indicates that the instrument executes an operation, and the specific operation type can be obtained by querying the operation status register.

2.1 Remote control basis

2) IST mark and parallel query enable register (PPE)

The IST identifies the combination of the overall status of the instrument with a separate data bit. This flag can be obtained by parallel query or by sending the command "*IST?". The associated parallel query enable register (PPE) determines which data bits of the STB act on the IST mark. The STB data bits have the And relation with the PPE data bits, and the usage of bit 6 is opposite to that in the SRE. The IST flag is equal to the Or value of all results. Set and read the PPE through the command "*PRE" and the command "*PRE?" respectively.

3) Event status register (ESR) and event status enable register (ESE)

For definition of ESR, refer to IEEE488.2. The event status register (ESR) can be read through the command "*ESR?". The ESE is an enable part of the SCPI register. If one position is set to 1 and one data bit in the responsive ESR changes to 1 from 0, the ESB bit of the STB will be set to 1. Set and read the ESE through the command "*ESE" and the command "*ESE?" respectively.

Table2.7 Description of the Event Status Byte

Data Bit	Meaning
0	Operation completed The bit can be set when the previous commands have been executed and the command *OPC has been received.
1	Not used.
2	Query error This bit is set if the controller reads the instrument data without sending a query command or sends a new command without reading the query data. It means that a wrong query is generated and the query can't be executed.
3	Instrument error Set the bit if an instrument error is generated. Error code range: -300 ~ -399, or positive error code. For details of specific error information, query relevant information in the error queue.
4	Execution error Set the bit if a command with correct syntax is received but can't be executed. In addition, an error with the code within the range of -200 ~ -300 is generated in the error queue.
5	Command error Set the bit if the received command has a syntax error. Error code range: -100 ~ -200. For details of specific error information, query relevant information in the error queue.
6	User request Set the bit if the instrument is switched to the manual control mode.
7	Power on Set the bit when the instrument is powered on.

4) Status: Operation register

Status: The operation register includes the current instrument operation information, and previously executed operation information. The value of the operation register can be read through the command"Status:OPERation:CONDition?" or "Status: OPERation[: EVENt]?". The description of the status register is as shown in the following Table 2.8.

Table2.8 Status: Description of operation register

Bit	Value	Definition
0	1	Not used
1	2	Calibration status of channel A
2	4	Calibration status of channel B

3	8	Calibration status of USB interface channel
4-14	-	Not used
15	-	It is always 0

5) Status: Questionable register

The register includes the status of the instrument not conforming to requirements of the specification. The value of the register can be queried through the command “STAT:QUES:COND” or “STAT:QUES:EVEN”. The description of the status register is as shown in the following Table 2.9.

NOTE

Query register

Status: The questionable register gathers the information (for example: bit 2 gathers all time-related information) of all the low-level sub-registers. As each channel corresponds to the independent sub-register, if one status bit indication of the questionable register has an error, it is necessary to trace back in the channel sub-register and check the specific error root. The status of the sub-register status to be queried belongs to the currently selected channel by default.

Table2.9 Status: Description of questionable register

Bit	Value	Definition
0-2	-	Not used
3	8	Power summary
4-7	-	Not used
8	256	Calibration summary
9	512	Power-on self-test
10-14	-	Not used
15	-	It is always 0

2.1.5.4 Application of status reporting system

The status reporting system is used to monitor the status of one or more instruments in the test system. To correctly realize the function of the status reporting system, the controller in the test system must receive and evaluate the information of all instruments. The standard methods applied include:

1) Query the service request (SRQ) initiated by the instrument;
2) Series query of all the instruments in the bus system, initiated by the controller in the system, in order to find the initiator and the cause of service request;
3) Perform parallel query of all instruments;
4) Query of the status of specific instrument by remote control command;
5) Query of the error queue.

1) Service request

In some cases, the instrument will send a service request (SRQ) to the controller to obtain the controller’s service, and then the controller will initiate an interruption to enter the corresponding interruption handler. As shown in Figure 2.5, an SRQ is usually initiated by one or more status bytes and the 2^{nd}, 3^{rd}, 4^{th}, 5^{th} or 7^{th} bits of the associated enable register (SRE). These data bits are composed of the advanced register, error queue, or output buffer area further. In order to use all the service requests as much as possible, all data bits of the enable registers SRE and ESE shall be set to 1.

2.1 Remote control basis

Example: Generate the SRQ signal with the command *OPC when scanning is completed.

a) Call the write function InstrWrite and write command “*ESE 1”, and set the ESE bit 0 (operation is completed).

b) Call the write function InstrWrite and write command “*ESE 32”, and set the SRE bit

5 (ESB).

c) Call the write function InstrWrite and write command “*INIT;*OPC”, and generate the SRQ signal after operation is completed.

The instrument will generate an SRQ after settings are completed.

The SRQ can only be initiated by the instrument, and the controller program shall allow sending the service request to it when the instrument has an error, and it will be processed by a special interruption handler.

2) Series query

Similar to the command *STB, the series query can be used to query the status byte of the instrument. The series query adopts the interface message mode, therefore, the query is fast. The IEEE 488.2 defines the specific series query method. This method is mainly used to quickly obtain the status of one or more instruments connected with the controller in the test system.

3) Parallel query

The controller can send an information bit to the USB cable through a command, and query 8 instruments in the test system. The data configured on the USB cable of the instrument is logic “0” or “1”. Except that the SRE register determines the conditions generating the SRQ, perform parallel query to check AND operation of data bit of the enable register (PPE) and the STB register. The result will be made as the response result and sent to the parallel query controller through OR operation and bit reverse, and it can also be obtained through the command *IST.

During parallel query, set the instrument to the parallel query status through the command PPC firstly, and this command will allocate a USB cable to the instrument and determine whether the data bit is reversed in response. Use the PPE register during execution of the parallel query. The parallel query is mainly used to quickly position which instrument sends the service request by the controller. Accordingly, the same value shall be set for the registers SRE and PPE.

4) Instrument status query

Query each part of the status register through following two commands:

- The commands *ESR?, *IDN?, *IST?, *STB? can be used to query the advanced register;
- The status system command can be used to query the SCPI register (for example: Status：QUEStionable…).

The returned value of the queried register is usually in decimal format, which is used by the controller program for detection. In order to obtain a more detailed description of the SRQ cause, the parallel query will be carried out after the SRQ generally.

Description of response data bit

The STB and ESR registers include 8 bits, and the SCPI register includes 16 bits. The returned value of the queried status register is in decimal format. The decimal value is equal to the summary of the data bits and their own weights after operation.

The relationship between the data bit and its weight is as shown in the following Figure:

Data Bit	7	6	5	4	3	2	1	0
Weight	128	64	32	16	8	4	2	1

Fig.2.6 Diagram of Relationship Between the Data Bit and Its Weight

5) Error queue

Each error status of the instrument corresponds to an entry in the error queue, including the specific error information text, which can be viewed through the error log or queried through the SCPI:SYSTem:ERRor[:NEXT]? or SYSTem:ERRor:ALL?. If there is no error in the error queue, the query will return 0, “No Error”.

As the obtained error cause description is more accurate than the status register, the error queue shall be queried in the controller service request handler. The error queue shall be frequently queried especially during the controller program test stage, so as to clarify the error command record sent to the instrument by the controller.

2.1.5.5 Reset status reporting system

The following list shows the commands and events for resetting the status reporting system. Except for the commands *RST and SYSTem:PRESet, other commands do not change the instrument function settings. Similarly, the DCL will not change setting status of the instrument. The specific description is as shown in the following table:

Table2.10 Reset status reporting system

Event / Funct	Power On/Off (Power-on status cleared)		DCL, SDC (Instrument cleared, selected instrument cleared)	*RST or SYSTem: PRESet	Status: PRESet	*CLS
	0	1				
Clearing STB, ESR	—	Yes	—	—	—	Yes
Clearing SRE, ESE	—	Yes	—	—	—	—
Clearing PPE	—	Yes	—	—	—	—
Clearing the event part of the register	—	Yes	—	—	—	Yes
Clearing the enable part of the operation and questionable registers. Filling 1 in the enable part of other registers.	—	Yes	—	—	Yes	—
Filling 1 in the positive transition part. Clearing the negative transition part.	—	Yes	—	—	Yes	—
Clearing the error queue	Yes	Yes	—	—	—	Yes
Clearing the output buffer area	Yes	Yes	Yes	—	—	—
Clearing the command processing and input buffer area	Yes	Yes	Yes	—	—	—

2.1.6 Programming considerations

1) Please initialize the instrument status before changing the settings

When setting the instrument through remote control, it is necessary to initialize the instrument status (e.g. send “*RST”) and then set the desired status.

2) Command sequence

In general, the setting and query commands should be sent separately; otherwise the returned value of the query command will change according to the current instrument operation sequence.

3) Failure response

The service request can only be initiated by the instrument itself. The controller program in the test system should instruct the instrument to initiate a service request when an error occurs, and then enter the corresponding interrupt service routine for processing.

4) Error queue

Each time the controller program processes a service request, the error queue rather than the status register of the instrument should be queried to obtain a more accurate error reason. The error queue should be frequently queried to obtain the wrong command sent by the controller to the instrument especially during testing of the controller program.

2.2 Remote interface and its configuration

2.2.1 LAN

The LAN (Local Area Network) remote control system adopts SICL-LAN to control the 2438 series microwave power meter.

Attention

Use of USB main control port connector on front panel

The Type-A connector on the front panel is a USB main control port connector, which can be used to connect with the flash disk of the USB 1.1 interface to upgrade the TSR software of the instrument and can be connected with the USB keyboard and mouse to control the microwave power meter in the 2438 series microwave power meter. It is not possible to remotely control the instrument via this port.

2.2.1.1 Connection

Connect 2438 and the external controller (computer) to the LAN through the network cable, as shown in Figure 2.7:

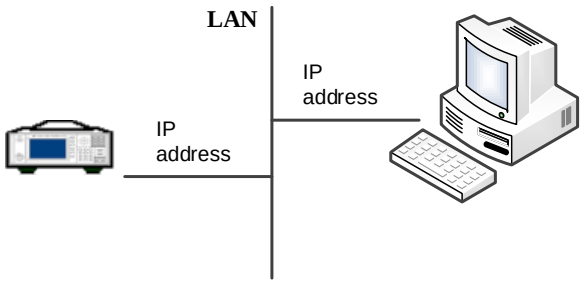


Fig.2.7 LAN Interface Connection Diagram

2.2.1.2 Interface configuration

When remote control of the microwave power meter is achieved through LAN, unblocked physical connection of the network should be guaranteed. As it doesn't support the DHCP, domain name access,

and WAN connection, the network program setting of the microwave power meter is relatively simple, just set the “IP Address”, “Sub-network Mask” and “Default Gateway” to the sub-network where the main controller is located through the menu as shown in Figure 2.8.

The relevant SCPIs include:

SYSTem:COMMunicate:LAN:ADDRess	Set the IP address
SYSTem:COMMunicate:LAN:SMASk	Set the sub-network mask
SYSTem:COMMunicate:LAN:DGATeway	Set the gateway
SYSTem:COMMunicate:LAN:CURRent:ADDRess?	Query the current IP address
SYSTem:COMMunicate:LAN:CURRent:SMASk?	Query the current sub-network mask
SYSTem:COMMunicate:LAN:CURRent:DGATeway?	Query the current route/gateway address

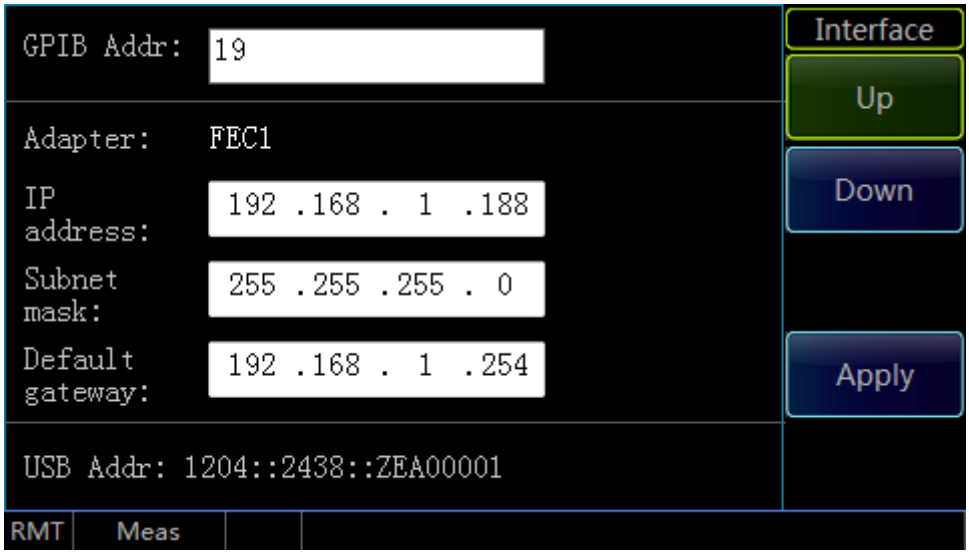


Fig.2.8 Setting of the LAN Interface and GPIB Interface (The USB Interface is Read-only)

Attention

Ensure that the microwave power meter is subjected to normal physical connection through a 10Base-T LAN or 100Base-T LAN cable.

Since the microwave power meter only supports the establishment of a single LAN control system and the setting of a static IP address and it doesn't support DHCP or access to the host through the DNS and domain name server, the user isn't required to modify the subnet mask which is set as a fixed value of 255.255.255.0 inside the instrument.

2.2.2 GPIB

2.2.2.1 Connection

Connect the 2438 microwave power meter with the external controller (computer) through the GPIB cable, as shown in Figure 2.9:

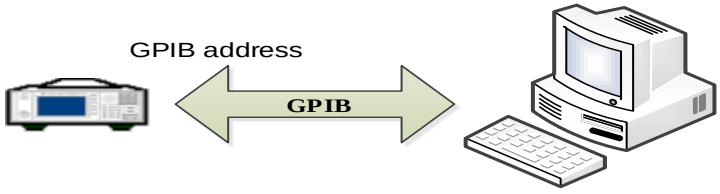


Fig.2.9 GPIB Interface Connection Diagram

2.2.2.2 Interface configuration

The user may need to modify the GPIB address when building a system with a microwave power meter. The GPIB address of the machine is 19 by default. The method to change the GPIB address is as follows:

Press down[System] [Remote Port Configuration>>][Local GPIB Address] to enter the interface as shown in Figure 2.8. Changes can be made in the local GPIB address input box by pressing down the digital key on the front panel.

The setting range of the GPIB address is 0 ~ 30. The GPIB address of each instrument on the bus must be unique. The default address is 13 under the factory reset mode.

The relevant SCPIs include:

SYSTem:COMMunicate:GPIB:ADDRess Set the GPIB address

2.3 I/O library

2.3.1 Overview of I/O library

As a library of software programs pre-written for the instrument, the I/O library is called an instrument driver. It is considered as the intermediate layer of the software between the computer and the instrument hardware device, composed of function library, utility program and tool kit, and used as a software code module set that corresponds to a planned operation, e.g. configuring, reading from, writing to or triggering the instrument. It resides in the computer as the bridge and link between the computer and the instrument and provides an easily programmed high-level modular library so that the user no longer needs to learn complex low-level programming protocols specific to an instrument. The instrument driver is the key to rapid development and test of measurement applications.

From the aspect of function, a general instrument driver usually consists of a functional body, an interactive developer interface, a program developer interface, a subprogram interface and an I/O interface as shown in Fig. 2.10.

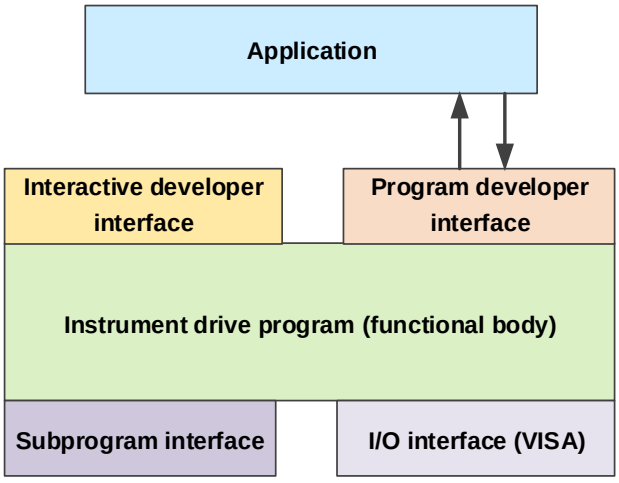


Fig.2.10 Structure Model of the Instrument Driver

The detailed description is given as follows:

1) Functional body. It is the main functional part of the instrument driver and can be understood as the framework program of the instrument driver.

2) Interactive developer interface. For user's convenience, a graphical interactive developer interface is generally provided in the application development environment that supports the development of the instrument driver. For example, the function panel in Labwindows/CVI is an interactive developer interface. In the function panel, each parameter of the instrument driver function is represented by a graphical control.

3) Program developer interface. It is a software interface for calling of the instrument driver function by the application, such as the dynamic link library file .dll of the instrument driver of the Windows system.

4) I/O interface. It is used to complete the actual communication between the instrument driver and the instrument. Bus-specific I/O software (such as GPIB and RS-232) and also common standard I/O software (VISA I/O) across multiple buses can be used.

5) Subroutine interface. It is a software interface for the instrument driver to access other support libraries including database and FFT function. When the instrument driver needs to call other software modules, operating systems, program code libraries and analysis function libraries to complete its task, the subprogram interface will be used.

2.3.2 Installation and configuration of I/O library

With the development of the test field application from the traditional instrument to the virtual instrument, the instrument driver has experienced different development processes in order to solve the instrument interchangeability and test program reusability of the automatic test system. Currently, the IVI (Interchangeable Virtual Instruments) driver is popularly applied. Based on the IVI specification, a new instrument programming interface is defined, the class driver and VPP architecture are inserted onto the VISA so that the test application is completely independent of the instrument hardware, and unique instrument simulation, range detection and status buffer functions are added, which improves the system operation efficiency and truly achieves the instrument interchange.

The IVI driver comes in two types: IVI-C and IVI-COM. IVI-COM is based on Microsoft Component Object Model (COM) technology in the form of COM API; IVI-C is based on ANSI C in the form of C API. These two types of drivers are designed according to the instrument defined by the IVI specification, and their application development environments are the same, including Visual Studio, Visual Basic, Keysight VEE, LabVIEW, CVI/LabWindows.

Currently, it is necessary to provide two types of drivers in order to meet the demands of different users in different development environments. The IVI driver of the microwave power meter is developed based on Nimbus Driver Studio so that the IVI-COM and IVI-C drivers and program installation packages are generated directly. For details about installation and configuration, please refer to the accompanied documents of your selected control card and I/O library.

The installed IVI driver is divided into an IVI intrinsic functional group and an instrument class functional group (a basic functional group and an extended functional group). For details about functional classification, functions and attributes, please refer to the accompanied help document of the driver.

NOTE

Configuration of ports and installation of IO library

Before using a computer to control the microwave power meter, confirm that you have correctly installed and configured the necessary ports and I/O library.

NOTE

Use of I/O library

Once installed, the attached IVI-COM/C driver installation package will automatically install the driver function panel, help documents, and sample programs of the driver functions to facilitate the users to develop and integrate the program control functions.

2.4 Zeroing and calibration of power sensor

2.4.1 Zeroing

The zeroing is used to deduct the channel noise. No power signal can be sent to the sensor before zero. When will zeroing be carried out? It is recommended to zero the microwave power meter in the following conditions:

- When the temperature change is larger than 5℃;
- When replacing the power sensor;
- After 24 h;
- Before measuring the low power signal. For example, when measuring the signal 10 dB lower than the minimum power specified by the power sensor.

The relevant SCPIs are:

CALibration[1]|2:ZERO

For example, zero channel B:

CAL2:ZERO

2.4.2 Calibration

It is recommended to zero the power meter before calibration.

For the 71710 series CW (continuous wave) power sensor, the overall gain of the channel and sensor of the power meter is calibrated with a 50MHz 1 mW (0 dBm) signal.

The 2438 supports the newly developed 81702D/E/F/L and 81703D/E/F/L peak power sensors, which are calibrated with built-in DC voltage rather than 1 GHz power dynamic calibrator.

Use the reference power of the power meter or a proper external reference signal as a traceable power reference. The essence of calibration is to set the correct reference calibration factor for your power sensor.

The calibration time is relatively longer. During calibration, the prompt information and progress bar indication will occur.

Attention: During calibration, the power meter will automatically turn on the power reference calibrator (if it is turned off). The status before calibration will be recovered after calibration is completed.

The relevant SCPIs are:

CALibration[1]|2:AUTO ONCE

For example, calibrate channel B:

CAL2:AUTO ONCE

2.4.3 Zero + calibration

It is equivalent to zero the power meter before calibration.

Before operation of the 71710 series CW sensor, the power sensor shall be connected to the calibrator output end of the power meter.

For the 81702 series peak sensor, it is unnecessary to connect the power sensor to the calibrator output end of the power meter.

The relevant SCPIs are:

CALibration[1]|2[:ALL]

For example, zero and calibrate channel B:

CAL2

2.5 Measurement

The measurement can be configured as forms including absolute power measurement, difference power measurement, ratio power measurement and relative power measurement. For details, please refer to the “Measurement of the Subsystem”.

2.6 Use of FDO table

How to use FDO table? The FDO table is used to compensate and measure the frequency response during establishment.

2.6.1 Overview

Enable or disable FDO table with [SENSe[1]]|SENSe2:CORRection:CSET2:Status. When FDO table is enabled, it will provide a quick method to compensate for the frequency response in the test system. It is important to note that when FDO table is enabled, the frequency offset is an “additional” sensor frequency response, namely, the inherent frequency response (saved in the sensor EEPROM) of the sensor shall also be considered. The power meter can save up to 10 FDO tables, up to 80 frequency points for each.

Method to use FDO table:

a) Entering in FDO table

b) Selecting FDO table

c) Enabling FDO table

d) Measurement application

2.6.2 Entering in FDO table

a) Entering steps

- Enter in the frequency list: MEMory: TABle:FREQuency <Frequency 1>{, <Frequency i>}. For example, 50 MHz, 1 GHz, 10 GHz, 40 GHz;
- Enter the corresponding offset factor of the frequency list: MEMory: TABle:GAIN <Factor 1>{, <Factor i>}. For example, 100, 98.8, 101.2, 110.8 respectively correspond to 50 MHz, 1 GHz, 10 GHz, 40 GHz offset factors;
- If necessary, rename FDO table: MEMory:TABLe: MOVE <Former Name>, <Target Name>.

For example, "User_3", "MyFdo0"

b) List name of FDO table: MEMory: CATalog:TABLe?. For specific information, see description of the command.

c) Rename of FDO table: MEMory:TABLe:MOVE <Former Name>, <Target Name>.

d) Query data in FDO table. For example, query data in No. 3 FDO table.

- Query number of frequency points in FDO table: MEMory:TABLe3:FREQuency:POINTs?
- Query frequency list in FDO table: MEMory:TABLe3 :FREQuency?
- Query number of factor points in FDO table: MEMory:TABLe3:GAIN[:MAGNitude]:POINTs?
- Query factor list in FDO table: MEMory:TABLe3 :GAIN[:MAGNitude]?

e) Modify data of FDO table:See 5.2 Entering in FDO table.

f) Description

- The frequency list must be in ascending order.
- The effective suffix of the frequency list includes Hz, kHz, MHz, GHz. It is Hz by default;
- Ensure that the frequency list is within the effective frequency range of the sensor;
- The name of FDO table can have up to 12 bytes, and no space is allowed.

2.6.3 Selecting FDO table

[SENSe[1]]|SENSe2:CORRection:CSET2[:SELect] <Name of FDO Table>, such as "User_3"

2.6.4 Enabling FDO table

[SENSe[1]]|SENSe2:CORRection:CSET2:Status ON

2.6.5 Measurement application

- ABOR
- CONF:POW:AC DEF,1,(@1)
- SENS:CORR:CSET2:SEL "MyFdo0"
- SENS:CORR:CSET2:STAT ON
- SENS:FREQ 5GHz
- INIT1
- FETC?

2.6.6 Specific application

a) If the frequency list of FDO table is 500 MHz, 1 GHz, 11 GHz. The offset factor list is 100, 10, 10. Set the signal frequency to Freq and the calculated offset factor to Gain.

b) If the Freq is out of the range of FDO table, the frequency offset value of the highest or the lowest frequency points in FDO table shall be used. In case of 18 GHz, use the corresponding offset factor 102 of the maximum frequency point 10 GHz. In case of 50 MHz, use the corresponding offset factor 100 of the minimum frequency point 500 MHz.

c) If the Freq is within the effective range of the frequency list but it is between two frequencies (Freq1, Freq2), such as 5 GHZ, the offset factor will be obtained by two linear interpolations. Set the corresponding offset factors of the Freq1 and Freq2 to Gain1 and Gain2 respectively. Gain can be calculated as per the formula below (the calculated result is 50).

$$Gain = Gain1 + \frac{Freq - Freq1}{Freq2 - Freq1} \times (Gain2 - Gain1)$$

d) If the power before using FDO table is 1.000 mW (recorded as Pwr0) and the final display power is

recorded as Pwr, the Pwr＝Pwr0/Gain/100 = 2.000 mW.

2.7 Setting of display resolution

Relevant SCPIs:

DISPlay[:WINDow[1]|2][:NUMeric[1]|2]:RESolution <Resolution>

The range of the <Resolution> is 1 - 4.

For linear power display, <Resolution> represents the effective number of the displayed bits; for logarithmic power display, <Resolution> represents number of bits behind the decimal point.

2.8 Setting of average

The power meter memory has a digital filter for average power reading. The range of the average counts is 1 - 1,024. If the average status is enabled, the measurement time will be increased.

The CW power sensor can be set to the automatic average status, namely, set different average numbers of times according to different power levels and the display resolutions. Generally, the lower power and the higher resolution will bring the larger average counts.

Relevant SCPIs:

[SENSe[1]]|SENSe2:AVERage[:Status] <Switch> Set the average switch

For example, turn on average switch of channel B:

SENS2:AVER 1

Disable average of channel A.

AVER 0

[SENSe[1]]|SENSe2:AVERage:COUNt:AUTO <Switch> Set the automatic average switch

[SENSe[1]]|SENSe2:AVERage:COUNt <Average Counts> Set average counts

2.9 Setting of range

This function is only valid for CW power sensor. It is referred to as CW power sensor hereinafter, which generally refers to the 7171X series power sensor.

The sensor range is classified into high and low ranges, which can be set as automatic range and manual range modes. If the measured power level is unclear, automatic range can be used.

Set the SCPI of the automatic range status:

[SENSe[1]]|SENSe2:POWer:AC:RANGe:AUTO <Switch>

For example, set channel B to automatic range ON:

SENS2:POW:AC:RANG:AUTO 1

For example, set channel A to automatic range OFF:

SENS:POW:AC:RANG:AUTO 0

Set the SCPI of keeping the range:

[SENSe[1]]|SENSe2:POWer:AC:RANGe <Range>

The <Range> value is as follows: 0 represents low range and 1 represents high range. The 7171X series power sensor will be classified in low range and high range when its noise level is -13.5 dBm or above and -14.5 - +20 dBm or above respectively.

For example, set channel B to high range

SENS2:POW:AC:RANG 1

2.10 Setting of offset

2.10.1 Channel offset

The power meter can compensate for signal attenuation or gain in the test device (such as compensating for 20 dB attenuator). The channel offset is added to the power measurement before its display.

The relevant SCPIs are:

[SENSe[1]]|SENSe2:CORRection:GAIN2 <Offset Value> Set the channel offset value

[SENSe[1]]|SENSe2:CORRection:GAIN2:Status <Switch> Set the channel offset switch

For example, set offset of channel B to 3 dB.

SENS2:CORR:GAIN2 3

2.10.2 Display offset

The display offset is used to display one offset value added before power display, which is located in the last step of all mathematical operations. The display offset directly corresponds to the display window.

The relevant SCPIs are:

CALCulate[1]|2|3|4:GAIN[:MAGNitude] <Offset Value> Set the display offset value

CALCulate[1]|2|3|4:GAIN[:MAGNitude]:Status <Switch> Set the display offset switch

For example, set the measured display offset on the lower window to 3 dB.

CALC2:GAIN 3

2.10.3 Specific application

For the double-channel power meter, set offset of channel A to $GainA$ and offset of channel B to $GainB$, and set the display offset to $Offset$. Before applying the channel offset and display offset, the measured power values of channel A and channel B are $PowerA$, $PowerB$ respectively. If the measured result is recorded as $Ratio$, the $Ratio$ expression will be as follows.

When all the above units are logarithmic units:

$$Ratio = (PowerA + GainA - (PowerB + GainB)) + Offset$$

When all the above units are linear units:

$$Ratio = \frac{PowerA \times GainA}{PowerB \times GainB} \times Offset$$

2.11 Setting of measurement limit

Verify if the measured power is out of the given range by setting the measurement limit.

The relevant SCPIs are:

:CALCulate[1]|2|3|4:LIMit:LOWer[:DATA] <Lower Limit> Set the lower limit

:CALCulate[1]|2|3|4:LIMit:UPPer[:DATA] <Upper Limit> Set the upper limit

:CALCulate[1]|2|3|4:LIMit:Status <Switch>	Set the limit detection switch
:CALCulate[1]|2|3|4:LIMit:FAIL?	Query if it is out of the limit
:CALCulate[1]|2|3|4:LIMit:FCOunt?	Query if it is out of the number of limits (FCO)
CALCulate[1]|2|3|4:LIMit:CLEar[:IMMediate]	Reset failure count (FCO).

2.12 Status reporting

The status report is used to detect power error information, operation status, questionable status, etc. The status report will be reported level by level. For example, the calibration operation will be reported to the operation status and the operation status will be reported to the status byte.

For example, query if the instrument is being calibrated, if the instrument calibration is completed, if zero and calibration error occurs, if the instrument is connected with the sensor, if zero is required, and if measurement is out of the measurement range. The “Query if the Instrument is Calibrating Channel A” is described as follows.

The first bit in the Status:OPERation:CALibrating register set represents the calibration status of channel A.

Set occurrence of the calibration operation event as follows: Event detection in case of transition to calibrated (Status 1) from uncalibrated (Status 0), set the positive transition filter to 1.

STAT:OPER:CAL:PTR 2 (Configure the calibration event detection of channel A as 0 - 1) Note 1

Report the calibration event report to the upper level operation status register. Namely, the calibration status bit (0^{th} status) of the Status:OPERation register set.

STAT:OPER:CAL:ENAB 2 (If the event of channel B shall be reported, the parameter can be 4 or 6). Note 1

Similarly, if the operation status shall be further reported to the 7^{th} bit of the “Status Byte”, it is necessary to set to operate the corresponding bit (bit 0) of the positive transition filter and the enable register.

STAT:OPER:CAL:PTR 1 (Configure the calibration event detection as 0 - 1)

STAT:OPER:ENAB 1 (If the lower limit detection event shall be reported, the parameter can be 2048 or 2049)

In this case, the configuration is completed. Next, query if channel A is being calibrated.

Method 1: Query and calibrate the Bit 1 of the condition register. If non-zero is returned, it means that it is calibrating.

STAT:OPER:CAL:COND?

Method 2: Query the bit 0 of the condition register. If non-zero is returned, it means that it is calibrating.

STAT:OPER:COND?

Method 3: Query the bit 7 of the status byte. If non-zero is returned, it means that it is calibrating.

*STB?

Note 1: If it is necessary to query if one of the two channels is being calibrated, change parameter 2 to 6 (bits 1 and 2 represent channel A and channel B respectively).

2.13 Save recall

In order to reduce repeated settings, the instrument can save up to 10 configuration data to non-volatile memory. The error list, remote control address (such as IP address and instrument serial number), FDO table and zero and calibration information are not saved in this configuration. Except that the error list will not be saved, others will be saved in a hard configuration file and will not be changed along with the user recall.

The relevant SCPIs are:

2.13 Save recall

*SAV <NRf>

*RCL <NRf>

The range of <NRf> is 1 - 10.

3 SCPI

3.1 Command description

This chapter provides detailed command reference information to facilitate remote control, including:

- Complete syntax format and parameter list;
- For non-standard SCPI, list the syntax diagram;
- Detailed function description and instructions of associated command;
- Supported command formats (setting or query);
- Parameter description, including: data type, value range and default value (unit);
- Key path;
- The model of similar instruments compatible to the command. If not indicated, it means that the current command is only applicable to the 2438 series;
- Other descriptions.

The command order items are listed in the common command and instrument subsystem command sections to facilitate the user's query and use.

The description of relevant command suffix in case of remote control in this manual is as shown in the following table:

Table3.1 Description of the command suffix

Suffix	Value Range	Description
<ch>	1..2	Channel
<m>	1..2	Measurement
<w>	1..4	Window
<t>	1..10	FDO table

3.2 Common command (IEEE488.2)

The common command is used to control general functions including the instrument status register, status report, synchronization and data storage. The application method and function of the common command are applicable to different instruments. All the common commands can be identified by the first "*" in the command word, which are defined in details in IEEE488.2.

The explanations and descriptions of the IEEE488.2 common commands are as follows.

NOTE

Use of commands:

Unless otherwise specified, the commands can be used to set or query.

If a command is only used for setting or query or it is only used to start an event, it will be separately described in the instructions of the command.

***CLS**

Function:	Clear the instrument status data structure, including the SCPI register (such as query status and operation status), standard event register, status byte and error/event queue.	
Query:	Not supported	
Setting:	*CLS	
Example:	*CLS	Clear the instrument status
Error information:	None	
Reset status:	None	

***DDT**

Function:	Query or set the operation of response to the *TRG common command of the power meter.	
Query:	*DDT?	
Setting:	*DDT <Arbitrary Data Block> | <String> The form of Arbitrary Data Block is #nN<action> The form of the string is "<action>" 1) The action has following forms: FETC? FETC1? FETC2? *TRG TRIG1 TRIG2 2) In Arbitrary Data Block, the first value n after # represents the number of data length, and the following value represents the length of data block. For example: #15FETC? -- n = 1, N = 5 (FETC? has 5 bytes totally)	
Example:	*DDT?	Query if the instrument receives the *TRG command.
	*DDT #206FETCh?	

*DDT "FETCh?"

*DDT "TRIG1;FETC1"

Error information: None

Reset status: None

***ESE**

Function: Query or set the standard event status enable register. 0 Disable, 1 Enable.

Query: *ESE?

Setting: *ESE <NRf>

The NRf represents the value, a multiple of 2. The bit mapping is as shown in Table 3.2.

Example: *ESE? Query current setting of the register. The returned format is <NR1>, 0 ~ 255.

*ESE 60 Enable 4+8+16+32 bits.

Table3.2 Standard Event Bit Mapping

Bit	Value	Description
0	1	Operation completed
1	2	Not used
2	4	Query error
3	8	Device dependent error
4	16	Execution error
5	32	Command error
6	64	Not used
7	128	Not used

***ESR?**

Function: Query the value of the standard event status register, and reset it. See Table 3.2

Query: *ESR?

Setting: Not supported

Example: *ESR? Query the value of the standard event status register, and reset it.

Error information: None

Reset status: None

***IDN?**

Function: Query identification string of the microwave power meter.

Query: *IDN?

Setting: Not supported

Example: *IDN?

Error information: None

Reset status: None

***OPC**

Function: When all pending operations are completed, set the operation end bit in the standard event status register.

Query: *OPC?

Setting: *OPC

Example: *OPC? If the pending operation is completed, return 1; otherwise, wait.

Error information: None

Reset status: None

***OPT?**

Function: Query instrument option configuration.

Query: *OPT?

Setting: Not supported

Error information: None

Reset status: None

***RCL**

Function: Recall the microwave power meter status in the specified save recall register.

Query: Not supported

Setting: *RCL <NRf>
The range is 0 - 9

Example: *RCL 8

Error information: If the register is not between 1 - 10, it will prompt “-222, Data out of Range”.

Reset status: None

***RST**

Function: Reset the microwave power meter. Please refer to SYSTem:PRESet.

Query: Not supported

Setting: *RST

***SAV**

Function: Save the instrument status in the specified register.

Query: Not supported

Setting: *SAV <NRf>
The range is 0 - 9

Example: *SAV 9

Error If the register is not between 1 - 10, it will prompt “-222, Data out of Range”.

information:

Reset status: None

***SRE**

Function: Query or set the service request register. 0 Disable, 1 Enable.

Query: *SRE?

Setting: *SRE <NRf>

The NRf represents the value, a multiple of 2. The bit mapping is as shown in Table 3.3.

Example: *SRE? Query current setting of the register. The returned format is <NR1>, 0 ~ 255.

*SRE 316 Respectively set the 2nd, 3rd, 4th, 5th and 8th bits (4+8+16+32+256).

Table3.3 Mapping of the Service Request Register Bit

Bit	Value	Description
0	1	Not used
1	2	Not used
2	4	Device dependent
3	8	Questionable status
4	16	Message available
5	32	Event status bit
6	64	It must be 0
7	128	Operation status

***STB?**

Function: Query the status byte.

Query: *STB?

Setting: Not supported

Example: *STB?

Error information: None

Reset status: None

The bit mapping is as follows:

Table3.4 Status byte

Bit	Value	Description
0	1	Not used
1	2	Device dependent
2	4	Error/event queue
3	8	Questionable status
4	16	Message available

5	32	Event status bit
6	64	Service request
7	128	Operation status

***TRG**

Function: Trigger all channels to be triggered. The *TRG function can be changed with *DDT.

Query: Not supported

Setting: *TRG

Example: *TRG

Error information: If the trigger source is not BUS, it will prompt “-211, “Trigger Ignored””.

Reset status: None

***TST?**

Function: Execute self-test, and its time is longer.

Query: *TST?

Setting: Not supported

Example: *TST? If 0 is returned, it means pass; if 1 is returned, it means failure.

Error information: None

Reset status: None

***WAI**

Function: Keep the microwave power meter in a waiting status until one of the followings is satisfied:
All pending operations have been completed
Receive the device clearing command
Restart.

Query: Not supported

Setting: *WAI

Example: *WAI

Error information: None

Reset status: None

3.3 Instrument subsystem command

This section describes the subsystem command of the 2438 series microwave power meter in detail.

3.3.1 Calculation (CALCulate)

The calculation (CALCulate) subsystem is used for post level data processing, which shares four independent calculation function blocks. The corresponding relationship with the screen display window is as follows:

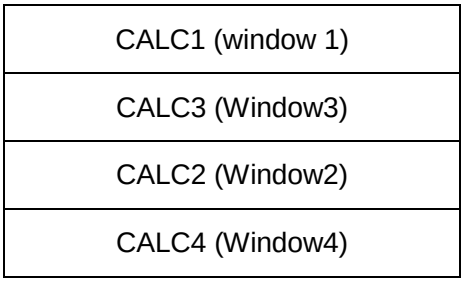


Fig.3.1 Relationship Between CALC and Window

Two SENSe subsystems can be used as FEEDs of the operation subsystem, and the operation schematic diagram is as follows:

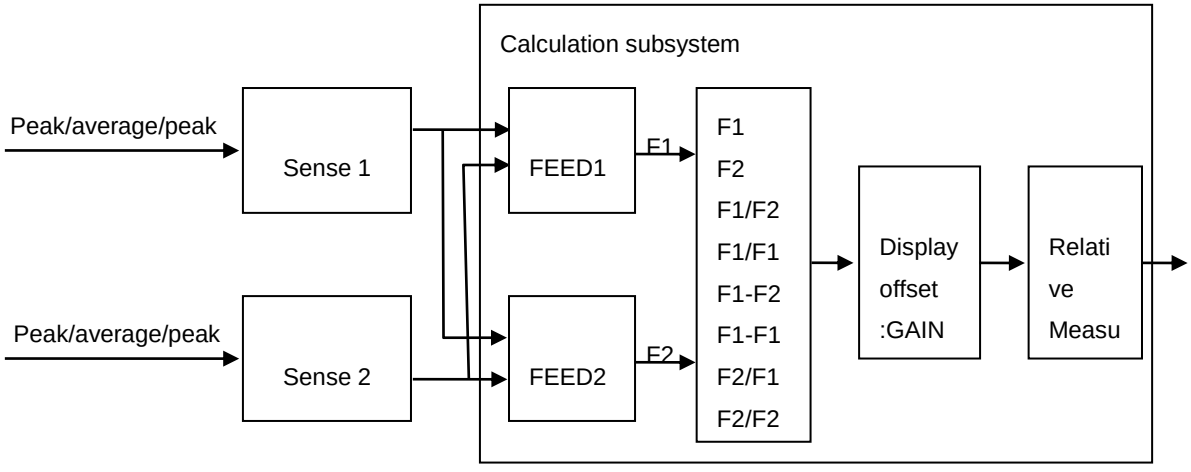


Fig.3.2 Schematic Diagram

The display offset and relative measurements will be calculated when the switch is turned on.

The command includes:

:CALCulate[1]|2|3|4:FEED[1]|2

Function: Query or set the measurement mode displayed in the window. The CALC:MATH:EXPR command is used to determine which channel does it come from.

The suffix meaning in CALC: 1 represents upper measurement of the upper window, 2 represents upper measurement of the lower window, 3 represents lower measurement of the upper window, and 4 represents lower measurement of the lower window, and the same below.

Query: :CALCulate[1]|2|3|4:FEED[1]|2?

Setting: :CALCulate[1]|2|3|4:FEED[1]|2 <String>

The parameter form is:"POW:PEAK", "POW:PTAV", "POW:AVER"

In addition, it can be followed by ON SWEEP[1]|2|3|4 to indicate the measurement gate. For example, the "POW:AVER ON SWEEP3" represents average power in the measurement gate 3. If the ON SWEEP[1]|2|3|4 is not specified, the measurement gate will be kept unchanged.

The FEED2 is only used for ratio and difference measurement.

Example:

CALC2:FEED?	Query the measurement mode of the FEED1 of the upper measurement of the lower window.
CALC:FEED2 "POW:AVER ON SWEEP3"	Set the average power in the measurement gate 3 of the FEED2 of the upper measurement of the upper window.

Limit: For the continuous wave sensor (7171X), only the"POW:AVER" can be used, and no measurement gate can be set.

Error information If no sensor is connected, it will prompt “-241,"Hardware Missing"”;

If the ON SWEEP[1]|2|3|4 is included in the mode but the trigger source is not the EXT or INT1 or INT2, it will prompt “-221, "Settings Conflict"”;

If the measurement mode is set to POW:PEAK or POW:PTAV but it is a kind of free running sampling mode, it will prompt “-221, "Settings Conflict"”.

:CALCulate[1]|2|3|4:GAIN[:MAGNitude]

Function: Query or set the displayed offset value of the specified window, unit: dB, with a range of -100, 100. After the setting succeeds, the display offset switch of the window will be turned on automatically.

The relevant command is :CALCulate[1]|2|3|4:GAIN:Status, which is used to set or query

the display offset switch.

Query: :CALCulate[1]|2|3|4:GAIN[:MAGNitude]? [MIN|MAX]

Setting: :CALCulate[1]|2|3|4:GAIN[:MAGNitude] <Numeric Data>

The form of <Numeric Data> includes: DEF, MIN, MAX, NRf, and DEF is used for setting only.

The DEF represents 0 dB, MIN represents -100 dB, and MAX represents 100 dB

Example:

CALC:GAIN?	Query the display offset of the upper measurement of the upper window.
CALC2:GAIN? MIN	Query the minimum value of display offset of the upper measurement of the lower window.
CALC3:GAIN MAX	Set the display offset of the lower measurement of the upper window to the maximum value.
CALC4:GAIN 18	Set the display offset of the lower measurement of the lower window to 18 dB.

Reset status: Set to 0 (DEF).

:CALCulate[1]|2|3|4:GAIN:Status

Function: Query or set the display offset switch state of the specified window.

The relevant command is :CALCulate[1]|2|3|4:GAIN[:MAGNitude], which is used to set or query the display offset value.

Query: :CALCulate[1]|2|3|4:GAIN:Status?

Setting: :CALCulate[1]|2|3|4:GAIN:Status <Boolean Data>

The effective form of <Boolean Data> includes 0, OFF, 1 and ON

Example:

CALC:GAIN:STAT?	Query the display offset switch state of the upper measurement of the upper window.
CALC2:GAIN:STAT ON	Turn on the display offset switch of the upper measurement of the lower window.
CALC3:GAIN:STAT 0	Disable the display offset of the lower measurement of the upper window.

Reset status: Off

:CALCulate[1]|2|3|4:LIMit:CLEar:AUTO

Function: Control the time to reset the limit FCO (failure count).

Query: :CALCulate[1]|2|3|4:LIMit:CLEar:AUTO?

For the ONCE status, if the measurement is not started, 1 will be returned; otherwise, 0 will be returned

For the OFF status, 0 will be returned always

For the ON status, if the measurement is started, 1 will be returned; otherwise, 0 will be returned

Setting: :CALCulate[1]|2|3|4:LIMit:CLEar:AUTO <Boolean Data> | ONCE | 2

The effective form of <Boolean Data> includes 0, OFF, 1 and ON.

For “ON”, when following operations are carried out, FCO will be set to 0:

Initialize it with INITiate[:IMMediate] command;

Initialize it with INITiate:CONTinuous ON command;

Measure it with MEASure? command;

Read the measurement with READ? command.

For “OFF”, FCO will not be reset.

For "ONCE" or 2, only reset it during the first initialization, and then add it up when the limit detection fails.

Example: CALC1:LIM:CLE:AUTO? Query the measured FCO reset status of the upper measurement of the upper window.

CALC2:LIM:CLE:AUTO ONCE Set the reset FCO of the upper measurement of the lower window during the first initialization.

Reset status: Set it to “ON”.

:CALCulate[1]|2|3|4:LIMit:CLEar[:IMMediate]

Function: Reset FCO (failure count) of the specified window, and FCO can be obtained by CALCulate[1]|2|3|4:LIMit:FCOunt? query.

Query: Not supported

Setting: :CALCulate[1]|2|3|4:LIMit:CLEar[:IMMediate]

Example: :CALC:LIM:CLE Reset the failure count of the upper measurement of the upper window.

:CALCulate[1]|2|3|4:LIMit:FAIL?

Function: Query if the specified window is out of the limit, 1 represents yes and 0 represents no.

Query: :CALCulate[1]|2|3|4:LIMit:FAIL?

Setting: Not supported

Example: :CALC:LIM:FAIL? Query the detection status of the upper measurement of the upper window.

:CALCulate[1]|2|3|4:LIMit:FCOunt?

Function: Query the limit detection failure count (FCO) of the specified window.

Reset FCO in the following conditions:

a) Reset

b) CALCulate[1]|2|3|4:LIMit:CLEar:IMMediate

c) CALCulate[1]|2|3|4:LIMit:CLEar:AUTO ON

Query: Query: :CALCulate[1]|2|3|4:LIMit:FCOunt?

Setting: Not supported

Example: :CALC:LIM:FCO? Query the detection failure count of the upper measurement of the upper window.

:CALCulate[1]|2|3|4:LIMit:LOWer[:DATA]

Function: Query or set the lower measurement limit of the specified window.

Query: :CALCulate[1]|2|3|4:LIMit:LOWer[:DATA]? [MIN|MAX]

Setting: :CALCulate[1]|2|3|4:LIMit:LOWer[:DATA] <Numeric Data>

The form of <Numeric Data> includes: DEF, MIN, MAX, NRf, and DEF is used for setting only.

If the currently set lower limit value is larger than or equal to the upper limit value, the upper limit value will be automatically adjusted according to the unit, as shown in Table 3.7.

Example: CALC:LIM:LOW? Query the lower limit of the upper measurement of the upper window.

CALC4:LIM:LOW 0.2 Set the lower limit of the lower measurement of the lower window as follows according to the

display unit of the window:
0.2 dBm in case of dBm
200 mW in case of W
0.2 dB in case of dB
0.2% in case of %.

Reset status: Set all the windows to -90 dBm or -90 dB

Table3.5 Measurement Unit

Measurement Mode	Measurement Type	CALC:REL:STAT OFF		CALC:REL:STAT ON	
		Linear	Logarithmic	Linear	Logarithmic
Single channel	Average, peak	Watt	dBm	%	dB
	PAR	%	dB	%	dB
Ratio	Average, peak, peak-to-average ratio	%	dB	%	dB
Difference	Average, peak	Watt	dBm	%	dB
	PAR	%	dB	%	dB

Table3.6 Limit Range

	Watt	dBm	%	dB
DEF	1pW	-90	100p%	-120
MIN	1aW	-150	100a%	-180
MAX	1XW	200	100X%	180

Table3.7 Limit Range Measurement

Lower limit value	Upper limit value			
	Watt	dBm	%	dB
$nLow$	$nLow \times 10^{0.001}$	$nLow + 0.01$	$nLow \times 10^{0.001}$	$nLow + 0.01$

:CALCulate[1]|2|3|4:LIMit:Status

Function: Query or set the measurement limit detection switch of the specified window.

Query: :CALCulate[1]|2|3|4:LIMit:Status?

Setting: :CALCulate[1]|2|3|4:LIMit:Status <Boolean Data>
The effective form of <Boolean Data> includes 0, OFF, 1 and ON

Example:

CALC:LIM:STAT?	Query the limit detection switch state of the upper measurement of the upper window.
CALC2:LIM:STAT ON	Turn on the limit detection switch of the upper measurement of the lower window.
CALC3:LIM:STAT 0	Disable the limit detection of the lower measurement of the upper window.

Limit:

Error information:

Reset status: Disable the limit detection of the window.

3.3 Instrument subsystem command

:CALCulate[1]|2|3|4:LIMit:UPPer[:DATA]

Function: Query or set the upper measurement limit of the specified window. Refer to CALCulate[1]|2|3|4:LIMit:LOWer[:DATA]

Query: :CALCulate[1]|2|3|4:LIMit:UPPer[:DATA]? [MIN|MAX]

Setting: :CALCulate[1]|2|3|4:LIMit:UPPer[:DATA] <Numeric Data>

The form of <Numeric Data> includes: DEF, MIN, MAX, NRf, and DEF is used for setting only.

If the currently set upper limit value is smaller than or equal to the lower limit value, the lower limit value will be automatically adjusted according to the unit, as shown in Table 3.9.

Example: CALC:LIM:UPP? Query the upper limit of the upper measurement of the upper window.

CALC4:LIM:UPP 8 Set the upper limit of the lower measurement of the lower window as follows according to the display unit of the window:

8 dBm in case of dBm

8W in case of W

8 dB in case of dB

8% in case of %.

Reset status: Set all the windows to 90 dBm or 90 dB

Table3.8 Limit Range

	Watt	dBm	%	dB
DEF	1MW	90	100M%	60
MIN	1aW	-150	100a%	-180
MAX	1XW	200	100X%	180

Table3.9 Limit Range Measurement

Upper limit value	Lower limit value			
	Watt	dBm	%	dB
$nUpp$	$nUpp/10^{0.001}$	$nUpp-0.01$	$nUpp/10^{0.001}$	$nUpp-0.01$

:CALCulate[1]|2|3|4:MATH[:EXPRession]

Function: Query or set the expression of the specified measurement of the specified window: Single channel, difference and ratio

Query: :CALCulate[1]|2|3|4:MATH[:EXPRession]?

Setting: :CALCulate[1]|2|3|4:MATH[:EXPRession] <String>

The form of the string is as follows:

"(SENS1)", "(SENS2)",

"(SENS1-SENS1)", "(SENS2-SENS2)",

"(SENS1-SENS2)", "(SENS2-SENS1)",

"(SENS1/SENS1)", "(SENS2/SENS2)",

"(SENS1/SENS2)", "(SENS2/SENS1)",

The string containing SENS2 is only applicable to the double-channel power meter

Example: CALC1:MATH? Query the measurement expression of the upper measurement of the upper window.

	CALC2:MATH "(SENS1/SENS2)"	Set the expression of the upper measurement of the upper window to channel A/B ratio measurement.

Reset status: For the single channel power meter, set all the windows to channel A ("(SENS1)").
If the double-channel power meter is connected with sensors, the upper window and the lower window will be A and B respectively.

:CALCulate[1]|2|3|4:MATH[:EXPRession]:CATalogue?

Function: List all measurement expressions, and separate them by commas.
For the single channel power meter, the string is:
"(SENS1)", "(SENS1-SENS1)", "(SENS1/SENS1)"
For the double-channel power meter, the string is:
"(SENS1)", "(SENS2)", "(SENS1/SENS2)", "(SENS2/SENS1)",
"(SENS1-SENS2)", "(SENS2-SENS1)""(SENS1-SENS1)",
"(SENS2-SENS2)", "(SENS1/SENS1)", "(SENS2/SENS2)"

Query: :CALCulate[1]|2|3|4:MATH[:EXPRession]:CATalogue?

Setting: Not supported

Example:	CALC:MATH:CAT?	List all the defined mathematical expressions.

:CALCulate[1]|2|3|4:RELative[:MAGNitude]:AUTO

Function: Set the reference value for relative measurement. In the CALCulate block, the relative value will be used for the measurement signal after any mathematical calculation and display offset calculation is completed. This value shall be set to ONCE to set the reference value for relative measurement. After the reference value is set, the instruction will return OFF. Set the instruction to ONCE, and change the instruction CALCulate[1]|2|3|4:RELative:Status to ON.
0|OFF No operation will be carried out.
1|ON Invalid, power meter return error: Invalid parameter.
2|ONCE, valid parameter, and the meaning is same as above.

Query: :CALCulate[1]|2|3|4:RELative[:MAGNitude]:AUTO?

Setting: :CALCulate[1]|2|3|4:RELative[:MAGNitude]:AUTO ONCE

Example:	CALC:REL:AUTO?	0 will be returned always.
	CALC:REL:AUTO ONCE	Set the relative measurement reference value of the upper measurement of the upper window.

Error information: If the parameter is set to 1 or ON, it will prompt “-224, "Invalid Parameter Value"”.

:CALCulate[1]|2|3|4:RELative[:MAGNitude]:VALue?

Function: Query the reference value for relative measurement.

Query: :CALCulate[1]|2|3|4:RELative[:MAGNitude]:VALue?

Setting: Not supported

Example:	CALC:REL:VAL?	Query the relative measurement reference value of the upper measurement of the upper window.

:CALCulate[1]|2|3|4:RELative:Status

Function: Query or set the relative measurement switch state.
When it is turned on, the relative measurement value set by :CALCulate[1]|2|3|4:RELative[:MAGNitude]:AUTO will be applied for measurement.

Query: :CALCulate[1]|2|3|4:RELative:Status?

Setting: :CALCulate[1]|2|3|4:RELative:Status <Boolean Data>

Example: CALC:REL:STAT? When the relative measurement of the upper measurement of the upper window is enabled, return 1, otherwise, return 0.

CALC2:REL:STAT ON Enable the relative measurement status of the upper measurement of the lower window.

Reset status: Disable relative measurement.

3.3.2 Calibration (CALibration)

The CALibration subsystem is used to control the automatic zero offset setting and linearity adjustment of the RF power sensor and channel. If no RF signal is loaded onto the sensor, zero setting can be carried out at any time. The sensor shall be connected with the calibrator of the microwave power meter for calibration.

The digital suffix in CALibration command represents the measurement channel, and CALibration1 and CALibration2 represent channel A and channel B respectively

The command includes:

:CALibration[1]|2[:ALL]

Function: Zero and calibrate the power meter. 1 represents channel A and can be omitted; 2 represents channel B.

Operation: Assume that the sensor is connected to the output end of the calibrator. Zero it before calibration.

When zero and calibration is required?

When the temperature change is greater than 5℃

When the sensor is replaced

Every 24 h

When measuring the low power. For example, when measuring the power 10 dB higher than the minimum power of the sensor.

Query: Not supported

Setting: :CALibration[1]|2[:ALL]

Example: CAL2 Zero and calibrate channel B.

Error information: In case of zero error, it will prompt “-231, "Data Questionable; ZERO ERROR"”;

In case of calibration error, it will prompt “-231, "Data Questionable; CAL ERROR"”;

If the specified channel is not connected with the sensor, it will prompt “-241,"Hardware Missing"”.

:CALibration[1]|2:AUTO

Function: Calibrate the specified channel of the power meter.

Operation: Assume that the sensor is connected to the output end of the calibrator. Execute calibration. For 71710 series CW sensor, only 0 dBm will be calibrated. For 8170X series sensor, the calibration range includes 20 dBm ~ minimum power of the sensor.

Query: Not supported

Setting: :CALibration[1]|2:AUTO ONCE

Example: CAL1:AUTO ONCE Calibrate channel A of the power meter.

Error information: If the specified channel is not connected with the sensor, it will prompt “-241,"Hardware Missing"”.
In case of calibration error, it will prompt “-231,” Data Questionable; CAL ERROR””;

:CALibration[1]|2:RCALibration

Function: Set the “Must Cal” switch of the channel. When it is turned on, the measurement of the current channel will stop until the channel is zeroed and calibrated.

Query: :CALibration[1]|2:RCALibration?

Setting: :CALibration[1]|2:RCALibration <Boolean Data>

Example: CAL1:RCAL? Query the Must Cal switch of channel A.
CAL2:RCAL OFF Disable the Must Cal switch of channel B.

Reset status: Not affected (namely keeping the status before reset, same as below)

:CALibration[1]|2:ZERO:AUTO

Function: Zero the power meter. 1 represents channel A and can be omitted;2 represents channel B.

Query: Not supported

Setting: :CALibration[1]|2:ZERO:AUTO ONCE

Example: CAL:ZERO:AUTO ONCE Zero channel A of the power meter

Error information: If the specified channel is not connected with the sensor, it will prompt “-241,"Hardware Missing"”.
In case of zero error, it will prompt “-231,” Data Questionable; ZERO ERROR"”.

3.3.3 Measurement (CONFigure/FETCh/READ/MEASure)

Generally, if not specified, the linear power unit will be W, the logarithmic power unit will be dBm, the linear power ratio unit will be %, the logarithmic power ratio unit will be dB, and the time unit will be s.

If the returned value is invalid, NAN will be returned (9.91E37). The definition is as shown in IEEE 754.

The difference between the FETCh command and the MEASure command is as follows:

The FETCh command is to query the display value of the given window. The execution speed of the FETCh command is irrelated to the power level, and it shall be returned immediately generally. The FETCh command may return intermediate results during the power measurement, rather than the actual power value.

The MEASure command is to start a window measurement and return the measurement result after the measurement is completed. Generally, the lower the power, the longer time the MEASure command will need.

The command includes:

:CONFigure[1]|2|3|4[:SCALar][:POWer][:AC]

Function: Query or set the power measurement mode of the specified window.

Query: :CONFigure[1]|2|3|4?

Setting: :CONFigure[1]|2|3|4[:SCALar][:POWer][:AC] [<Expected Value>[, <Resolution>[, <Source Channel List>]]]

Set it to the absolute power measurement, and disable relative measurement. The expected value and resolution can be expressed in DEF, indicating no change. The range of the resolution is 1 - 4; the form of the channel list is: (@1), (@2), indicating channel A and channel B respectively.

Example:

CONF?	Query the power measurement configuration of the upper measurement of the upper window.
CONF1 DEF, 3, (@1)	Set the upper measurement of the upper window to the absolute power measurement, and set the resolution to 3 and source channel to A.

Error information If the specified channel is not connected with the sensor, it will prompt “-241, “Hardware Missing"”.

Reset status: Set it to measurement of the absolute power, and set the resolution to 3. For the single channel power meter, the measurement channel is A; for the double-channel power meter, the measurement channel of the upper window and the lower window is channel A and channel B respectively.

:CONFigure[1]|2|3|4[:SCALar][:POWer][:AC]:DIFFerence

Function: Set the power measurement mode of the specified window to the difference measurement, and disable relative measurement.

Query: Not supported

Setting: :CONFigure[1]|2|3|4[:SCALar][:POWer][:AC]:DIFFerence [<Expected Value>[, <Resolution>[, <Source Channel List>]]]

Set it to the difference power measurement, the expected value and resolution can be expressed in DEF, indicating no change. The range of the resolution is 1 - 4; the form of the channel list is:

(@1), (@2), indicating channel A - channel B.

(@2), (@1), indicating channel B - channel A.

(@1), (@1), indicating channel A - channel A.

(@2), (@2), indicating channel B - channel B.

Example: CONF2:DIFF DEF, 3, (@1), (@2) Set the upper measurement of the lower window to the difference power measurement (channel A - channel B), and the resolution is 3.

Error information If the specified channel is not connected with the sensor, it will prompt “-241, “Hardware Missing"”.

:CONFigure[1]|2|3|4[:SCALar][:POWer][:AC]:DIFFerence:RELative

Function: Set the power measurement mode of the specified window to the difference measurement, and enable relative measurement.

Query: Not supported

Setting: :CONFigure[1]|2|3|4[:SCALar][:POWer][:AC]:DIFFerence:RELative [<Expected Value>[, <Resolution>[, <Source Channel List>]]]

Set it to the difference power measurement, and enable relative measurement, the expected value and resolution can be expressed in DEF, indicating no change. The range of the resolution is 1 - 4; the form of the channel list is:

(@1), (@2), indicating channel A - channel B.

(@2), (@1), indicating channel B - channel A.

(@1), (@1), indicating channel A - channel A.

(@2), (@2), indicating channel B - channel B.

Example: CONF3:DIFF:REL DEF, 3, (@2), (@1) Set the lower measurement of the upper window to the difference power measurement (channel A - channel B), set the resolution to 3, and enable relative measurement.

Error information: If the specified channel is not connected with the sensor, it will prompt “-241, “Hardware Missing"”.

Reset status: None

:CONFigure[1]|2|3|4[:SCALar][:POWer][:AC]:RATio

Function: Set the power measurement mode of the specified window to the ratio measurement, and disable relative measurement.

Query: Not supported

Setting: :CONFigure[1]|2|3|4[:SCALar][:POWer][:AC]:RATio [<Expected Value>[, <Resolution>[, <Source Channel List>]]]

Set it to the ratio power measurement, the expected value and resolution can be

expressed in DEF, indicating no change. The range of the resolution is 1 - 4; the form of the channel list is:

(@1), (@2), indicating that channel B is divided by channel A.

(@2), (@1), indicating that channel A is divided by channel B.

(@1), (@1), indicating that channel A is divided by channel A.

(@2), (@2), indicating that channel B is divided by channel B.

Example: CONF4:RAT DEF, 3, (@1), (@2) Set the lower measurement of the lower window to the ratio power measurement (channel B is divided by channel A), and the resolution is 3.

Error information: If the specified channel is not connected with the sensor, it will prompt “-241, “Hardware Missing"”.

Reset status: None

:CONFigure[1]|2|3|4[:SCALar][:POWer][:AC]:RATio:RELative

Function: Set the power measurement mode of the specified window to the ratio measurement, and enable relative measurement.

Query: Not supported

Setting: :CONFigure[1]|2|3|4[:SCALar][:POWer][:AC]:RATio:RELative [<Expected Value>[, <Resolution>[, <Source Channel List>]]]

Set it to the ratio power measurement, and enable relative measurement. The expected value and resolution can be expressed in DEF, indicating no change. The range of the resolution is 1 - 4; the form of the channel list is:

(@1), (@2), indicating that channel B is divided by channel A.

(@2), (@1), indicating that channel A is divided by channel B.

(@1), (@1), indicating that channel A is divided by channel A.

(@2), (@2), indicating that channel B is divided by channel B.

Example: CONF:RAT:REL DEF, 3, (@1), (@2) Set the upper measurement of the upper window to the ratio power measurement (channel B is divided by channel A), set the resolution to 3, and enable relative measurement.

Error information: If the specified channel is not connected with the sensor, it will prompt “-241, “Hardware Missing"”.

:CONFigure[1]|2|3|4[:SCALar][:POWer][:AC]:RELative

Function: Set the absolute power measurement mode of the specified window, and enable relative measurement.

Query: Not supported

Setting: :CONFigure[1]|2|3|4[:SCALar][:POWer][:AC]:RELative [<Expected Value>[, <Resolution>[, <Source Channel List>]]]

Set it to the absolute power measurement, and enable relative measurement. The expected value and resolution can be expressed in DEF, indicating no change. The range of the resolution is 1 - 4; the form of the channel list is: (@1), (@2), indicating channel A and channel B respectively.

Example: CONF:REL DEF, 3, (@2) Set the upper measurement of the upper window to the absolute power measurement, and set the resolution to 3 and source channel to B, and enable relative measurement.

Error information: If the specified channel is not connected with the sensor, it will prompt “-241, “Hardware Missing"”.

:FETCh[1]|2:ARRay:AMEasure:POWer?

Function: Query the peak power, average pulse power, overshoot, top power, bottom power and pulse power measured by the given channel pulse, and the unit is the same as the channel trace display unit. The average pulse power can be measured only if a complete waveform is displayed on the screen. If one parameter is invalid, 9.91e37 (NAN) will be returned. It is same as below, which will not be described any more.

Query: :FETCh[1]|2:ARRay:AMEasure:POWer?

The returned value represents the peak power, average power, overshoot, top power, bottom power and pulse power in turn.

Setting: Not supported

Example: FETC:ARR:AME:POW? Query the automatic power measurement value of channel 1.

Limit: The peak measurement mode of peak sensor; the horizontal scale (time base) shall be properly set to measure the above automatic parameters.

:FETCh[1]|2:ARRay:AMEasure:TIME?

Function: Query the pulse measurement frequency, cycle, width, closing time, duty cycle, rising time and falling time of the given channel. Each automatic measurement parameter shall be displayed on the screen under the graphic mode to obtain correct reading. For example, measurement of the pulse frequency, cycle, closing time and duty cycle shall ensure that at least one complete cycle can be displayed on the screen, the pulse width shall ensure that at least one complete pulse can be displayed on the screen, measurement of the rising time and falling time can be observed, and ensure that the whole edge will occupy at least 0.1 grids.

Query: :FETCh[1]|2:ARRay:AMEasure:TIME?

The returned value represents the pulse measurement frequency, cycle, width, closing time, duty cycle, rising time and falling time in turn.

Setting: Not supported

Example: FETC:ARR:AME:TIME? Query the automatic time measurement value of channel 1.

Limit: The peak measurement mode of peak sensor; the horizontal scale (time base) shall be properly set to measure the above automatic parameters.

Reset status: None.

:FETCh[1]|2:DROop?

Function: Query the pulse droop of the given channel.

Query: :FETCh[1]|2:DROop?

Setting: Not supported

Example: FETC:DRO? Query the pulse droop of channel 1.

Limit: The measurement mode of peak sensor; the horizontal scale (time base) shall be properly set to measure the above automatic parameters.

Reset status:

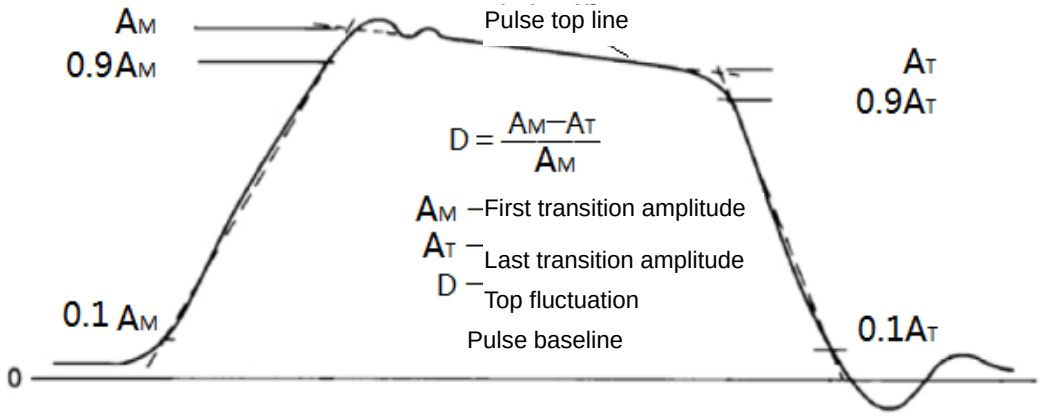


Fig.3.3 Droop

:FETCh[1]|2|3|4[:SCALar][:POWer][:AC]?

Function: Set the specified window to the absolute power measurement, disable relative measurement, and return the measurement value displayed by the current window. The measurement unit will be specified by UNIT[1]|2|3|4:POWer. This command will be returned even though one measurement is not completed. To obtain accurate measurement value, please use meas command.

Query: :FETCh[1]|2|3|4[:SCALar][:POWer][:AC]? [<Expected Value>[, <Resolution>[, <Source Channel List>]]]

Set it to the absolute power measurement, and disable relative measurement. The expected value and resolution can be expressed in DEF, indicating no change. The range of the resolution is 1 - 4; the form of the channel list is: (@1), (@2), indicating channel A and channel B respectively.

Setting: Not supported

Example: FETC2? Query if the upper measurement of the lower window is the absolute power measurement value.

Error information: If the specified channel is not connected with the sensor, it will prompt “-241, “Hardware Missing"”.

:FETCh[1]|2|3|4[:SCALar][:POWer][:AC]:DIFFerence?

Function: Set the specified window to the difference power measurement, disable relative measurement, and return the measurement value. The measurement unit will be specified by UNIT[1]|2|3|4:POWer. This command will be returned even though one measurement is not completed. To obtain accurate measurement value, please use meas command.

Query: :FETCh[1]|2|3|4[:SCALar][:POWer][:AC]:DIFFerence? [<Expected Value>[, <Resolution>[, <Source Channel List>]]]

Set it to the difference power measurement, and disable relative measurement. The expected value and resolution can be expressed in DEF, indicating no change. The range of the resolution is 1 - 4; the form of the source channel list is

(@1), (@2), indicating channel A - channel B.

(@2), (@1), indicating channel B - channel A.

(@1), (@1), indicating channel A - channel A.

(@2), (@2), indicating channel B - channel B.

Setting: Not supported

Example: FETC3:DIFF? DEF, 3, (@2), (@1) Set the lower measurement of the upper window

to the difference power measurement (channel B - channel A), set the resolution to 3, disable relative measurement, and return the power measurement value.

Error information: If the specified channel is not connected with the sensor, it will prompt “-241, “Hardware Missing"”.

:FETCh[1]|2|3|4[:SCALar][:POWer][:AC]:DIFFerence:RELative?

Function: Set the specified window to the difference power measurement, enable relative measurement, and return the measurement value. The measurement unit will be specified by UNIT[1]|2|3|4:POWer:RATio. This command will be returned even though one measurement is not completed. To obtain accurate measurement value, please use meas command.

Query: :FETCh[1]|2|3|4[:SCALar][:POWer][:AC]:DIFFerence:RELative? [<Expected Value>[, <Resolution>[, <Source Channel List>]]]

Set it to the difference power measurement, and enable relative measurement. The expected value and resolution can be expressed in DEF, indicating no change. The range of the resolution is 1 - 4; the form of the source channel list is

(@1), (@2), indicating channel A - channel B.

(@2), (@1), indicating channel B - channel A.

(@1), (@1), indicating channel A - channel A.

(@2), (@2), indicating channel B - channel B.

Setting: Not supported

Example: FETC3:DIFF:REL? DEF,3,(@2), (@1) Set the lower measurement of the upper window to the difference power measurement (channel B - channel A), set the resolution to 3, enable relative measurement, and return the power measurement value.

Error information: If the specified channel is not connected with the sensor, it will prompt “-241, “Hardware Missing"”.

:FETCh[1]|2|3|4[:SCALar][:POWer][:AC]:RATio?

Function: Set the power measurement mode of the specified window to the ratio measurement, disable relative measurement, and return the measurement value. The measurement unit will be specified by UNIT[1]|2|3|4:POWer:RATio. This command will be returned even though one measurement is not completed. To obtain accurate measurement value, please use meas command.

Query: :FETCh[1]|2|3|4[:SCALar][:POWer][:AC]:RATio? [<Expected Value>[, <Resolution>[, <Source Channel List>]]]

Set it to the ratio power measurement, the expected value and resolution can be expressed in DEF, indicating no change. The range of the resolution is 1 - 4; the form of the channel list is:

(@1), (@2), indicating that channel B is divided by channel A.

(@2), (@1), indicating that channel A is divided by channel B.

(@1), (@1), indicating that channel A is divided by channel A.

(@2), (@2), indicating that channel B is divided by channel B.

Setting: Not supported

Example: FETC4:RAT? DEF, 3, (@1), (@2) Set the lower measurement of the lower window to the ratio power measurement (channel B is divided by channel A), disable relative measurement, and set the resolution to 3.

Return the measurement value.

Error information: If the specified channel is not connected with the sensor, it will prompt “-241, “Hardware Missing"”.

:FETCh[1]|2|3|4[:SCALar][:POWer][:AC]:RATio:RELative?

Function: Set the power measurement mode of the specified window to the ratio measurement, enable relative measurement, and return the measurement value. The measurement unit will be specified by UNIT[1]|2|3|4:POWer:RATio. This command will be returned even though one measurement is not completed. To obtain accurate measurement value, please use meas command.

Query: :FETCh[1]|2|3|4[:SCALar][:POWer][:AC]:RATio:RELative? [<Expected Value>[, <Resolution>[, <Source Channel List>]]]

Set it to the ratio power measurement, the expected value and resolution can be expressed in DEF, indicating no change. The range of the resolution is 1 - 4; the form of the channel list is:

(@1), (@2), indicating that channel B is divided by channel A.

(@2), (@1), indicating that channel A is divided by channel B.

(@1), (@1), indicating that channel A is divided by channel A.

(@2), (@2), indicating that channel B is divided by channel B.

Setting: Not supported

Example: FETC4:RAT:REL? DEF, 3, (@1), (@2) — Set the lower measurement of the lower window to the ratio power measurement (channel B is divided by channel A), enable relative measurement, and set the resolution to 3. Return the measurement value

Error information: If the specified channel is not connected with the sensor, it will prompt “-241, “Hardware Missing"”.

:FETCh[1]|2|3|4[:SCALar][:POWer][:AC]:RELative?

Function: Set the specified window to the absolute power measurement, enable relative measurement, and return the measurement value. The measurement unit will be specified by UNIT[1]|2|3|4:POWer:RATio. This command will be returned even though one measurement is not completed. To obtain accurate measurement value, please use meas command.

Query: :FETCh[1]|2|3|4[:SCALar][:POWer][:AC]:RELative? [<Expected Value>[, <Resolution>[, <Source Channel List>]]]

Set it to the absolute power measurement, and disable relative measurement. The expected value and resolution can be expressed in DEF, indicating no change. The range of the resolution is 1 - 4; the form of the channel list is: (@1), (@2), indicating channel A and channel B respectively.

Setting: Not supported

Example: FETC2:REL? — Query the relative power measurement value of the upper measurement of the lower window.

Error information: If the specified channel is not connected with the sensor, it will prompt “-241, “Hardware Missing"”.

:MEASure[1]|2|3|4[:SCALar][:POWer][:AC]?

Function: Set the specified window to the absolute power measurement, disable relative measurement, and return the measurement value. The measurement unit will be specified by UNIT[1]|2|3|4:POWer. Start one measurement, and return the measurement value after completion. The corresponding FETCh command is to return the currently

measured value, rather than returning it after the measurement is completed. Please use MEASure command when establishing the test system.

Query: :MEASure[1]|2|3|4[:SCALar][:POWer][:AC]? [<Expected Value>[, <Resolution>[, <Source Channel List>]]]

Set it to the absolute power measurement, and disable relative measurement. The expected value and resolution can be expressed in DEF, indicating no change. The range of the resolution is 1 - 4; the form of the channel list is: (@1), (@2), indicating channel A and channel B respectively.

Setting: Not supported

Example: MEAS2? Start one measurement, and the upper measurement of the lower window returned after the measurement is completed is the absolute power measurement value.

Error information: If the specified channel is not connected with the sensor, it will prompt “-241, “Hardware Missing"”.

:MEASure[1]|2|3|4[:SCALar][:POWer][:AC]:DIFFerence?

Function: Set the specified window to the difference power measurement, disable relative measurement, and return the measurement value. The measurement unit will be specified by UNIT[1]|2|3|4:POWer. Start one measurement, and return the measurement value after completion. The corresponding FETCh command is to return the currently measured value, rather than returning it after the measurement is completed. Please use MEASure command when establishing the test system.

Query: :MEASure[1]|2|3|4[:SCALar][:POWer][:AC]:DIFFerence? [<Expected Value>[, <Resolution>[, <Source Channel List>]]]

Set it to the difference power measurement, and disable relative measurement. The expected value and resolution can be expressed in DEF, indicating no change. The range of the resolution is 1 - 4; the form of the source channel list is

(@1), (@2), indicating channel A - channel B.

(@2), (@1), indicating channel B - channel A.

(@1), (@1), indicating channel A - channel A.

(@2), (@2), indicating channel B - channel B.

Setting: Not supported

Example: MEAS3:DIFF? DEF, 3, (@2), (@1) Set the lower measurement of the upper window to the difference power measurement (channel B - channel A), set the resolution to 3, disable relative measurement, start one measurement, and return the power measurement value after completion.

Error information: If the specified channel is not connected with the sensor, it will prompt “-241, “Hardware Missing"”.

:MEASure[1]|2|3|4[:SCALar][:POWer][:AC]:DIFFerence:RELative?

Function: Set the specified window to the difference power measurement, enable relative measurement, and return the measurement value. The measurement unit will be specified by UNIT[1]|2|3|4:POWer:RATio. Start one measurement, and return the measurement value after completion. The corresponding FETCh command is to return the currently measured value, rather than returning it after the measurement is completed. Please use MEASure command when establishing the test system.

Query: :MEASure[1]|2|3|4[:SCALar][:POWer][:AC]:DIFFerence:RELative? [<Expected Value>[, <Resolution>[, <Source Channel List>]]]

Set it to the difference power measurement, and enable relative measurement. The

expected value and resolution can be expressed in DEF, indicating no change. The range of the resolution is 1 - 4; the form of the source channel list is

(@1), (@2), indicating channel A - channel B.

(@2), (@1), indicating channel B - channel A.

(@1), (@1), indicating channel A - channel A.

(@2), (@2), indicating channel B - channel B.

Setting: Not supported

Example: MEAS3:DIFF:REL? DEF, 3, (@2), (@1) — Set the lower measurement of the upper window to the difference power measurement (channel B - channel A), set the resolution to 3, enable relative measurement, start one measurement, and return the power measurement value after completion.

Error information: If the specified channel is not connected with the sensor, it will prompt “-241, “Hardware Missing"”.

:MEASure[1]|2|3|4[:SCALar][:POWer][:AC]:RATio?

Function: Set the power measurement mode of the specified window to the ratio measurement, disable relative measurement, and return the measurement value. The measurement unit will be specified by UNIT[1]|2|3|4:POWer:RATio. Start one measurement, and return the measurement value after completion. The corresponding FETCh command is to return the currently measured value, rather than returning it after the measurement is completed. Please use MEASure command when establishing the test system.

Query: :MEASure[1]|2|3|4[:SCALar][:POWer][:AC]:RATio? [<Expected Value>[, <Resolution>[, <Source Channel List>]]]

Set it to the ratio power measurement, the expected value and resolution can be expressed in DEF, indicating no change. The range of the resolution is 1 - 4; the form of the channel list is:

(@1), (@2), indicating that channel B is divided by channel A.

(@2), (@1), indicating that channel A is divided by channel B.

(@1), (@1), indicating that channel A is divided by channel A.

(@2), (@2), indicating that channel B is divided by channel B.

Setting: Not supported

Example: MEAS4:RAT? DEF, 3, (@1), (@2) — Set the lower measurement of the lower window to the ratio power measurement (channel B is divided by channel A), disable relative measurement, and set the resolution to 3. Start one measurement, and return the power measurement value after completion.

Error information: If the specified channel is not connected with the sensor, it will prompt “-241, “Hardware Missing"”.

:MEASure[1]|2|3|4[:SCALar][:POWer][:AC]:RATio:RELative?

Function: Set the power measurement mode of the specified window to the ratio measurement, enable relative measurement, and return the measurement value. The measurement unit will be specified by UNIT[1]|2|3|4:POWer:RATio. Start one measurement, and return the measurement value after completion. The corresponding FETCh command is to return the currently measured value, rather than returning it after the measurement is completed. Please use MEASure command when establishing the test system.

Query: :MEASure[1]|2|3|4[:SCALar][:POWer][:AC]:RATio:RELative? [<Expected Value>[, <Resolution>[, <Source Channel List>]]]

Set it to the ratio power measurement, the expected value and resolution can be expressed in DEF, indicating no change. The range of the resolution is 1 - 4; the form of the channel list is:

(@1), (@2), indicating that channel B is divided by channel A.

(@2), (@1), indicating that channel A is divided by channel B.

(@1), (@1), indicating that channel A is divided by channel A.

(@2), (@2), indicating that channel B is divided by channel B.

Setting: Not supported

Example: MEAS4:RAT:REL? DEF, 3, (@1), (@2) — Set the lower measurement of the lower window to the ratio power measurement (channel B is divided by channel A), enable relative measurement, and set the resolution to 3. Start one measurement, and return the power measurement value after completion.

Error information: If the specified channel is not connected with the sensor, it will prompt “-241, “Hardware Missing"”.

:MEASure[1]|2|3|4[:SCALar][:POWer][:AC]:RELative?

Function: Set the specified window to the absolute power measurement, enable relative measurement, and return the measurement value. The measurement unit will be specified by UNIT[1]|2|3|4:POWer. Start one measurement, and return the measurement value after completion. The corresponding FETCh command is to return the currently measured value, rather than returning it after the measurement is completed. Please use MEASure command when establishing the test system.

Query: :MEASure[1]|2|3|4[:SCALar][:POWer][:AC]:RELative? [<Expected Value>[, <Resolution>[, <Source Channel List>]]]

Set it to the absolute power measurement, and disable relative measurement. The expected value and resolution can be expressed in DEF, indicating no change. The range of the resolution is 1 - 4; the form of the channel list is: (@1), (@2), indicating channel A and channel B respectively.

Setting: Not supported

Example: MEAS2:REL? — Start one measurement, and return the absolute power measurement value of the upper measurement of the lower window after the measurement is completed.

Error information: If the specified channel is not connected with the sensor, it will prompt “-241, “Hardware Missing"”.

:READ[1]|2|3|4[:SCALar][:POWer][:AC]?

Function: Set the specified window to the absolute power measurement, disable relative measurement, and return the measurement value. The measurement unit will be specified by UNIT[1]|2|3|4:POWer.

Query: :READ[1]|2|3|4[:SCALar][:POWer][:AC]? [<Expected Value>[, <Resolution>[, <Source Channel List>]]]

Set it to the absolute power measurement, and disable relative measurement. The expected value and resolution can be expressed in DEF, indicating no change. The range of the resolution is 1 - 4; the form of the channel list is: (@1), (@2), indicating channel A and channel B respectively.

Setting: Not supported

Example: READ2? — Query if the upper measurement of the lower window is the absolute power measurement

value.

Error information: If the specified channel is not connected with the sensor, it will prompt “-241, “Hardware Missing"”.

:READ[1]|2|3|4[:SCALar][:POWer][:AC]:DIFFerence?

Function: Set the specified window to the difference power measurement, disable relative measurement, and return the measurement value. The measurement unit will be specified by UNIT[1]|2|3|4:POWer.

Query: :READ[1]|2|3|4[:SCALar][:POWer][:AC]:DIFFerence? [<Expected Value>[, <Resolution>[, <Source Channel List>]]]

Set it to the difference power measurement, and disable relative measurement. The expected value and resolution can be expressed in DEF, indicating no change. The range of the resolution is 1 - 4; the form of the source channel list is

(@1), (@2), indicating channel A - channel B.

(@2), (@1), indicating channel B - channel A.

(@1), (@1), indicating channel A - channel A.

(@2), (@2), indicating channel B - channel B.

Setting: Not supported

Example: READ3:DIFF? DEF, 3, (@2), (@1) Set the lower measurement of the upper window to the difference power measurement (channel B - channel A), set the resolution to 3, disable relative measurement, and return the power measurement value.

Error information: If the specified channel is not connected with the sensor, it will prompt “-241, “Hardware Missing"”.

:READ[1]|2|3|4[:SCALar][:POWer][:AC]:DIFFerence:RELative?

Function: Set the specified window to the difference power measurement, enable relative measurement, and return the measurement value. The measurement unit will be specified by UNIT[1]|2|3|4:POWer:RATio.

Query: :READ[1]|2|3|4[:SCALar][:POWer][:AC]:DIFFerence:RELative? [<Expected Value>[, <Resolution>[, <Source Channel List>]]]

Set it to the difference power measurement, and enable relative measurement. The expected value and resolution can be expressed in DEF, indicating no change. The range of the resolution is 1 - 4; the form of the source channel list is

(@1), (@2), indicating channel A - channel B.

(@2), (@1), indicating channel B - channel A.

(@1), (@1), indicating channel A - channel A.

(@2), (@2), indicating channel B - channel B.

Setting: Not supported

Example: READ3:DIFF:REL? DEF, 3, (@2), (@1) Set the lower measurement of the upper window to the difference power measurement (channel B - channel A), set the resolution to 3, enable relative measurement, and return the power measurement value.

Error information: If the specified channel is not connected with the sensor, it will prompt “-241, “Hardware Missing"”.

:READ[1]|2|3|4[:SCALar][:POWer][:AC]:RATio?

Function: Set the power measurement mode of the specified window to the ratio measurement, disable relative measurement, and return the measurement value. The measurement

unit will be specified by UNIT[1]|2|3|4:POWer:RATio.

Query: :READ[1]|2|3|4[:SCALar][:POWer][:AC]:RATio [<Expected Value>[, <Resolution>[, <Source Channel List>]]]

Set it to the ratio power measurement, the expected value and resolution can be expressed in DEF, indicating no change. The range of the resolution is 1 - 4; the form of the channel list is:

(@1), (@2), indicating that channel B is divided by channel A.

(@2), (@1), indicating that channel A is divided by channel B.

(@1), (@1), indicating that channel A is divided by channel A.

(@2), (@2), indicating that channel B is divided by channel B.

Setting: Not supported

Example: READ4:RAT? DEF, 3, (@1), (@2) Set the lower measurement of the lower window to the ratio power measurement (channel B is divided by channel A), disable relative measurement, and set the resolution to 3. Return the measurement value.

Error information: If the specified channel is not connected with the sensor, it will prompt “-241, “Hardware Missing"”.

:READ[1]|2|3|4[:SCALar][:POWer][:AC]:RATio:RELative?

Function: Set the power measurement mode of the specified window to the ratio measurement, enable relative measurement, and return the measurement value. The measurement unit will be specified by UNIT[1]|2|3|4:POWer:RATio.

Query: :READ[1]|2|3|4[:SCALar][:POWer][:AC]:RATio:RELative? [<Expected Value>[, <Resolution>[, <Source Channel List>]]]

Set it to the ratio power measurement, the expected value and resolution can be expressed in DEF, indicating no change. The range of the resolution is 1 - 4; the form of the channel list is:

(@1), (@2), indicating that channel B is divided by channel A.

(@2), (@1), indicating that channel A is divided by channel B.

(@1), (@1), indicating that channel A is divided by channel A.

(@2), (@2), indicating that channel B is divided by channel B.

Setting: Not supported

Example: READ4:RAT:REL? DEF, 3, (@1), (@2) Set the lower measurement of the lower window to the ratio power measurement (channel B is divided by channel A), enable relative measurement, and set the resolution to 3. Return the measurement value.

Error information: If the specified channel is not connected with the sensor, it will prompt “-241, “Hardware Missing"”.

:READ[1]|2|3|4[:SCALar][:POWer][:AC]:RELative?

Function: Set the specified window to the absolute power measurement, enable relative measurement, and return the measurement value. The measurement unit will be specified by UNIT[1]|2|3|4:POWer:RATio.

Query: :READ[1]|2|3|4[:SCALar][:POWer][:AC]:RELative? [<Expected Value>[, <Resolution>[, <Source Channel List>]]]

Set it to the absolute power measurement, and disable relative measurement. The expected value and resolution can be expressed in DEF, indicating no change. The range of the resolution is 1 - 4; the form of the channel list is: (@1), (@2), indicating channel A and channel B respectively.

Setting: Not supported

Example: READ2:REL? Query the relative power measurement value of the upper measurement of the lower window.

Error information: If the specified channel is not connected with the sensor, it will prompt “-241, “Hardware Missing"”.

3.3.4 Display (DISPlay)

The DISPlay subsystem is used to control the display of texts, graphics, and traces.

The command includes:

:DISPlay:IMAGe:TEST

Function: Display image test.

Query: Not supported

Setting: :DISPlay:IMAGe:TEST

Example: :DISPlay:IMAGe:TEST Image test.

:DISPlay:SCReen:FORMat

Function: Query or set the display mode.

Query: :DISPlay:SCReen:FORMat?

Setting: :DISPlay:SCReen:FORMat <Character Data>

The valid character data includes:

The WINDowed sets the screen to the display in the upper and lower windows, which is invalid for statistical trace or statistical list mode.

The EXPanded sets the screen to the extended window display, with single window + menu

The FSCReen sets it to the full screen display, with single window while without menu display, which is invalid for statistical list mode.

Example: DISP:SCR:FORM? Query the display mode of the screen.

DISP:SCR:FORM FSCR Set it to the full screen mode.

Reset status: Display in the upper and lower windows.

Error information: For the statistical trace display mode, if the parameter WIND is selected , it will prompt “-221, “Settings Conflict"”.

For the statistical trace display mode, if the parameter WIND or FSCR is selected , it will prompt “-221, "Settings Conflict"”.

:DISPlay[:WINDow[1]|2]:FORMat

Function: Query or set the display mode of the specified window.

Query: :DISPlay[:WINDow[1]|2]:FORMat?

Setting: :DISPlay[:WINDow[1]|2]:FORMat <Character Data>
The valid character data includes:
DIGital: Set the single digit displayed in the window
SNUMeric: Set the single digit displayed in the window
DNUMeric: Set the double-digit displayed in the window
TRACe: Set the pulse trace displayed in the window
CTRace: Set the statistical trace displayed in the window
CTABle: Set the CCDF table displayed in the window.

Example:

DISP:FORM?	Query the display mode of the upper window.
DISP:WIND2:FORM DIG	Set the upper window to the single digit display.

Limit: The TRACe, CTRace and CTABle are only valid for the peak sensor (8170X).

Reset status: Single digit display.

Error information: If it is set to TRACe or CTRace or CTABl, or it is not connected with the sensor or it is only connected with CW sensor, it will prompt “-241, "Hardware Missing"”.

:DISPlay[:WINDow[1]|2][:NUMeric[1]|2]:RESolution

Function: Query or set the display resolution of the specified measurement of the specified window. The WINDow1 represents the upper window, which can be omitted, and WINDow2 represents the lower window. The NUMeric1 represents the upper measurement, which can be omitted, and NUMeric2 represents the lower measurement.

Query: :DISPlay[:WINDow[1]|2][:NUMeric[1]|2]:RESolution? [MIN|MAX]

Setting: :DISPlay[:WINDow[1]|2][:NUMeric[1]|2]:RESolution <Numeric Data>
The valid value of the numeric data includes: DEF, MIN, MAX and <NRf>, and DEF and <NRf> are only used for setting.
The range of <NRf> is 1 - 4.

Example:

DISP:WIND2:NUM2:RES?	Query the display resolution of the lower measurement of the lower window.
DISP:RES 3	Set the display resolution of the upper measurement of the upper window to 3, namely, in case of linear display, 3 valid digits will be displayed; in case of logarithmic display, 2 digits after the decimal point (0.01) will be displayed.

Reset status: The resolution is 3

:DISPlay[:WINDow[1]|2]:SELect[1]|2

Function: Query or set the specified measurement of the specified window. The WINDow1 represents the upper window, which can be omitted, and WINDow2 represents the lower window. The SELect1 represents the upper measurement, and SELect2 represents the lower measurement.

Query: :DISPlay[:WINDow[1]|2]:SELect[1]|2?

Setting: :DISPlay[:WINDow[1]|2]:SELect[1]|2

Example:

DISP:SEL1?	Query if the upper measurement of the upper window is selected.
DISP:WIND2:SEL1	Select the upper measurement of the lower window.

Limit: For an invisible window, there will be no operation after this command is sent.

Reset status: Select the upper measurement of the upper window.

:DISPlay[:WINDow[1]|2]:Status

Function: Enable or disable the display in the specified window.

Query: :DISPlay[:WINDow[1]|2]:Status?

Setting: :DISPlay[:WINDow[1]|2]:Status <Boolean Data>

Example:

DISP:STAT?	Query the upper window for display.
DISP:WIND2:STAT OFF	Disable the display in the lower window while extending the display in the upper window.
DISP:WIND2:STAT ON	Enable the display in the lower window.

Reset status: It will be displayed in both the upper and lower windows.

:DISPlay[:WINDow[1]|2]:TRACe:FEED

Function: Query or set the channel input of the trace display window.

Query: :DISPlay[:WINDow[1]|2]:TRACe:FEED?

Setting: :DISPlay[:WINDow[1]|2]:TRACe:FEED <String>

Example:

DISP:WIND1:TRAC:FEED?	Query the trace display channel of the upper window.
DISP:WIND2:TRAC:FEED "SENS1"	Set the trace of the display channel A of the lower window.

Limit: It is only valid for the peak sensor (8170X).

Reset status: For the single channel power meter, both the upper and lower windows will be A. For the double-channel power meter, the upper window and the lower window will be A and B respectively.

3.3.5 Format (FORMat)

:FORMat[:READings]:BORDer

Function: Query or set the transmission order of binary data: Normal or byte exchange.
It will be valid only whenFORMat[:READings][:DATA] is set to REAL.

Query: :FORMat[:READings]:BORDer?

Setting: :FORMat[:READings]:BORDer <Character Data>
The valid value of <Character Data> is: 0 or ASCii, 1 or REAL

Example:

FORM:BORD?	Query the transmission order.
FORM:BORD SWAP	Set the transmission order to byte exchange.

Reset status: Set it to normalNORMal

:FORMat[:READings][:DATA]

Function: Query or set the data transmission format: ASCii and REAL (real number)

Query: :FORMat[:READings][:DATA]?

Setting: :FORMat[:READings][:DATA] <Character Data>

The valid value of <Character Data> is: 0 or ASCii, 1 or REAL

ASCii: The transmission format of the numeric data is <NRf> form.

REAL: The transmission format of the numeric data is IEEE 754 64, and each data has 8 bytes.

Example: FORM? Query the data transmission format.

FORM REAL Set the data transmission format to REAL.

Reset status: Set it to ASCii

3.3.6 Memory (MEMory/MMEMory)

:MEMory:CATalog[:ALL]?

Function: List the user configuration in the power meter, including save recall configuration and FDO table.

The data format is: <Value 1>, <Value 2>{, <String>}

The <Value 1> represents the length of bytes used by the user in the configuration, and <Value 2> represents the length of unused bytes.

The form of each <String> is as follows:

<String i>, <Type>, <Length>

The <String i> indicates name of the user configuration.

The <Type> indicates type of the user configuration, TABL represents FDO table, and STAT represents save recall configuration.

The <Length> indicates the byte length of the configuration item.

Query: :MEMory:CATalog[:ALL]?

Setting: Not supported

Example: MEM:CAT? List all the user configurations in the power meter.

Reset status: None

:MEMory:CATalog:Status?

Function: List the save recall configuration in the microwave power meter.

The data format is: <Value 1>, <Value 2>{, <String>}

The <Value 1> represents the length of bytes used by the user in the configuration, and <Value 2> represents the length of unused bytes.

The form of each <String> is as follows:

<String i>, <Type>, <Length>

The <String i> indicates name of the user configuration.

The <Type> indicates type of the user configuration, and STAT represents the save recall configuration.

The <Length> indicates the byte length of the configuration item.

Query: :MEMory:CATalog:Status?

Setting: Not supported

Example: MEM:CAT:STAT? List the save recall configuration in the microwave power meter.

:MEMory:CATalog:TABLe?

Function: List FDO table in the power meter.

The data format is: <Value 1>, <Value 2>{, <String>}

The <Value 1> represents the length of bytes used by the user in the configuration, and <Value 2> represents the length of unused bytes.

The form of each <String> is as follows:

<String i>, <Type>, <Length>

The <String i> indicates name of the user configuration.

The <Type> indicates type of the user configuration, and TABL represents FDO table.

The <Length> indicates the byte length of the configuration item.

Query: :MEMory:CATalog:TABLe?

Setting: Not supported

Example: MEM:CAT:TABL? List FDO table in the power meter.

:MEMory:CLEar[:NAME]

Function: It is used to reset FDO table and save recall table specified in the power.

Query: Not supported

Setting: :MEMory:CLEar[:NAME] <String>

The <String> represents name of FDO table or save recall table

Example: MEM:CLE "fdo0" Clear fdo0 FDO table.

Description: 1) It will be automatically used if FDO table is enabled.

2) The English name of the save recall status is “State1”, “State2”……“State10”, and the name can’t be changed. The Chinese name of the save recall status is “State1”，“State2”……“State10”, and the name can’t be changed.

3) The FDO table will be cleared if the specified name can be found in the FDO list;

4) The status table will be cleared if the specified name can be found in the save recall list.

5) If “State1” FDO exists, recall MEM:CLE “State1” to clear FDO table and status table.

6) In the remote control setting, the status name of the save recall is irrelated to the

language switch of the interface, namely, the following two commands will be used to clear the Status 1 (English name is recommended):

MEM:CLE "State1"

MEM:CLE "State1"

Error information: If there is no specified name, it will prompt “-224, "Invalid Parameter Value"”

Reset status: None

:MEMory:CLEar:TABLe[1]|2|3|4|5|6|7|8|9|10

Function: Clear the specified FDO table.

Query: Not supported

Setting: :MEMory:CLEar:TABLe[1]|2|3|4|5|6|7|8|9|10

Example: MEM:CLE:TABL5 Clear the 5th FDO table. (10 totally)

:MEMory:FREE[:ALL]?

Function: Query the total number of unused bytes and the number of used bytes in the user configuration space.

The form of the returned string: <Number of Unused Bytes>, <Number of Used Bytes>

Query: :MEMory:FREE[:ALL]?

Setting: Not supported

Example: MEM:FREE?

:MEMory:FREE:Status?

Function: Query the total number of unused bytes and the number of used bytes in the save recall space.

The form of the returned string: <Number of Unused Bytes>, <Number of Used Bytes>

Query: :MEMory:FREE:Status?

Setting: Not supported

Example: MEM:FREE:STAT?

:MEMory:FREE:TABLe?

Function: Query the total number of unused bytes and the number of used bytes in FDO table space.

The form of the returned string: <Number of Unused Bytes>, <Number of Used Bytes>

Query: :MEMory:FREE:TABLe?

Setting: Not supported

Example: MEM:FREE:TABL?

:MEMory:NStatuss?

Function: Query number of the save recall status, and 10 will be returned always

Query: :MEMory:NStatuss?

Setting: Not supported

Example: MEM:NST?

:MEMory:Status:CATalog?

Function: List name of all the save recall status.

Query: :MEMory:Status:CATalog?

Setting: Not supported

Example: MEM:STAT:CAT?

:MEMory:TABLe[1]|2|3|4|5|6|7|8|9|10:DEFine

Function: Query or set name of the specified FDO table.

Query: :MEMory:TABLe[1]|2|3|4|5|6|7|8|9|10:DEFine?

Setting: :MEMory:TABLe[1]|2|3|4|5|6|7|8|9|10:DEFine <String>

Example: MEM:TABL6:DEF? Query name of the 6th FDO table.

MEM:TABL8:DEF "fdo0" Name the 8th FDO table as fdo0.

Error information: If the specified name exists, it will prompt “-257, "File Name Error"”.

:MEMory:TABLe[1]|2|3|4|5|6|7|8|9|10:FREQuency

Function: Query or set the frequency list of the specified FDO table.

When the frequency list is set, the previous frequency list will be cleared, and the frequency list must be in ascending order.

The relevant command is :MEMory:TABLe[1]|2|3|4|5|6|7|8|9|10:GAIN[:MAGNitude]

Query: :MEMory:TABLe[1]|2|3|4|5|6|7|8|9|10:FREQuency?

Setting: :MEMory:TABLe[1]|2|3|4|5|6|7|8|9|10:FREQuency <Numeric Data 1>{, <Numeric Data n>}

It is necessary to ensure that the frequency list covers the frequency range of the sensor, and if the frequency of the measured signal is out of the range of the list, the value at the lowest or the highest frequencies will be used.

The number of the maximum frequency point is 80.

The effective frequency unit includes Hz, kHz, MHz, GHz

Example: MEM:TABL6:FREQ? Query the frequency list of the 6th FDO table.

MEM:TABL6:FREQ 50MHz, 40GHz Set the frequency of the 6th FDO table to 50 MHz and 40 GHz.

Error information: If the number of points in the frequency list is more than 80, it will prompt Programming Manual.

If the frequency list is not in ascending order, it will prompt “-220,” Parameter Error””

Reset status: None

:MEMory:TABLe[1]|2|3|4|5|6|7|8|9|10:FREQuency:POINts?

Function: Query number of the frequency point of FDO table.

Query: :MEMory:TABLe[1]|2|3|4|5|6|7|8|9|10:FREQuency:POINts?

Setting: Not supported

Example: MEM:TABL6:FREQ:POIN? Query number of the frequency point of the 6th FDO table.

:MEMory:TABLe[1]|2|3|4|5|6|7|8|9|10:GAIN[:MAGNitude]

Function: Query or set the amplitude gain list of the specified FDO table.

When the gain list is set, the previous gain list will be cleared,

The relevant command is :MEMory:TABLe[1]|2|3|4|5|6|7|8|9|10:FREQuency

Query: :MEMory:TABLe[1]|2|3|4|5|6|7|8|9|10:GAIN[:MAGNitude]?

Setting: :MEMory:TABLe[1]|2|3|4|5|6|7|8|9|10:GAIN[:MAGNitude] <Numeric Data 1>{, <Numeric

Data n>}

The number of the maximum gain point is 80.

The unit is PCT, namely 100 represents 100%

The amplitude gain range is 1.0e-009 - 1.0e+009, namely -90 dB - 90 dB.

Example:	MEM:TABL6:GAIN?	Query the gain list of the 6th FDO table.
	MEM:TABL6:GAIN 98, 102	Set the gain list of the 6th FDO table to 98%, 102%.

:MEMory:TABLe[1]|2|3|4|5|6|7|8|9|10:GAIN[:MAGNitude]:POINts?

Function: Query number of the amplitude gain point of FDO table.

Query: :MEMory:TABLe[1]|2|3|4|5|6|7|8|9|10:GAIN[:MAGNitude]:POINts?

Setting: Not supported

Example:	MEM:TABL6:GAIN:POIN?	Query number of the amplitude gain point of the 6th FDO table

:MEMory:TABLe:MOVE

Function: Rename the specified FDO table. This command needs to know name of FDO table to be modified in advance.

The relevant command MEMory:TABLe[1]|2|3|4|5|6|7|8|9|10:DEFine

The MEMory:TABLe[1]|2|3|4|5|6|7|8|9|10:DEFine is recommended.

Query: Not supported

Setting: :MEMory:TABLe:MOVE <String 1>, <String 2>

The <String 1> indicates name of FDO table to be modified

The <String 2> indicates name of the modified FDO table

Example: MEM:TABL:MOVE "fdo0", "fdo1"

Error information: If FDO table specified by the first parameter doesn't exist, it will prompt "-256, "File Name Not Found""

If FDO table specified by the second parameter doesn't exist, it will prompt "-257, "File Name Error""

If the length of the second parameter exceeds 16 characters, it will prompt "-257, "File Name Error""

:MEMory:TABLe:SELect

Function: Query or set the current FDO table. It is different from 2434. As the sensor calibration table is supported in 2434, it can be selected with this command. Only FDO table is supported in this case.

Query: :MEMory:TABLe:SELect?

Setting: :MEMory:TABLe:SELect <String>

Example:	MEM:TABL:SEL?	Return name of the current FDO table.
	MEM:TABL:SEL "fdo0"	Set the current FDO table to fdo0.

Error information: If FDO table specified by the parameter doesn't exist, it will prompt "-224, "Invalid Parameter Value"".

3.3.7 Output (OUTPut)

:OUTPut:LEVel:POWer

Function: Query or set the power level of the calibrator.
Equivalent command :OUTPut:ROSCillator:LEVel

Query: :OUTPut:LEVel:POWer? [MIN|MAX]

Setting: :OUTPut:LEVel:POWer <Numeric Data>
The valid value of the numeric data includes: DEF, MIN, MAX and <NRf>, and DEF and <NRf> are only used for setting.
The range of <NRf> is -40 - 20, and DEF is 0.

Example:

OUTP:LEV:POW?	Query the output power level of the current calibrator.
OUTP:LEV:POW? MAX	Query the upper limit of the output power level of the calibrator.
OUTP: LEV:POW DEF	Set the output power level of the calibrator to 0 dBm.

Limit: It is supported by 2436 but not supported by 2438.

Reset status: Set it to 0 dBm

:OUTPut:RECorder[1]|2:FEED

Function: Query or set measurement input of the recorder, namely, which measurement will be sent to the recorder.

Query: :OUTPut:RECorder[1]|2:FEED?

Setting: :OUTPut:RECorder[1]|2:FEED <Data Handle>
The range of <Data Handle> (data_handle) is:
"CALCulate[1]": Upper measurement of the upper window
"CALCulate2": Upper measurement of the lower window
"CALCulate3": Lower measurement of the upper window
"CALCulate4": Lower measurement of the lower window

Example:

OUTP:REC1:FEED?	Query measurement input of the recorder.
OUTP:REC1:FEED "CALC2"	Send measurement result of the upper measurement of the lower window to the recorder.

Limit: It is supported by 2436 but not supported by 2438.

Reset status: Not affected

:OUTPut:RECorder[1]|2:LIMit:LOWer

Function: Query or set the lower limit power of the recorder. Its unit will be determined by the unit of the window specified by OUTPut:RECorder[1]|2:FEED.

Query: :OUTPut:RECorder[1]|2:LIMit:LOWer?

Setting: :OUTPut:RECorder[1]|2:LIMit:LOWer <NRf>
The range of <NRf>: Different units will have different ranges.
dBm: -150 dBm ~ 210 dBm

W: 0 W ~ 1X W
dB: -180 dB ~ 180 dB
%: 0% ~ 100X%

Example: OUTP:REC1:LIM:LOW?
OUTP:REC1:LIM:LOW -90

Limit: It is supported by 2436 but not supported by 2438.

Reset status: Set the lower limit of the recorder to -70 dBm

:OUTPut:RECorder[1]|2:LIMit:UPPer

Function: Query or set the upper limit power of the recorder. Its unit will be determined by the unit of the window specified by OUTPut:RECorder[1]|2:FEED.

Query: :OUTPut:RECorder[1]|2:LIMit:UPPer?

Setting: :OUTPut:RECorder[1]|2:LIMit:UPPer <NRf>
The range of <NRf>: Different units will have different ranges.
dBm: -150 dBm ~ 210 dBm
W: 0W ~ 1XW
dB: -180dB ~ 180dB
%: 0% ~ 100X%

Example: OUTP:REC1:LIM:UPP?
OUTP:REC1:LIM:UPP 20

Limit: It is supported by 2436 but not supported by 2438.

Reset status: Set the upper limit of the recorder to 20 dBm

:OUTPut:RECorder[1]|2:Status

Function: Query or set the output switch state of the recorder.

Query: :OUTPut:RECorder[1]|2:Status?

Setting: :OUTPut:RECorder[1]|2:Status <Boolean Data>
The effective form of <Boolean Data> includes 0, OFF, 1 and ON

Example:

OUTP:REC1:STAT?	Query the switch state of recorder 1.
OUTP:REC1:STAT ON	Turn on the switch of recorder 1.
OUTP:REC1:STAT 0	Disable the output of recorder 1.

Limit: It is supported by 2436 but not supported by 2438.

Reset status: Disable the output of the recorder

:OUTPut:ROSCillator:LEVel

Function: Query or set the power level of the calibrator.
Equivalent command :OUTPut:LEVel:POWer

Query: :OUTPut:ROSCillator:LEVel? [MIN|MAX]

Setting: :OUTPut:ROSCillator:LEVel <Numeric Data>
The valid value of the numeric data includes: DEF, MIN, MAX and <NRf>, and DEF and <NRf> are only used for setting.
The range of <NRf> is -40 - 20, and DEF is 0.

Example: OUTP:ROSC:LEV? Query the output power level of the current

		calibrator.
	OUTP:ROSC:LEV? MAX	Query the upper limit of the output power level of the calibrator.
	OUTP:ROSC:LEV DEF	Set the output power level of the calibrator to 0 dBm.

Limit: It is supported by 2436 but not supported by 2438.

Reset status: Set it to 0 dBm

:OUTPut:ROSCillator[:Status]

Function: Query or set the output status of the calibrator.

Query: :OUTPut:ROSCillator[:Status]?

Setting: :OUTPut:ROSCillator[:Status] <Boolean Data>
The effective form of <Boolean Data> includes 0, OFF, 1 and ON

Example:	OUTP:ROSC?	Query the output status of the calibrator.
	OUTP:ROSC 1	Enable the output of the calibrator.

Reset status: Off

3.3.8 Statistic (PSTatistic)

The statistic subsystem command is only applicable to the peak power sensor(8170X), which is used to configure settings of Cumulative Distribution Function (CDF), Complementary Cumulative Distribution Function (CCDF) and Density Distribution Function(PDF).

:PSTatistic[1]|2:CCDF:COUNt

Function: Query or set the total number of statistical terminations, which can be in the form of 1.2 G.

The total number of statistics of the two channels is shared, namely, once the total number of statistics of channel A is set, the statistics of channel B will be changed accordingly.

Relevant command:

:PSTatistic[1]|2:CCDF:END:ACTion

:PSTatistic[1]|2:CCDF:TIME

Query: :PSTatistic[1]|2:CCDF:COUNt?

Setting: :PSTatistic[1]|2:CCDF:COUNt <NRf>

The range of <NRf> is 1 M (1e+06) - 4200 M (4.2e+09)

Example:	PST:CCDF:COUN?	Query the total number of statistical terminations.
	PST:CCDF:COUN 1e8	Set the total number of statistical terminations to 100 M.

Limit: It is only valid for the peak sensor (8170X).

Reset status: It is 100 M by default.

:PSTatistic[1]|2:CCDF:DATA?

Function: Query the statistical probability list of the power meter. The power range is 0 dB - maximum power, and the number of elements in the list is 321, unit: % (for example, 18.9 represents 18.9%).

The format of the returned data is <Arbitrary Data Block> See section 7.7.6 of the IEEE 488.2

#nNNN...Nddd……ddd<LF>

Data newline character, indicating the end of the data block.
Data length (namely the number of bytes of d)
Number of bits of data length (namely the number of bits of N)
Beginning tag of the data block.

For example: #41284…..<LF>, n = 4, N = 1284.

The format of each data element is IEEE 754 32-bit floating point data, namely, 4 bytes.

Query: :PSTatistic[1]|2:CCDF:DATA?

Setting: Not supported

Example:	PST2:CCDF:DATA?	Query the statistical probability buffer data of channel B.

Limit: It is only valid for the peak sensor (8170X).

Description: A newline character (0x0A) may be included in the binary data block. When using the VISA library, VI_ATTR_TERMCHAR_EN shall be set to VI_FALSE after sending the

command and before reading the data. Firstly read the first two bytes (#n) to determine the length of the subsequent data block. After that, read n bytes, calculate number of subsequent bytes N, and finally read N bytes. N bytes are the real trace data.

Error information: If the given channel is not connected with the sensor or it is connected with the CW sensor, it will prompt “-241, “Hardware Missing"”;

If the current display mode is not the statistical trace or statistical table, it will prompt “-221, “Settings Conflict"”.

Reset status: None

:PSTatistic[1]|2:CCDF:DATA:MAX

Function: Query or set the maximum value of X axis of the statistical trace.

The total number of statistics of the two channels is shared, namely, once the maximum value of X axis of channel A is set, that of channel B will be changed accordingly.

Query: :PSTatistic[1]|2:CCDF:DATA:MAX?

Setting: :PSTatistic[1]|2:CCDF:DATA:MAX <NRf>

The range of <NRf> is 0 - 50 dB

Example: PST:CCDF:DATA:MAX?

PST:CCDF:DATA:MAX 15

Limit: It is only valid for the peak sensor (8170X).

:PSTatistic:CCDF:DECades

Function: Query or set the “Decimal Number” of the statistical longitudinal axis. For example, when it is set to 6, the range of statistical probability will be 1e06. If the maximum ratio is set to 100%, the minimum ratio will be 1e-04 (100%/1e06).

The relevant command is: PSTatistic:CCDF:Y:MAX (set the maximum statistical probability value).

The total number of statistics of the two channels is shared, namely, once the decimal number of channel A is set, that of channel B will be changed accordingly.

Query: :PSTatistic:CCDF:DECades?

Setting: :PSTatistic:CCDF:DECades <NRf>

The range of <NRf> is 1 - 6.

Example: PST:CCDF:DEC?

PST:CCDF:DEC 6

Limit: It is only valid for the peak sensor (8170X).

Reset status: Set the decimal number to 6.

:PSTatistic[1]|2:CCDF:END:ACTion

Function: Query or set the statistical termination. The termination conditions are as follows: There will be three operations when the count times reach the set termination counts or the count times reach the set termination time, including

STOP: When the termination condition is satisfied, the statistics will be stopped.

FLUSh: When the termination condition is satisfied, clear the statistics buffer data, and restart the statistics measurement.

DECimate: When termination condition is satisfied, the count in the statistics buffer area will be reduced by a half, and the statistics measurement will be continued.

The total number of statistics of the two channels is shared, namely, once the terminal of channel A is set, that of channel B will be changed accordingly.

Query: :PSTatistic[1]|2:CCDF:END:ACTion?

Setting: :PSTatistic[1]|2:CCDF:END:ACTion <Character Data>
The <Character Data> includes: STOP, FLUSh and DECimate

Example:

PST:CCDF:END:ACT?	Query the statistical termination.
PST:CCDF:END:ACT STOP	Set the “STOP” statistical termination.

Limit: It is only valid for the peak sensor (8170X).

Reset status: Set the termination to STOP.

:PSTatistic:CCDF:GAUSsian:MARKer[1]|2[:SET]

Function: Set the mark to Gaussian probability curve.
Relevant command:
PSTatistic:CCDF:REFerence:MARKer[1]|2[:SET]
PSTatistic:CCDF:TRACe:MARKer[1]|2[:SET]

Query: Not supported

Setting: :PSTatistic:CCDF:GAUSsian:MARKer[1]|2[:SET]

Example:

PST:CCDF:GAUS:MARK	Set mark 1 to Gaussian probability curve.
PST:CCDF:GAUS:MARK1	Set mark 1 to Gaussian probability curve.
PST:CCDF:GAUS:MARK2	Set mark 2 to Gaussian probability curve.

Limit: It is only valid for the peak sensor (8170X).

Reset status: If the current display mode is not the statistical trace or statistical table, it will prompt “-221, “Settings Conflict"”.
If Gaussian curve is not opened, it will prompt “-221, "Settings Conflict"”.

:PSTatistic:CCDF:GAUSsian[:Status]

Function: Query or set the display status of Gaussian probability curve.

Query: :PSTatistic:CCDF:GAUSsian[:Status]?

Setting: :PSTatistic:CCDF:GAUSsian[:Status] <Boolean Data>
The effective form of <Boolean Data> includes 0, OFF, 1 and ON

Example:

PST:CCDF:GAUS?	Query the display status of Gaussian probability curve.
PST:CCDF:GAUS 1	Turn on the display switch of Gaussian probability curve.

Limit: It is only valid for the peak sensor (8170X).

Reset status: Display Gaussian probability curve.

Error information: If the current display mode is not the statistical trace or statistical table, it will prompt “-221, “Settings Conflict"”.

:PSTatistic:CCDF:MARKer[1]|2:DATA?

Function: Query the power and probability of the mark in the statistical trace.
The form of the returned data includes <POWER> and <PCT>,
for example 0, 36.79
0 is power, and the probability is 36.79

Query: :PSTatistic:CCDF:MARKer[1]|2:DATA?

Setting: Not supported

Example: PST:CCDF:MARK1:DATA? Query the power and probability of mark 1.

Limit: It is only valid for the peak sensor (8170X).

Error information: If the current display mode is not the statistical trace or statistical table, it will prompt "-221, "Settings Conflict"".

:PSTatistic:CCDF:MARKer:DELTa?

Function: Query two power differences and probability differences (M2-M1).
The form of the returned data includes <ΔPOWER> and <ΔPCT>,
for example -3, 3.87
The difference between the power of mark 2 and that of mark 1 is -3, and the difference between the power of mark 2 and the probability of mark 1 is 3.87

Query: :PSTatistic:CCDF:MARKer:DELTa?

Setting: Not supported

Example: PST:CCDF:MARK:DELT?

Limit: It is only valid for the peak sensor (8170X).

Error information: If the current display mode is not the statistical trace or statistical table, it will prompt "-221, "Settings Conflict"".

:PSTatistic:CCDF:MARKer[1]|2:X

Function: Query or set the horizontal position of the mark. The range of the mark is 0 - maximum power of X axis.

Query: :PSTatistic:CCDF:MARKer[1]|2:X?

Setting: :PSTatistic:CCDF:MARKer[1]|2:X <NRf>
The range of <NRf> is 0 - maximum power of X axis.

Example: PST:CCDF:MARK2:X? Query the horizontal power of mark 2.
PST:CCDF:MARK1:X 1.6 Set the horizontal power of mark 1 to 1.6 dB.

Limit: It is only valid for the peak sensor (8170X).

Reset status: Set the horizontal power of the mark to 0.

Error information: If the current display mode is not the statistical trace or statistical table, it will prompt "-221, "Settings Conflict"".

:PSTatistic:CCDF:MARKer[1]|2:Y

Function: Query or set the vertical position of the mark (namely the probability value). The range of the mark is 0 - 100%.

Query: :PSTatistic:CCDF:MARKer[1]|2:Y?

Setting: :PSTatistic:CCDF:MARKer[1]|2:Y <NRf>
The range of <NRf> is 0 - 100%.

Example: PST:CCDF:MARK2:Y? Query the probability of mark 2.
PST:CCDF:MARK1:Y 16 Set the probability of mark 16%.

Limit: It is only valid for the peak sensor (8170X).

Error information: If the current display mode is not the statistical trace or statistical table, it will prompt "-221, "Settings Conflict"".

:PSTatistic[1]|2:CCDF:POWer?

Function: Query the power of the given probability point. The inputted parameter represents the

specified probability.

Query: :PSTatistic[1]|2:CCDF:POWer? <NRf>

The range of <NRf> is 0 - 100%.

Setting: Not supported

Example: PST2:CCDF:POW? 10 Query the power with 10% probability in channel B.

Limit: It is only valid for the peak sensor (8170X).

Error information: If no channel is connected with the sensor or it is only connected with the CW sensor, it will prompt “-241, “Hardware Missing"”; if the given channel is not connected with the sensor or it is connected with the CW sensor, it will prompt “-241, "Hardware Missing"”;

If the current display mode is not the statistical trace or statistical table, it will prompt “-221, “Settings Conflict"”.

:PSTatistic[1]|2:CCDF:PROBability?

Function: Query the probability of the given power point. The inputted parameter represents the specified power.

Query: :PSTatistic[1]|2:CCDF:PROBability? <NRf>

The range of <NRf> is 0 - 50 dB.

Setting: Not supported

Example: PST1:CCDF:PROB? 6.78 Query the probability of channel A when the power is 6.78 dB.

Limit: It is only valid for the peak sensor (8170X).

Error information: If no channel is connected with the sensor or it is only connected with the CW sensor, it will prompt “-241, “Hardware Missing"”; if the given channel is not connected with the sensor or it is connected with the CW sensor, it will prompt “-241, "Hardware Missing"”;

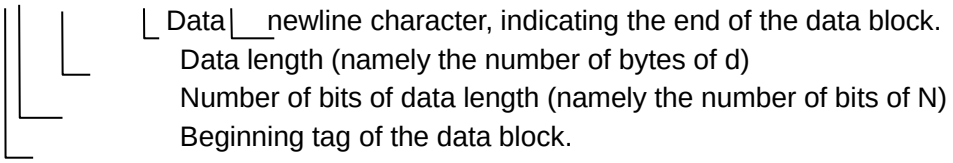
If the current display mode is not the statistical trace or statistical table, it will prompt “-221, “Settings Conflict"”.

:PSTatistic:CCDF:REFerence:DATA?

Function: Query the statistical probability list of the power meter. The power range is 0 dB - maximum power, and the number of elements in the list is 321, unit: % (for example, 18.9 represents 18.9%).

The format of the returned data is <Arbitrary Data Block> See section 7.7.6 of the IEEE 488.2

#nNNN...Nddd……ddd<LF>



For example: #41284…..<LF>, n = 4, N = 1284.

The format of each data element is IEEE 754 32-bit floating point data, namely, 4 bytes.

Query: :PSTatistic[1]|2:CCDF:REFerence:DATA?

Setting: Not supported

Example: PST:CCDF:REF:DATA? Query the statistical probability list of the reference trace.

Limit: It is only valid for the peak sensor (8170X).

Error information: If no channel is connected with the sensor or it is only connected with the CW sensor, it will prompt “-241, “Hardware Missing"”;

If the current display mode is not the statistical trace or statistical table, it will prompt “-221, “Settings Conflict"”.

If there is no reference data, it will prompt “-221, "Settings Conflict"”.

:PSTatistic:CCDF:REFerence:MARKer[1]|2[:SET]

Function: Set the mark to the reference statistics curve.

Relevant command:

PSTatistic:CCDF:GAUSsian:MARKer[1]|2[:SET]

PSTatistic:CCDF:TRACe:MARKer[1]|2[:SET]

Query: Not supported

Setting: :PSTatistic:CCDF:REFerence:MARKer[1]|2[:SET]

Example:

PST:CCDF:REF:MARK	Set mark 1 to the reference statistics curve.
PST:CCDF:REF:MARK1	Set mark 1 to the reference statistics curve.
PST:CCDF:REF:MARK2	Set mark 2 to the reference statistics curve.

Limit: It is only valid for the peak sensor (8170X).

Error information: If the current display mode is not the statistical trace or statistical table, it will prompt “-221, “Settings Conflict"”.

If the reference curve is not opened, it will prompt “-221, "Settings Conflict"”.

:PSTatistic:CCDF:REFerence:POWer:AVERage?

Function: Query the average power of the reference statistics curve.

Query: :PSTatistic:CCDF:REFerence:POWer:AVERage?

Setting: Not supported

Example: PST:CCDF:REF:POW:AVER?

Limit: It is only valid for the peak sensor (8170X).

Error information: If the current display mode is not the statistical trace or statistical table, it will prompt “-221, “Settings Conflict"”.

If there is no reference data, it will prompt “-221, "Settings Conflict"”.

:PSTatistic:CCDF:REFerence:POWer:PEAK?

Function: Query the peak power of the reference statistics curve.

Query: :PSTatistic:CCDF:TRACe:POWer:PEAK?

Setting: Not supported

Example: PST:CCDF:TRAC:POW:PEAK?

Limit: It is only valid for the peak sensor (8170X).

Error information: If the current display mode is not the statistical trace or statistical table, it will prompt “-221, “Settings Conflict"”.

If there is no reference data, it will prompt “-221, "Settings Conflict"”.

:PSTatistic:CCDF:REFerence:POWer:PTAVerage?

Function: Query the peak-to-average ratio of the reference statistics curve.

Query: :PSTatistic:CCDF:TRACe:POWer:PTAV?

Setting: Not supported

Example: PST:CCDF:TRAC:POW:PTAV?

Limit: It is only valid for the peak sensor (8170X).

Error If the current display mode is not the statistical trace or statistical table, it will prompt

information: “-221, “Settings Conflict"”.
If there is no reference data, it will prompt “-221, "Settings Conflict"”.

:PSTatistic:CCDF:REFerence[:Status]

Function: Query or set the display status of the reference statistics curve.

Query: :PSTatistic:CCDF:REFerence[:Status]?

Setting: :PSTatistic:CCDF:REFerence[:Status] <Boolean Data>
The effective form of <Boolean Data> includes 0, OFF, 1 and ON

Example: PST:CCDF:REF?

PST:CCDF:REF ON — Open the reference statistics curve.

Limit: It is only valid for the peak sensor (8170X).

Reset status: Disable the display of the reference statistics curve.

Error information: If the current display mode is not the statistical trace or statistical table, it will prompt “-221, “Settings Conflict"”.
If there is no reference data, it will prompt “-221, "Settings Conflict"”.

:PSTatistic[1]|2:CCDF:STORe:REFerence

Function: Save the statistics curve of the specified channel to the reference statistics curve.

Query: :PSTatistic:CCDF:STORe:REFerence? Query if the reference curve exists.

Setting: :PSTatistic[1]|2:CCDF:STORe:REFerence

Example: PST:CCDF:STOR:REF? — Query if the reference curve exists.

PST2:CCDF:STOR:REF — Save the statistics curve of channel B to the reference statistics curve.

Limit: It is only valid for the peak sensor (8170X).

Error information: If the given channel is not connected with the sensor or it is connected with the CW sensor, it will prompt “-241, “Hardware Missing"”;
If the current display mode is not the statistical trace or statistical table, it will prompt “-221, “Settings Conflict"”.

:PSTatistic[1]|2:CCDF:TABLe?

Function: Query the statistical measurement list, including the average power, average power probability, power under 6 probabilities (10%, 1%, 0.1%, 0.01%, 0.001%, 0.0001%), peak-to-average ratio and sampling times.

Query: :PSTatistic[1]|2:CCDF:TABLe?

Setting: Not supported

Example: PST1:CCDF:TABL? — Query the statistical measurement list of channel A.

Limit: It is only valid for the peak sensor (8170X).

Error information: If the given channel is not connected with the sensor or it is connected with the CW sensor, it will prompt “-241, “Hardware Missing"”;
If the current display mode is not the statistical trace or statistical table, it will prompt “-221, “Settings Conflict"”.

:PSTatistic[1]|2:CCDF:TIME

Function: Query or set the statistical termination time, unit: s.
The total number of statistics of the two channels is shared, namely, once the statistical

termination time of channel A is set, that of channel B will be changed accordingly.

Relevant command:

:PSTatistic[1]|2:CCDF:COUNt

:PSTatistic[1]|2:CCDF:END:ACTion

Query: :PSTatistic:CCDF:TIME? [MIN|MAX]

Setting: :PSTatistic:CCDF:TIME <Numeric Data>

The valid value of the numeric data includes: DEF, MIN, MAX and <NRf>, and DEF and <NRf> are only used for setting.

The range of <NRf> is 0 - 3,600 s (valid values include 0, 1, 2, 5, 10, 30, 60, 120, 300, 600, 1,800, 3,600. If the result is not the above value but it is within the range, it will be automatically rounded down to the similar value). 0 represents that no consideration will be given to the statistical termination time.

Example:

PST:CCDF:TIME?	Query the statistical time.
PST:CCDF:TIME 100	Set the statistical termination time to 60 s.

Limit: It is only valid for the peak sensor (8170X).

Reset status: Set it to 0 (no consideration is given to the statistical termination time).

:PSTatistic[1]|2:CCDF:TRACe:MARKer[1]|2[:SET]

Function: Set the mark to the channel statistics curve.

Relevant command:

PSTatistic:CCDF:GAUSsian:MARKer[1]|2[:SET]

PSTatistic:CCDF:REFerence:MARKer[1]|2[:SET]

Query: Not supported

Setting: PSTatistic:CCDF:TRACe:MARKer[1]|2[:SET]

Example:

PST:CCDF:TRAC:MARK	Set mark 1 to the channel statistics curve.
PST:CCDF:TRAC:MARK1	Set mark 1 to the channel statistics curve.
PST:CCDF:TRAC:MARK2	Set mark 2 to the channel statistics curve.

Limit: It is only valid for the peak sensor (8170X).

Error information: If the given channel is not connected with the sensor or it is connected with the CW sensor, it will prompt “-241, “Hardware Missing"”;

If the current display mode is not the statistical trace or statistical table, it will prompt “-221, “Settings Conflict"”.

:PSTatistic[1]|2:CCDF:TRACe:POWer:AVERage?

Function: Query the average power of the channel statistics curve.

Query: :PSTatistic[1]|2:CCDF:TRACe:POWer:AVERage?

Setting: Not supported

Example: PST:CCDF:TRAC:POW:AVER?

Limit: It is only valid for the peak sensor (8170X).

Error information: If the given channel is not connected with the sensor or it is connected with the CW sensor, it will prompt “-241, “Hardware Missing"”;

If the current display mode is not the statistical trace or statistical table, it will prompt “-221, “Settings Conflict"”.

:PSTatistic[1]|2:CCDF:TRACe:POWer:PEAK?

Function: Query the peak power of the channel statistics curve.

Query: :PSTatistic[1]|2:CCDF:TRACe:POWer:PEAK?

Setting: Not supported

Example: PST:CCDF:TRAC:POW:PEAK?

Limit: It is only valid for the peak sensor (8170X).

Error information: If the given channel is not connected with the sensor or it is connected with the CW sensor, it will prompt “-241, “Hardware Missing"”;
If the current display mode is not the statistical trace or statistical table, it will prompt “-221, “Settings Conflict"”.

:PSTatistic[1]|2:CCDF:TRACe:POWer:PTAVerage?

Function: Query the peak-to-average ratio of the channel statistics curve.

Query: :PSTatistic[1]|2:CCDF:TRACe:POWer:PTAV?

Setting: Not supported

Example: PST:CCDF:TRAC:POW:PTAV?

Limit: It is only valid for the peak sensor (8170X).

Error information: If the given channel is not connected with the sensor or it is connected with the CW sensor, it will prompt “-241, “Hardware Missing"”;
If the current display mode is not the statistical trace or statistical table, it will prompt “-221, “Settings Conflict"”.

:PSTatistic[1]|2:CCDF:TRACe[:Status]

Function: Query or set the display status of the channel statistics curve.

Query: :PSTatistic:CCDF:TRACe[:Status]?

Setting: :PSTatistic:CCDF:TRACe[:Status] <Boolean Data>
The effective form of <Boolean Data> includes 0, OFF, 1 and ON

Example:

PST1:CCDF:TRAC?	Query the display status of the statistics curve of channel A.
PST2:CCDF:TRAC ON	Open the statistics curve of channel B.

Limit: It is only valid for the peak sensor (8170X).

Reset status: Enable the display of the statistics curve of the channel.

Error information: If the given channel is not connected with the sensor or it is connected with the CW sensor, it will prompt “-241, “Hardware Missing"”;
If the current display mode is not the statistical trace or statistical table, it will prompt “-221, “Settings Conflict"”.

:PSTatistic:CCDF:Y:MAX

Function: Query or set the “Maximum Probability Value” of the statistics display.

Query: :PSTatistic:CCDF:Y:MAX?

Setting: :PSTatistic:CCDF:Y:MAX <NRf>
The <NRf> will take the following nearest groups: 0.01, 0.1, 1, 10, 100. The unit is PCT.

Example:

PST:CCDF:Y:MAX?	
PST:CCDF:Y:MAX 99	Set the maximum probability value to 100 (99 will be rounded up to 100).

Limit: It is only valid for the peak sensor (8170X).

Reset Set the maximum display probability value to 100%.

status:

Error information:

3.3.9 Sense (SENSe)

[:SENSe[1]|2]:ADJunct[:Status]

Function: Query or set the accessory compensation switch of the high power sensor.

Query: [:SENSe[1]|2]:ADJunct[:Status]?

Setting: [:SENSe[1]|2]:ADJunct[:Status] <Boolean Data>

The effective form of <Boolean Data> includes 0, OFF, 1 and ON

Example:	SENS1:ADJ?	Query the accessory compensation switch of channel A.
	SENS2:ADJ 0	Disable the accessory compensation of channel B.

Limit: It is supported by 2436 but not supported by 2438. It is only valid for the peak sensor (8170X).

Reset status: Set the accessory compensation to ON.

[:SENSe[1]|2]:AVERage[1]|2:COUNt

Function: Query or set the average counts of the channel.

Query: [:SENSe[1]|2]:AVERage[1]|2:COUNt? [MIN|MAX]

Setting: [:SENSe[1]|2]:AVERage[1]|2:COUNt <Numeric Data>

The valid value of the numeric data includes: DEF, MIN, MAX and <NRf>, and DEF and <NRf> are only used for setting.

The range of <NRf> is 1 - 1024,

The DEF is 8,

The MIN is 1

The MAX is1024。

Example:	SENS1:AVER:COUN?	Query the average counts of channel A.
	SENS1:AVER:COUN? MAX	Query the settable maximum value of the average counts of channel A.
	SENS2:AVER:COUN 28	Set the average counts of channel B to 28.

Reset status: Set the average counts to 8.

[:SENSe[1]|2]:AVERage:COUNt:AUTO

Function: Query or set the automatic average status of the channel. This function is only valid for the CW sensor.

Query: [:SENSe[1]|2]:AVERage:COUNt:AUTO?

Setting: [:SENSe[1]|2]:AVERage:COUNt:AUTO <Boolean Data>

The effective form of <Boolean Data> includes 0, OFF, 1 and ON

Example:	SENS1:AVER:COUN:AUTO?	Query the automatic average status of channel A.
	SENS2:AVER:COUN:AUTO 1	Enable the automatic average of channel B.

Limit: It is only valid for the continuous wave sensor (7171X).

Error information: If the USB channel is not connected with the sensor, it will prompt “-241,"Hardware Missing"”.

Reset status: The automatic average of the CW sensor is set to ON.

[:SENSe[1]|2]:AVERage:SDETect

Function: Query or set the step detection status of the channel. This function is only valid for the CW sensor.

The last four averages in the automatic average mode are used to compare with the value of the whole filter. When the average difference between these two is large than 15%, clear the digital filter. After that, the filter will start saving new measurement values. The function

is intended to shorten the filtering time when the power changes obviously.

Query: [:SENSe[1]|2]:AVERage:SDETect?

Setting: [:SENSe[1]|2]:AVERage:SDETect <Boolean Data>
The effective form of <Boolean Data> includes 0, OFF, 1 and ON

Example: SENS1:AVER:SDET? Query the step detection status of channel A.
SENS2:AVER:SDET 1 Enable the step detection of channel B.

Limit: It is only valid for the continuous wave sensor (7171X).

Reset status: The step detection of the CW sensor is set to ON.

[:SENSe[1]|2]:AVERage[1][:Status]

Function: Query or set the average switch state of the channel.

Query: [:SENSe[1]|2]:AVERage[1]|2[:Status]?

Setting: [:SENSe[1]|2]:AVERage[1]|2[:Status] <Boolean Data>
The effective form of <Boolean Data> includes 0, OFF, 1 and ON

Example: SENS1:AVER? Query the average switch state of channel A.
SENS2:AVER 1 Turn on the average switch of channel B.

Reset status: Set the average status to ON.

[:SENSe[1]|2]:CORRection:CSET2[:SELect]

Function: In this case, only the [:SENSe[1]|2]:CORRection:CSET2[:SELect] is supported. Select FDO table.
The data of FDO table is shared by two channels, but the switch state is separate.

Query: [:SENSe[1]|2]:CORRection:CSET2[:SELect]?

Setting: [:SENSe[1]|2]:CORRection:CSET2[:SELect] <String>
The <String> indicates name of FDO table.

Example: SENS:CORR:CSET2? Query the currently selected FDO table.
SENS:CORR:CSET2 "fdo0" Select FDO table with a name of “fdo0”.

Error information: If FDO table specified by the parameter doesn’t exist, it will prompt “-256, "File Name Not Found"”.

Reset status: Not affected.

[:SENSe[1]|2]:CORRection:CSET2:Status

Function: In this case, only the [:SENSe[1]|2]:CORRection:CSET2:Status is supported. Query or set the enable status of FDO table.
The data of FDO table is shared by two channels, but the enable status is separate.

Query: [:SENSe[1]|2]:CORRection:CSET2:Status?

Setting: [:SENSe[1]|2]:CORRection:CSET2:Status <Boolean Data>
The effective form of <Boolean Data> includes 0, OFF, 1 and ON

Example: SENS1:CORR:CSET2:STAT? Query the enable status of FDO table of channel A.
SENS2:CORR:CSET2:STAT 0 Disable FDO table of channel B.

Error information: If the frequency points and amplitude gain (offset) points in the currently selected FDO table are different, it will prompt “-226,” Lists Not Same Length””

If the point of the currently selected FDO table is 0, it will prompt “-221, "Settings Conflict"”.

Reset status: It will not affect the enable status of FDO table.

[:SENSe[1]|2]:CORRection:FDOFfset[:INPut][:MAGNitude]?

Function: Query the currently used FDO factor of the specified channel. The unit is PCT, namely 100 represents 100%.

Query: [:SENSe[1]|2]:CORRection:FDOFfset[:INPut][:MAGNitude]?

Setting: Not supported

Example: CORR:FDOF? Query the currently used FDO factor of channel A.

Limit: It is only applicable to USB channel (8), which is not supported by other channels.

[:SENSe[1]|2]:CORRection:GAIN[1]|2|3|4[:INPut][:MAGNitude]

Function: The equivalent form of GAIN[1] is CFACtor, which represents the calibration factor of the sensor. The former conforms to SCPI specification, while the latter doesn’t conform to it. The GAIN[1] is not supported in this case.

The GAIN2 represents the channel offset. It is supported in this case. Both query and setting are supported.

The equivalent form of GAIN3 is DCYCle, indicating the duty cycle. The GAIN3 is not supported in this case.

The equivalent form of GAIN4 is FDOFfset, indicating the FDO factor. The GAIN4 is supported in this case. The FDO factor only provides query.

Query: [:SENSe[1]|2]:CORRection:GAIN2|4[:INPut][:MAGNitude]? [MIN|MAX]

Setting: [:SENSe[1]|2]:CORRection:GAIN2[:INPut][:MAGNitude] <Numeric Data>

The valid value of the numeric data includes: DEF, MIN, MAX and <NRf>, and DEF and <NRf> are only used for setting.

The range of <NRf> is -100 - 100 dB,

The DEF is 0dB。

The MIN is -100 dB

The MAX is 100dB

Example:

SENS2:CORR:GAIN2?	Query the channel offset of channel B.
CORR:GAIN2? MAX	Query the maximum settable channel offset value.
SENS1:CORR:GAIN4?	Query the FDO value of channel A.
CORR:GAIN2 3.6	Set the channel offset of channel A to 3.6 dB.

[:SENSe[1]|2]:CORRection:GAIN[1]|2|3|4[:INPut]:Status

Function: The equivalent form of GAIN[1] is CFACtor, which represents the calibration factor of the sensor. The former conforms to SCPI specification, while the latter doesn’t conform to it. The GAIN[1] is not supported in this case.

The GAIN2 represents the channel offset.

The equivalent form of GAIN3 is DCYCle, indicating the duty cycle. The GAIN3 is not supported in this case.

The equivalent form of GAIN4 is FDOFfset, indicating the FDO factor. The query and setting of GAIN4 is not supported in this case.

Query: [:SENSe[1]|2]:CORRection:GAIN2[:INPut]:Status?

Setting: [:SENSe[1]|2]:CORRection:GAIN2[:INPut]:Status <Boolean Data>

The effective form of <Boolean Data> includes 0, OFF, 1 and ON

Example:	SENS2:CORR:GAIN2:STAT?	Query the channel offset enable status of channel B.
	CORR:GAIN2:STAT 1	Enable the channel offset of channel A.

[:SENSe[1]|2]:FREQuency[:CW|FIXed]

Function: Query or set the frequency of the specified channel.

Query: [:SENSe[1]|2]:FREQuency[:CW|FIXed]? [MIN|MAX]

Setting: [:SENSe[1]|2]:FREQuency[:CW|FIXed] <Numeric Data>

The valid value of the numeric data includes: DEF, MIN, MAX and <NRf>, and DEF and <NRf> are only used for setting.

The range of <NRf> is 1e3 - 1e12,

DEF is 50MHz.

The MIN is 1kHz;

The MAX is1000GHz

Example:	FREQ?	Query the frequency of channel A.
	FREQ? MAX	Query the maximum settable frequency.
	SENS2:FREQ 8GHz	Set the frequency of channel B to 8 GHz.

Reset status: Set it to 50 MHz.

[:SENSe[1]|2]:POWer:AC:RANGe

Function: Query or set the range of the sensor. This function is only valid for the CW sensor. 0 represents low range and 1 represents high range.

When the range is set with this command, the automatic range status will be changed to manual,

namely, set [SENSe[1]]|SENSe2:POWer:AC:RANGe:AUTO to OFF.

Query: [:SENSe[1]|2]:POWer:AC:RANGe?

Setting: [:SENSe[1]|2]:POWer:AC:RANGe <0|1>

Example:	SENS2:POW:AC:RANG?	Query the current range of channel B.
	POW:AC:RANG 1	Set the range of channel A to high range.

Limit: It is only valid for the CW sensor (7171X).

Reset status: Set the range to high range.

[:SENSe[1]|2]:POWer:AC:RANGe:AUTO

Function: Query or set the automatic range switch state of the sensor. This function is only valid for the CW sensor. 0 represents manual, and 1 represents automatic.

When the automatic range is enabled, the power meter will automatically adjust the range according to the power signal, and adopt the optimal range for measurement. Relevant command:

[:SENSe[1]|2]:POWer:AC:RANGe.

Query: [:SENSe[1]|2]:POWer:AC:RANGe:AUTO?

Setting: [:SENSe[1]|2]:POWer:AC:RANGe:AUTO <Boolean Data>

The effective form of <Boolean Data> includes 0, OFF, 1 and ON

Example:	SENS2:POW:AC:RANG:AUTO?	Query the automatic range switch of channel B.
	POW:AC:RANG:AUTO 0	Disable the automatic range of channel A.

Limit: It is only valid for the CW sensor (7171X).

Reset status: Set it to automatic range.

[:SENSe[1]|2]:PULSe:DISTal

Function: Query and set the Distal Line in the pulse measurement to calculate the pulse transition duration (rising time or falling time).

The relevant command is: [:SENSe[1]|2]:PULSe:PROXimal <Numeric Data>

:TRACe[1]|2:DEFine:TRANsition:REFerence <Numerical Value 1>, <Numerical Value 2>

The value set by this command is equivalent to the above <Numerical Value 2>.

Query: [:SENSe[1]|2]:PULSe:DISTal? [MIN|MAX]

Setting: [:SENSe[1]|2]:PULSe:DISTal <Numeric Data>

The valid value of the numeric data includes: DEF, MIN, MAX and <NRf>, and DEF and <NRf> are only used for setting.

The range of <NRf> is 0 - 100,

The DEF is 90

The MIN is 0

The MAX is100。

Example:

SENS2:PULS:DIST?	Query the pulse Distal Line setting value of channel B.
PULS:DIST 81	Set the pulse Distal Line of channel A to 81%.

Limit: It is only valid for the peak sensor (8170X).

Reset status: Set the Distal Line to 90%

Description: **Definition of pulse transition time and pulse duration.**

1) Definition of pulse transition time

The pulse transition time is generally referred to as rising time and falling time. The rising time refers to part of the time required by the specified pulse to transit to the “ON” status from the “OFF” status. The falling time is opposite to it. The percentage of pulse switch time will be determined by Proximal and Distal Lines. Set the top power of the pulse to P. Generally, the rising time is the time required by the pulse to change to 90%×P from 10%×P. In this case, the Proximal Line is 10% and the Distal Line is 90%. It will be changed by

[:SENSe[1]|2]:PULSe:PROXimal and [:SENSe[1]|2]:PULSe:DISTal respectively.

2) Definition of pulse duration

The pulse duration is the general pulse width. Generally, the pulse width refers to the duration from 50% of the first transition of pulse to 50% of the last transition of pulse. In this case, the Mesial Line value is 50%. This value can be changed by [:SENSe[1]|2]:PULSe:MESial.

[:SENSe[1]|2]:PULSe:MESial

Function: Query and set the Mesial Line in the pulse measurement to calculate the pulse duration (namely the pulse width).

The equivalent command of this command is :TRACe[1]|2:DEFine:DURation:REFerence

Query: [:SENSe[1]|2]:PULSe:MESial? [MIN|MAX]

Setting: [:SENSe[1]|2]:PULSe:MESial <Numeric Data>

The valid value of the numeric data includes: DEF, MIN, MAX and <NRf>, and DEF and <NRf> are only used for setting.

The range of <NRf> is 0 - 100,
The DEF is 50
The MIN is 0
The MAX is100。

Example:	SENS2:PULS:MES?	Query the pulse Mesial Line setting value of channel B.
	PULS:MES 25	Set the pulse Mesial Line of channel A to 25%.

Limit: It is only valid for the peak sensor (8170X).

Reset status: Set the Mesial Line to 50%

[:SENSe[1]|2]:PULSe:PROXimal

Function: Query and set the Proximal Line in the pulse measurement to calculate the pulse transition duration (rising time or falling time).
The relevant command is: [:SENSe[1]|2]:PULSe:DISTal <Numeric Data>
:TRACe[1]|2:DEFine:TRANsition:REFerence <Numerical Value 1>, <Numerical Value 2>
The value set by this command is equivalent to the above <Numerical Value 1>.

Query: [:SENSe[1]|2]:PULSe:PROXimal? [MIN|MAX]

Setting: [:SENSe[1]|2]:PULSe:PROXimal <Numeric Data>
The valid value of the numeric data includes: DEF, MIN, MAX and <NRf>, and DEF and <NRf> are only used for setting.
The range of <NRf> is 0 - 100,
The DEF is 90
The MIN is 0
The MAX is100。

Example:	SENS2:PULS:PROX?	Query the pulse Proximal Line setting value of channel B.
	PULS:PROX 1	Set the pulse Proximal Line of channel A to 1%.

Limit: It is only valid for the peak sensor (8170X).

Reset status: Set the Proximal Line to 10%

[:SENSe[1]|2]:PULSe:UNIT

Function: Query the pulse definition setting unit.

Query: [:SENSe[1]|2]:PULSe:UNIT?

Setting: [:SENSe[1]|2]:PULSe:UNIT <WATTS|VOLTS|0|1|>
WATTS or 0: Set it to the power unit
VOLTS is 1: Set it to the voltage unit

Example:	SENS:PULS:UNIT?	Query the pulse definition unit.
	PULS:UNIT 1	Set the pulse definition unit to “Voltage”.

Limit: None.

Reset status: Set the pulse definition unit to “Power”.

[:SENSe[1]|2]:ROSCillator:SOURce

Function: Query or select the internal calibrator.

Query: [:SENSe[1]|2]:ROSCillator:SOURce?

Setting: [:SENSe[1]|2]:ROSCillator:SOURce <Character Data>
The valid value of <Character Data> is:
INTernal[1]: Select 50 MHz calibrator.
INTernal2: Select 500 MHz or 1 GHz calibrator.
0: Select 50 MHz calibrator.
1: Select 500 MHz or 1 GHz calibrator.

Example:

ROSC:SOUR?	Query the current calibrator.
ROSC:SOUR 0	Select 50 MHz calibrator.

Limit: It is supported by 2436 but not supported by 2438.

Reset status: Select 50 M calibrator.

[:SENSe[1]|2]:SWEep[1]|2|3|4:AUTO

Function: Query or set the automatic gate status of the specified gate. It is only valid for the peak sensor.

Query: [:SENSe[1]|2]:SWEep[1]|2|3|4:AUTO?
0 or 1 will be returned. 0 represents closed automatic gate, and 1 represents open automatic gate.

Setting: [:SENSe[1]|2]:SWEep[1]|2|3|4:AUTO <Boolean Data> |ONCE|2
The effective form of <Boolean Data> includes 0, OFF, 1 and ON
OFF or 0: Close the automatic gate;
ON or 1: Open the automatic gate;
ONCE or 2: Trigger the once automatic gate, and then close it.

Example:

SENS2:SWE2:AUTO?	Query the automatic gate status of the gate 2 of channel B.
SENE1:SWE1:AUTO ON	Set the automatic gate of the gate 1 of channel A to ON.
SWE:AUTO ONCE	After triggering the once automatic gate of the gate 1 of channel A, close the automatic gate.

Limit: It is only valid for the peak sensor (8170X).

Reset status: Set the automatic gate to OFF

Error information: If the given channel is not connected with the sensor or it is connected with the CW sensor, it will prompt “-241, “Hardware Missing"”.

[:SENSe[1]|2]:SWEep[1]|2|3|4:AUTO:REFernce[1]|2

Function: Query or set the reference ratio of the specified gate.
The REF1 and REF2 respectively represent the position reference ratio of mark 1 and mark 2 (relative to the pulse duration).
It is as shown in the following Figure.

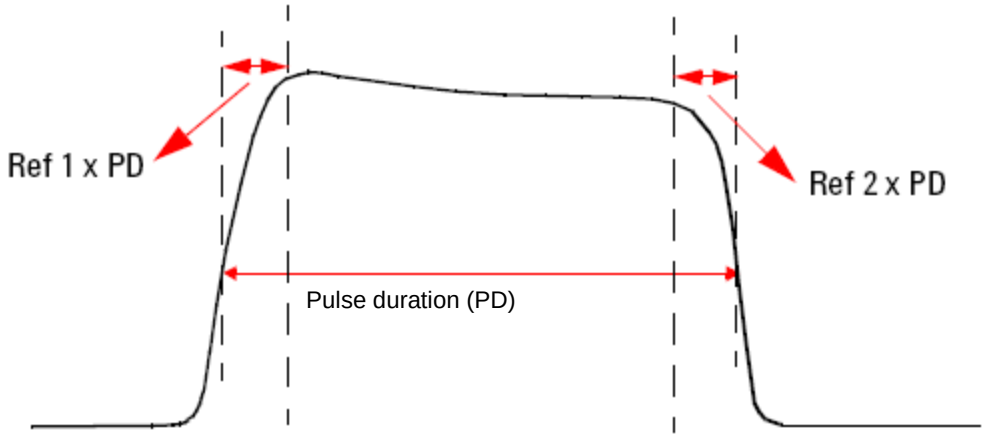


Fig.3.4 Pulse Reference Ratio

Query: [:SENSe[1]|2]:SWEep[1]|2|3|4:AUTO:REFernce[1]|2?

Setting: [:SENSe[1]|2]:SWEep[1]|2|3|4:AUTO:REFernce[1]|2 <NRf>

The range of <NRf> is 0 - 99.9, unit: PCT. The combination of REF1 and REF2 shall not be greater than 99.9

Example:

SENS2:SWE2:AUTO:REF2?	Query the reference ratio of the right mark of gate 2 of channel B.
SWE:AUTO:REF?	Query the reference ratio of the left mark of gate 1 of channel A.
SENS1:SWE1:AUTO:REF1 20	Set the reference ratio of the left mark of gate 1 of channel A to 20%.

Limit: It is only valid for the peak sensor (8170X).

Reset status: Both REF1 and REF2 are set to 10 (10%).

Error information: If the given channel is not connected with the sensor or it is connected with the CW sensor, it will prompt “-241, “Hardware Missing"”;

If sum of the set left/right reference ratios is larger than 99.9, it will prompt “-222, "Data out of Range"”.

[:SENSe[1]|2]:SWEep[1]|2|3|4:OFFSet:TIME

Function: Query or set the start time of the specified gate. In this case, time 0 represents the time of the trigger point if not specified.

Query: [:SENSe[1]|2]:SWEep[1]|2|3|4:OFFSet:TIME? [MIN|MAX]

Setting: [:SENSe[1]|2]:SWEep[1]|2|3|4:OFFSet:TIME <Numeric Data>

The valid value of the numeric data includes: DEF, MIN, MAX and <NRf>, and DEF and <NRf> are only used for setting.

The range of <NRf> is -1 - 1, which is related to the horizontal scale (time base).

The DEF is 0;

The MIN value is related to the time base;

The MAX value is related to the time base. The unit is s.

Example:

SENS2:SWE2:OFFS:TIME?	Query the start time of the gate 2 of channel B.
SENS1:SWE1:OFFS:TIME?	Query the start time of the gate 1 of channel A.
SWE:OFFS:TIME? MAX	Query the maximum value of the settable start time of the gate 1 of channel A.
SENS:SWE:OFFS:TIME DEF	Set the start time of the gate 1 of channel A to 0 s.

	SENS2:SWE2:OFFS:TIME 1e-6	Set the start time of the gate 2 of channel B to 1 μs.

Limit: It is only valid for the peak sensor (8170X).

Reset status: Set the start time of all the gates to 0.

Error information: If the given channel is not connected with the sensor or it is connected with the CW sensor, it will prompt “-241, “Hardware Missing"”.

Description: a) When the current window has a pulse waveform display, the start time range of the gate shall be within the effective range of the waveform display, otherwise, it will prompt “Data out of Range”.

If the gate length is 10 us;

The horizontal scale is 10 us/Div;

The trigger delay is 0;

The horizontal start is “Left”.

The range of the start time of the gate will be 0 - 90 us.

When MIN is made as the reference for query, 0 will be returned;

When MAX is made as the reference for query, 9e-5 will be returned;

Similarly, the setting is the same.

b) When the current window has a non-pulse waveform display, the start time range of the gate shall be -1 - 1 s in case of the numerical display.

If the set start time of the gate is not matched with the horizontal scale or trigger delay, these parameters will be automatically adjusted.

[:SENSe[1]|2]:SWEep[1]|2|3|4:TIME

Function: Query or set the time length of the specified gate.

Query: [:SENSe[1]|2]:SWEep[1]|2|3|4:TIME? [MIN|MAX]

Setting: [:SENSe[1]|2]:SWEep[1]|2|3|4:TIME <Numeric Data>

The valid value of the numeric data includes: DEF, MIN, MAX and <NRf>, and DEF and <NRf> are only used for setting.

The range of <NRf> is 0 - 1, which is related to the horizontal scale (time base).

The DEF is 1e-4 (namely 100 μs);

The MIN is 0

The MAX is1. The unit is s.

Example:	SENS2:SWE2:TIME?	Query the time length of the gate 2 of channel B.
	SENS1:SWE1:TIME?	Query the time length of the gate 1 of channel A.
	SWE:TIME? MAX	Query the maximum value of the settable time length of the gate 1 of channel A.
	SENS:SWE:TIME DEF	Set the time length of the gate 1 of channel A to 100 μs.
	SENS2:SWE2:TIME 1e-6	Set the time length of the gate 2 of channel B to 1 μs.

Limit: It is only valid for the peak sensor (8170X).

Reset status: Set the time length of the gate 1 to 100 μs, and set that of others to 0.

Error information: If the given channel is not connected with the sensor or it is connected with the CW sensor, it will prompt “-241, “Hardware Missing"”.

Description: a) When the current window has a pulse waveform display, the length range of the gate shall be within the effective range of the waveform display, otherwise, it will prompt “Data

out of Range".

If the start time of the gate is 20 us;

The horizontal scale is 10 us/Div;

The trigger delay is 0;

The horizontal start is "Left".

The range of the length of the gate will be 0 - 80 us.

When MIN is made as the reference for query, 0 will be returned;

When MAX is made as the reference for query, 8e-5 will be returned;

Similarly, the setting is the same.

b) When the current window has a non-pulse waveform display, the length range of the gate shall be 0 - 1 s in case of the numerical display.

If the set length of the gate is not matched with the horizontal scale or trigger delay, these parameters will be automatically adjusted.

[:SENSe[1]|2]:TRACe:AUToscale

Function: Set the specified channel automatically. This function is only valid for the peak sensor.

Automatically adjust measurement parameters including the vertical scale, vertical offset, trigger level and time base of channel 1 and channel 2, and find the trigger event in the currently set trigger source. In case of effective trigger, the automatic setting can display the whole amplitude of the pulse and at least one complete cycle, and ensure effective calculation of the automatic measurement parameters.

Query: Not supported

Setting: [:SENSe[1]|2]:TRACe:AUToscale

Example: TRAC:AUT Automatically set channel A.

SENS2:TRAC:AUT Automatically set channel B.

Limit: It is only valid for the peak sensor (8170X).

Error information: If the given channel is not connected with the sensor or it is connected with the CW sensor, it will prompt "-241, "Hardware Missing"";

If the given channel is not continuously triggered, it will prompt "-221, "Settings Conflict"".

Reset status: Set the vertical scale to 10 dB/Div, the horizontal scale (time base) to 10 us/Div, and the trigger level to -5 dBm.

[:SENSe[1]|2]:TRACe:LIMit:LOWer

Function: Query or set the lower power limit of the trace display of the specified channel.

The relevant command is: [:SENSe[1]|2]:TRACe:LIMit:UPPer

Query: [:SENSe[1]|2]:TRACe:LIMit:LOWer? [MIN|MAX]

Setting: [:SENSe[1]|2]:TRACe:LIMit:LOWer <Numeric Data>

The valid value of the numeric data includes: DEF, MIN, MAX and <NRf>, and DEF and <NRf> are only used for setting.

The range of <NRf> is as follows:

It is -150 - 210 dB in case of logarithmic display

The DEF is 100 dBm;

The MIN is -150 dBm;

The MAX is 210 dBm;

It is -100 MW - 100 MW in case of linear display

DEF is -100mW.

The MIN is -100 MW;

The MAX is100MW

Example: SENS2:TRAC:LIM:LOW? Query the lower power limit of the trace of channel B.

SENS1:TRAC:LIM:LOW -20 Set the lower power limit of the trace of channel A to -20 dB.

Limit: It is only valid for the peak sensor (8170X).

Reset status: Set the lower power limit to -60 dBm

[:SENSe[1]|2]:TRACe:LIMit:UPPer

Function: Query or set the upper power limit of the trace display of the specified channel, and the unit is the same as the display unit of the current channel.

The relevant command is:[:SENSe[1]|2]:TRACe:LIMit:LOWer

Query: [:SENSe[1]|2]:TRACe:LIMit:UPPer? [MIN|MAX]

Setting: [:SENSe[1]|2]:TRACe:LIMit:UPPer <Numeric Data>

The valid value of the numeric data includes: DEF, MIN, MAX and <NRf>, and DEF and <NRf> are only used for setting.

The range of <NRf> is as follows:

It is -150 - 210 dB in case of logarithmic display

The DEF is 100 dBm;

The MIN is -150 dBm;

The MAX is 210 dBm;

It is -100 MW - 100 MW in case of linear display

DEF is -100mW.

The MIN is -100 MW;

The MAX is100MW

Example: SENS2:TRAC:LIM:UPP? Query the upper power limit of the trace of channel B.

SENS1:TRAC:LIM:UPP 20 Set the upper power limit of the trace of channel A, which is 20 dBm and 20 W in case of logarithmic display and linear display.

Limit: It is only valid for the peak sensor (8170X).

Reset status: Set the upper power limit, which is 20 dBm and 100 mW in case of logarithmic display and linear display.

[:SENSe[1]|2]:TRACe:OFFSet:TIME

Function: Query or set the horizontal start time of the trace of the specified channel.

Query: [:SENSe]:TRACe:OFFSet:TIME? [MIN|MAX]

Setting: [:SENSe]:TRACe:OFFSet:TIME <Numeric Data>

The valid value of the numeric data includes: DEF, MIN, MAX and <NRf>, and DEF and <NRf> are only used for setting.

The range of <NRf> is -40 - 100 s

The DEF is 0

The MIN is related to the currently set time base, and the minimum value is larger than or equal to -40 (for example, this value will be -0.04 in case of 10 us/Div);

The MAX is related to the currently set time base, and the maximum value is smaller than or equal to 100 (for example, this value will be 0.04 in case of 10 us/Div);

Example: SENS2:TRAC:OFFS:TIME? Query the horizontal start time of the trace of channel B.

	TRAC:OFFS:TIME? MAX	Query the horizontal start time of the settable maximum trace.
	SENS1:TRAC:OFFS:TIME 1e-06	Set the horizontal start time of the trace to 1 μs.

Limit: It is only valid for the peak sensor (8170X).

Description: For 2436, the horizontal parameters of the two channels are shared, namely, once the horizontal parameter of channel A is set, that of channel B will be changed accordingly. For 2438, the two channels are independently set.

Error information: If the given channel is not connected with the sensor or it is connected with the CW sensor, it will prompt “-241, “Hardware Missing"”.

If the current window is not adopted with the waveform display, it will prompt “-221, “Settings Conflict"”.

Reset status: Set the horizontal start time to 0.

[:SENSe[1]|2]:TRACe:TIME

Function: Query or set the time length of the trace of the specified channel.

Query: [:SENSe[1]|2]:TRACe:TIME? [MIN|MAX]

Setting: [:SENSe[1]|2]:TRACe:TIME <Numeric Data>

The valid value of the numeric data includes: DEF, MIN, MAX and <NRf>, and DEF and <NRf> are only used for setting.

The range of <NRf> is 100 ns - 36,000 s

The DEF is 100 μs.

The MIN is100ns;

The MAX is 36,000 s

Example:	SENS2:TRAC:TIME?	Query the time length of the trace of channel B.
	TRAC:TIME? MAX	Query the time length of the settable maximum trace.
	SENS1:TRAC:TIME 1e-06	Set the time length of the trace of channel A to 1 μs.

Limit: It is only valid for the peak sensor (8170X).

Description: For 2436, the horizontal parameters of the two channels are shared, namely, once the horizontal parameter of channel A is set, that of channel B will be changed accordingly. For 2438, the two channels are independently set.

Error information: If the given channel is not connected with the sensor or it is connected with the CW sensor, it will prompt “-241, “Hardware Missing"”.

If the current window is not adopted with the waveform display, it will prompt “-221, “Settings Conflict"”.

Reset status: Set the time length to 100 μs.

[:SENSe[1]|2]:TRACe:UNIT

Function: Query or set the trace unit of the specified channel.

Query: [:SENSe[1]|2]:TRACe:UNIT?

Setting: [:SENSe[1]|2]:TRACe:UNIT < dBm|W|0|1>

Example:	SENS2:TRAC:UNIT?	Query the trace unit of channel B.
	TRAC:UNIT W	Set the trace unit of channel A to W.

Limit: It is only valid for the peak sensor (8170X).

Reset status: Set the trace unit to dBm.

[:SENSe[1]|2]:TRACe:X:SCALe:PDIV

Function: Query or set the horizontal scale (namely the time base) of the specified channel.

Query: [:SENSe[1]|2]:TRACe:X:SCALe:PDIV? [MIN|MAX]

Setting: [:SENSe[1]|2]:TRACe:X:SCALe:PDIV <Numeric Data>

The valid value of the numeric data includes: DEF, MIN, MAX and <NRf>, and DEF and <NRf> are only used for setting.

The range of <NRf> is 10 ns - 360 s,

The DEF is10us.

The MIN is 10ns.

The MAX is 3600.

The horizontal scale is 1-2-5-step.

Example:

SENS2:TRAC:X:SCAL:PDIV?	Query the horizontal scale of channel B.
TRAC:X:SCAL:PDIV 1e-8	Set the horizontal scale of channel A to 10 ns.

Limit: It is only valid for the peak sensor (8170X).

Description: For 2436, the horizontal parameters of the two channels are shared, namely, once the horizontal parameter of channel A is set, that of channel B will be changed accordingly. For 2438, the two channels are independently set.

Error information: If the given channel is not connected with the sensor or it is connected with the CW sensor, it will prompt “-241, “Hardware Missing"”.

If the current window is not adopted with the waveform display, it will prompt “-221, “Settings Conflict"”.

Reset status: Set the horizontal scale to 10 us.

[:SENSe[1]|2]:TRACe:Y:CENTer

Function: Query or set the vertical center of the trace of the specified channel. The unit will be determined by [:SENSe[1]|2]:TRACe:UNIT.

Query: [:SENSe[1]|2]:TRACe:Y:CENTer? [MIN|MAX]

Setting: [:SENSe[1]|2]:TRACe:Y:CENTer <NRf>

The range of <NRf> is -150 dBm - 210 dBm in case of logarithmic display.

The range of <NRf> is -100 MW - 100 MW in case of linear display.

Example:

SENS2:TRAC:Y:CENT?	Query the vertical center of channel B.
TRAC:Y:CENT 0	Set the vertical center of channel A to 0 (dBm or W).

Limit: It is only valid for the peak sensor (8170X).

Error information: If the given channel is not connected with the sensor or it is connected with the CW sensor, it will prompt “-241, “Hardware Missing"”.

Reset status: Set the vertical center to -20 dBm.

[:SENSe[1]|2]:TRACe:Y:SCALe:PDIV

Function: Query or set the vertical scale of the trace of the specified channel.

Query: [:SENSe[1]|2]:TRACe:Y:SCALe:PDIV? [MIN|MAX]

Setting: [:SENSe[1]|2]:TRACe:Y:SCALe:PDIV <NRf>

The range of <NRf> is 0.01 dB - 20 dB in case of logarithmic display

The range of <NRf> is 1 nW - 10 MW in case of linear display.

Example: SENS2:TRAC:Y:SCAL:PDIV? Query the vertical scale of channel B.

TRAC:Y:SCAL:PDIV 10 Set the vertical scale of channel A to 10 (dB or W).

Limit: It is only valid for the peak sensor (8170X).

Error information: If the given channel is not connected with the sensor or it is connected with the CW sensor, it will prompt “-241, “Hardware Missing"”.

Reset status: Set the vertical scale to 10 dB/Div.

3.3.10 Status (STATus)

The status subsystem command will detect the status of the microwave power meter through monitoring the device status register, operation status register and questionable register.

Table3.10 Command or Event Affecting the Status register

Status register	*RST	*CLS	Power-on	Status:PRESet
SCPI transition filter (NTR and PTR)	Not affected	Not affected	Preset	Preset
SCPI enable register	Not affected	Not affected	Preset	Preset
SCPI event register	Not affected	Reset	Reset	Not affected
SCPI error/event queue enable	Not affected	Not affected	Preset	Preset
SCPI error/event queue	Not affected	Reset	Reset	Not affected
IEEE488.2 register ESE SRE	Not affected	Not affected	Reset	Not affected
IEEE488.2 register SESR STB	Not affected	Reset	Reset	Not affected

Description of preset status: The preset value of PTR is 0x7fff (32767); NTR and enable registers are reset.

3.3.10.1 Command set

Query or set the content of the status register through the following command set:

:CONDition?

Query the condition register value of the status register, and the format of the returned value is＜NR1＞. The range is 0 ~ 32767. The value of the condition register will be kept unchanged after the query.

:ENABle <NRf>|<Non-decimal>

Query or set the event enable register of the status register, and the highest bit (Bit 15) is always 0.

[:EVENt?]

Query the event register of the status register, and reset it after the query.

:NTRansition <NRf>|<Non-decimal>

Query or set the negative transition filter of the status register, and the highest bit is always 0.

:PTRansition <NRf>|<Non-decimal>.

Query or set the positive transition filter of the status register, and the highest bit is always 0.

The status register supported in this case includes:

Status:DEVice

Status:OPERation

Status:OPERation:CALibrating[:SUMMary]

Status:OPERation:LLFail[:SUMMary]

Status:OPERation:SENSe[:SUMMary]

Status:OPERation:TRIGger[:SUMMary]

Status:OPERation:ULFail[:SUMMary]

Status:QUEStionable

Status:QUEStionable

Status:QUEStionable:CALibration[:SUMMary]

Status:QUEStionable:POWer[:SUMMary]

For example:

The:CONDition? can be used to query and calibrate the operation register STATus:OPERation:CALibrating[:SUMMary]

STATus:OPERation:CALibrating[:SUMMary]:CONDition?

The:ENABle can be used to query and calibrate the operation register STATus:OPERation:CALibrating[:SUMMary]

STATus:OPERation:CALibrating[:SUMMary]:ENABle

3.3.10.2 Transition filter

For description of the transition filter, please refer to section 9.2 of SCPI-99. The brief introduction is given below.

1） Positive transition (PTR): When the condition is FALSE - TRUE, the event is set to TRUE.

2） Negative transition (NTR): When the condition is TRUE - FALSE, the event is set to TRUE.

3） Positive transition or negative transition: When the condition is FALSE - TRUE or TRUE - FALSE, the event is set to TRUE.

4） The event report will be disabled by resetting the positive and negative transition register.

3.3.10.3 Description of device status register (STATus:DEVice)

Table3.11 Description of Device Status Register

Bit	Value	Definition
0	1	Not used
1	2	Detection status of the sensor of channel A
2	4	Detection status of the sensor of channel B
3	8	Error status of the sensor of channel A
4	16	Error status of the sensor of channel B
5	32	Detection status of the sensor of USB channel (reserved)
6	64	Error status of USB channel (reserved)
7-14	-	Not used
15	-	It is always 0

1) The Bit 1 and Bit 2 represents the sensor detection status of channel A and channel B respectively. (The instrument doesn't support hot-pluggable power sensor currently.)

   a) Returned value of STATus:DEVice:CONDition?: 1 means that sensor is detected and 0 means that no sensor is connected.

   b) Returned value of STATus:DEVice[:EVENt]?: 1 means that sensor is connected or removed. 0 means no occurrence. The event register will be reset after the query.

   c) When Status:DEVice:NTRansition is set to 1, if it is detected that the sensor is removed, set Status:DEVice[:EVENt] to 1.

   d) When Status:DEVice:PTRansition is set to 1, if it is detected that the sensor is connected, set Status:DEVice[:EVENt] to 1.

2) The bit 3 and bit 4 represents the sensor error of channel A and channel B respectively. 1 means error and 0 means that no error is found.

3.3 Instrument subsystem command

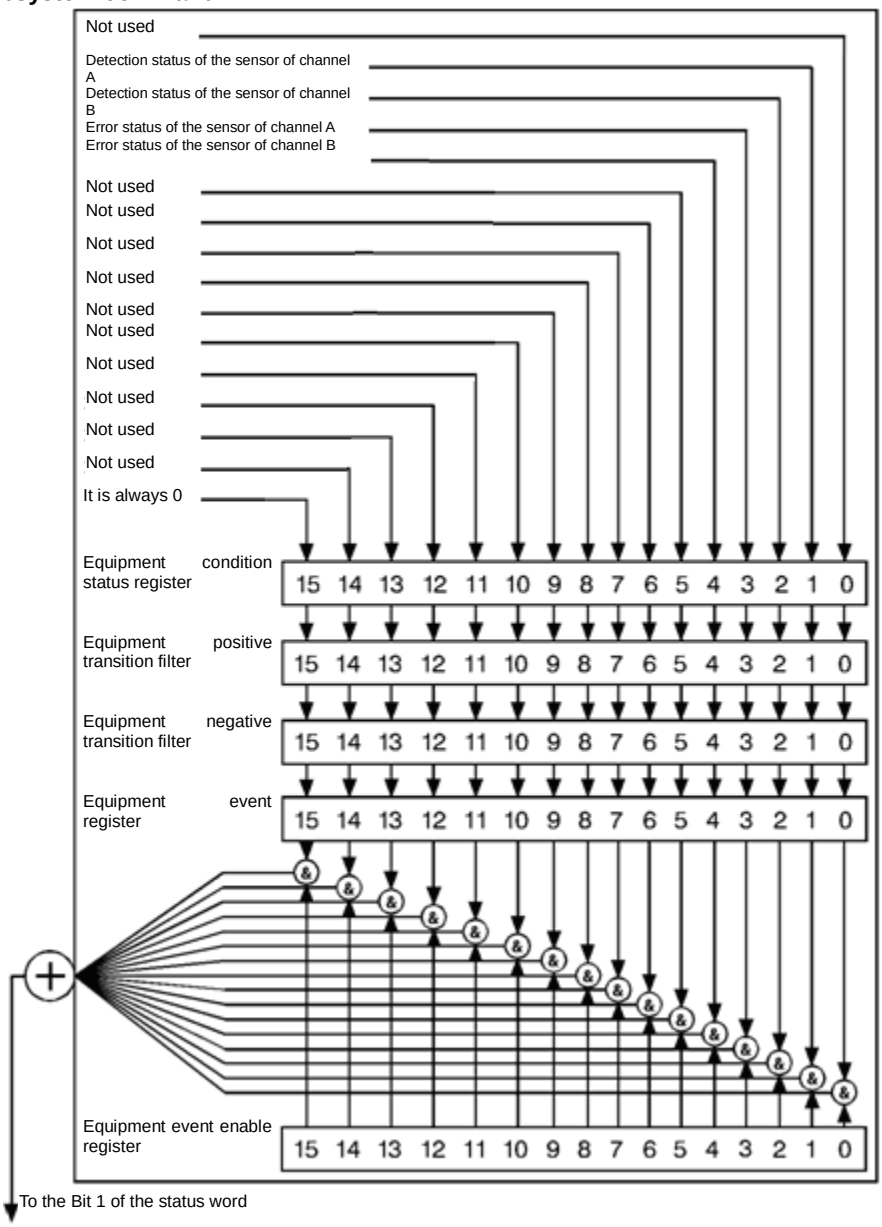


Fig.3.5 Device Status register

3.3.10.4 Description of operation status register (Status:OPERation)

Table3.12 Description of Operation Status register

Bit	Value	Definition
0	1	Calibration summary
1-4	-	Not used
5	32	Summary of waiting for trigger
6-9	-	Not used
10	1024	Summary of sense
11	2048	Summary of lower limit detection failure (LLF)
12	4096	Summary of upper limit detection failure (ULF)

13-14	-	Not used
15	-	It is always 0

It includes 6 groups of operation registers:

- Status:OPERation
- Status:OPERation:CALibrating[:SUMMary]
- Status:OPERation:LLFail[:SUMMary]
- Status:OPERation:SENSe[:SUMMary]
- Status:OPERation:TRIGger[:SUMMary]
- Status:OPERation:ULFail[:SUMMary]

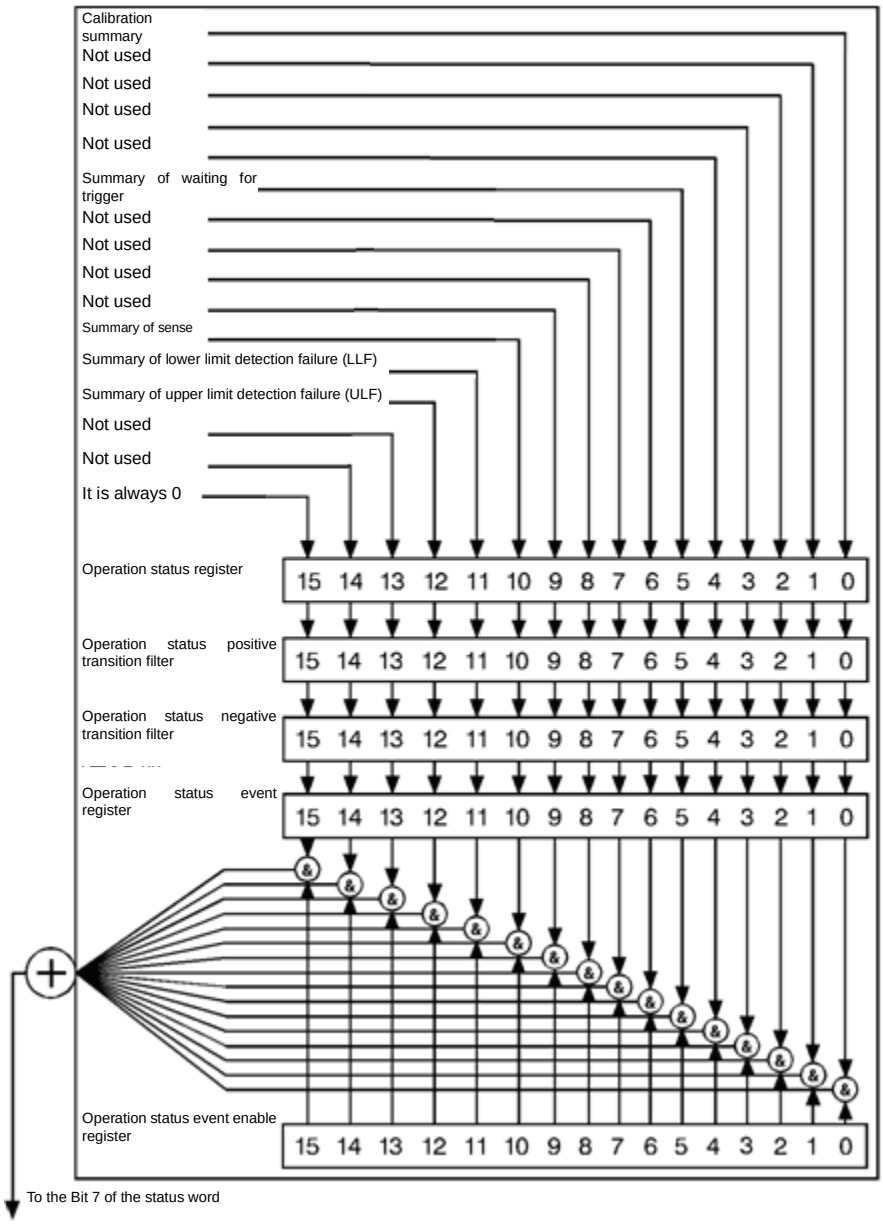


Fig.3.6 Description of Operation Status register

3.3 Instrument subsystem command

3.3.10.5 Summary of calibration operation status register (Status:OPERation:CALibrating[:SUMMary])

Table3.13 Summary of Calibration Operation Status register

Bit	Value	Definition
0	1	Not used
1	2	Calibration status of channel A.
2	4	Calibration status of channel B.
3-14	-	Not used
15	-	It is always 0

The bit 1 and bit 2 represents the calibration status of channel A and channel B respectively. 1 means that zero or calibration is being carried out, 0 means that calibration is completed or no zero or calibration is carried out.

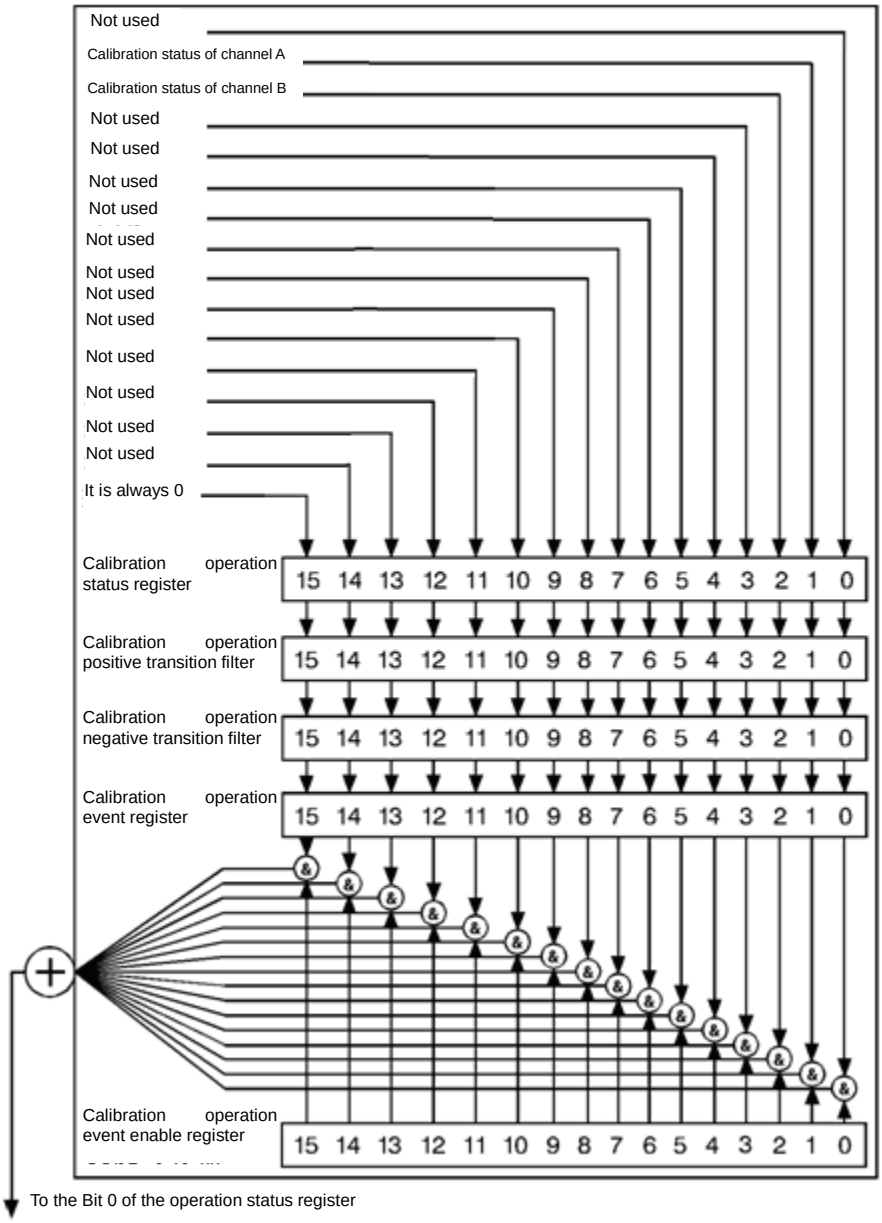


Fig.3.7 Calibration Operation Status register

3.3.10.6 Summary of lower limit detection operation status register (Status:OPERation:LLFail[:SUMMary])

Table3.14 Summary of Lower Limit Detection Operation Status register

Bit	Value	Definition
0-2	-	Not used
3	8	Lower limit detection status of the upper measurement of the upper window
4	16	Lower limit detection status of the upper measurement of the lower window
5	32	Lower limit detection status of the lower measurement of the upper window
6	64	Lower limit detection status of the lower measurement of the lower window
7-14	-	Not used
15	-	It is always 0

Bit 3 - Bit 6 represents the failure detection status of the lower limit of the corresponding window, and 1 means that it is out of the lower limit

3.3 Instrument subsystem command

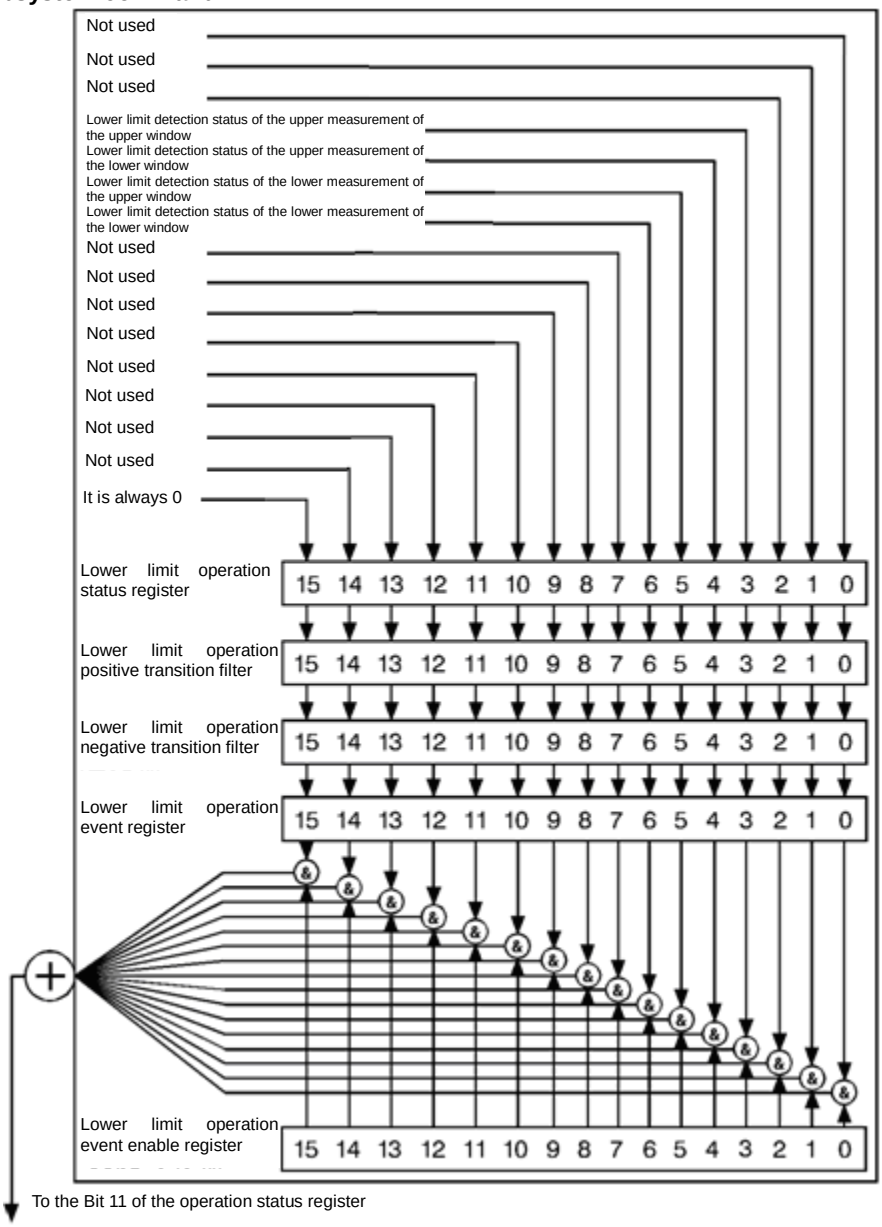


Fig.3.8 Lower Limit Detection Operation Status register

3.3.10.7 Summary of Sense Operation Status register (Status:OPERation:SENSe[:SUMMary])

Table3.15 Summary of Sense Operation Status register

Bit	Value	Definition
0	1	Not used
1	2	Reading sensor EEPROM status of channel A
2	4	Reading sensor EEPROM status of channel B
3-14	-	Not used
15	-	It is always 0

The Bit 1 and Bit 2 represents the reading sensor EEPROM status of channel A and channel B respectively. 1 means that the sensor is being read.

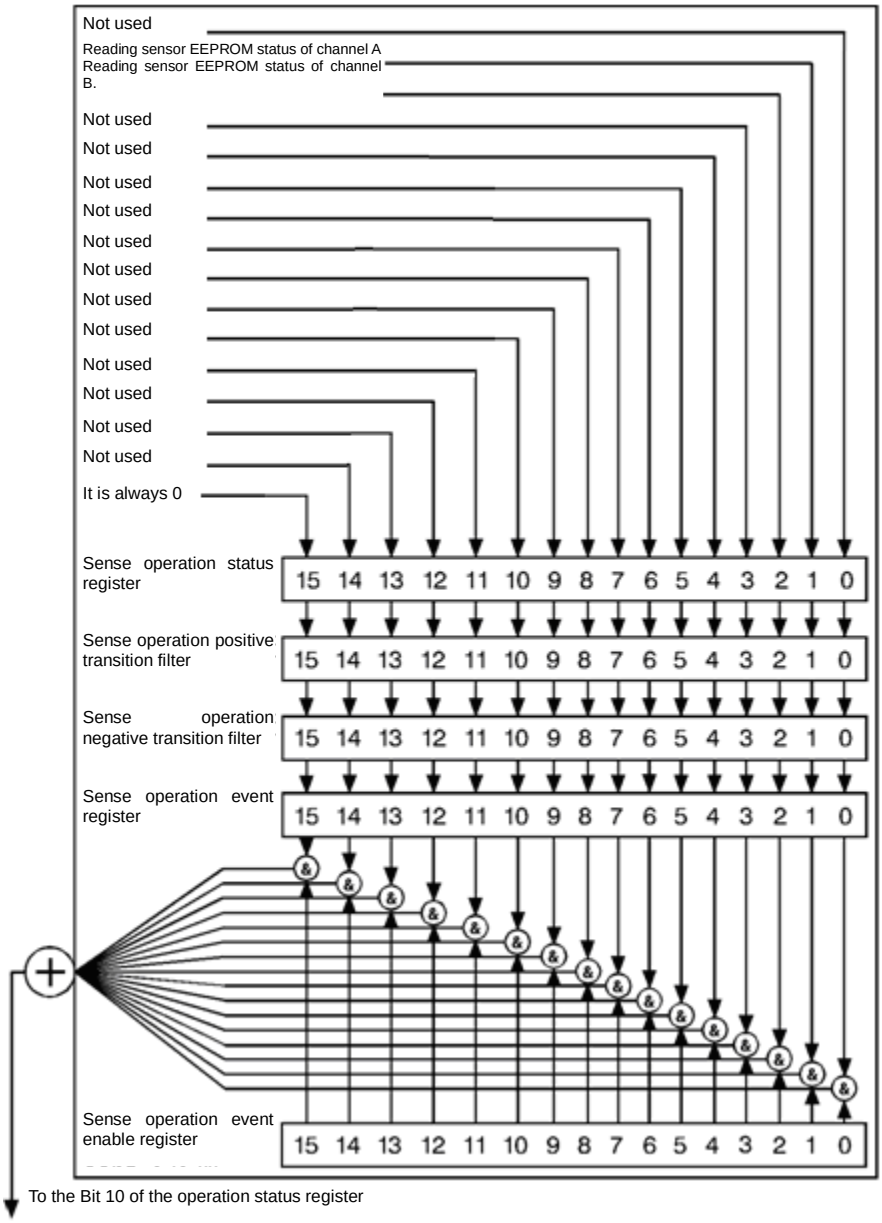


Fig.3.9 Sense Operation Status register

3.3.10.8 Summary of trigger operation status register (Status:OPERation:TRIGger[:SUMMary])

Table3.16 Summary of Trigger Operation Status register

Bit	Value	Definition
0	1	Not used
1	2	Trigger status of channel A
2	4	Trigger status of channel B
3-14	-	Not used
15	-	It is always 0

The Bit 1 and Bit 2 represents the trigger waiting status of channel A and channel B respectively. 1 means that it is waiting for trigger.

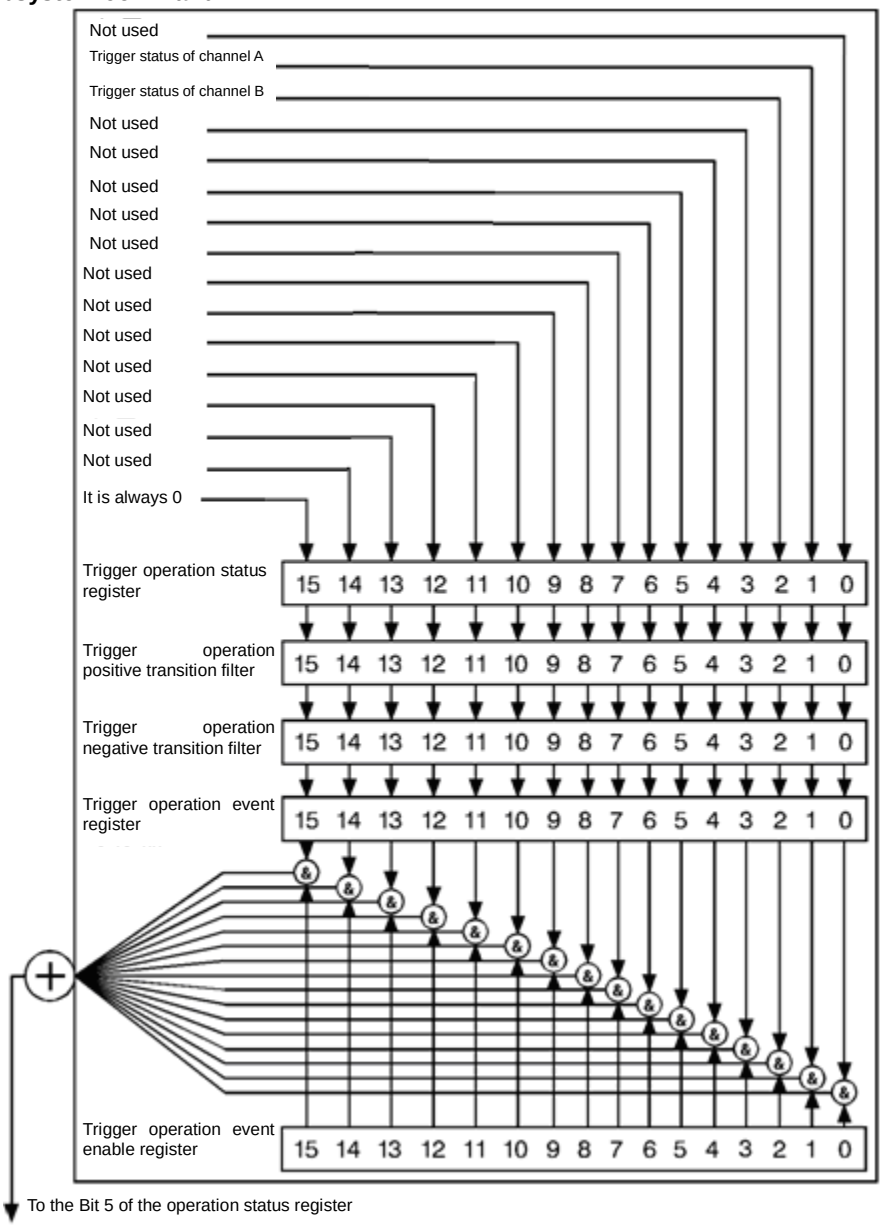


Fig.3.10 Trigger Operation Status register

3.3.10.9 Summary of upper limit detection operation status register (Status:OPERation:ULFail[:SUMMary])

Table3.17 Summary of Upper Limit Detection Operation Status register

Bit	Value	Definition
0-2	-	Not used
3	8	Upper limit detection status of the upper measurement of the upper window
4	16	Upper limit detection status of the upper measurement of the lower window
5	32	Upper limit detection status of the lower measurement of the upper window
6	64	Upper limit detection status of the lower measurement of the lower window

7-14	-	Not used
15	-	It is always 0

Bit 3 - Bit 6 represents the failure detection status of the upper limit of the corresponding window, and 1 means that it is out of the upper limit.

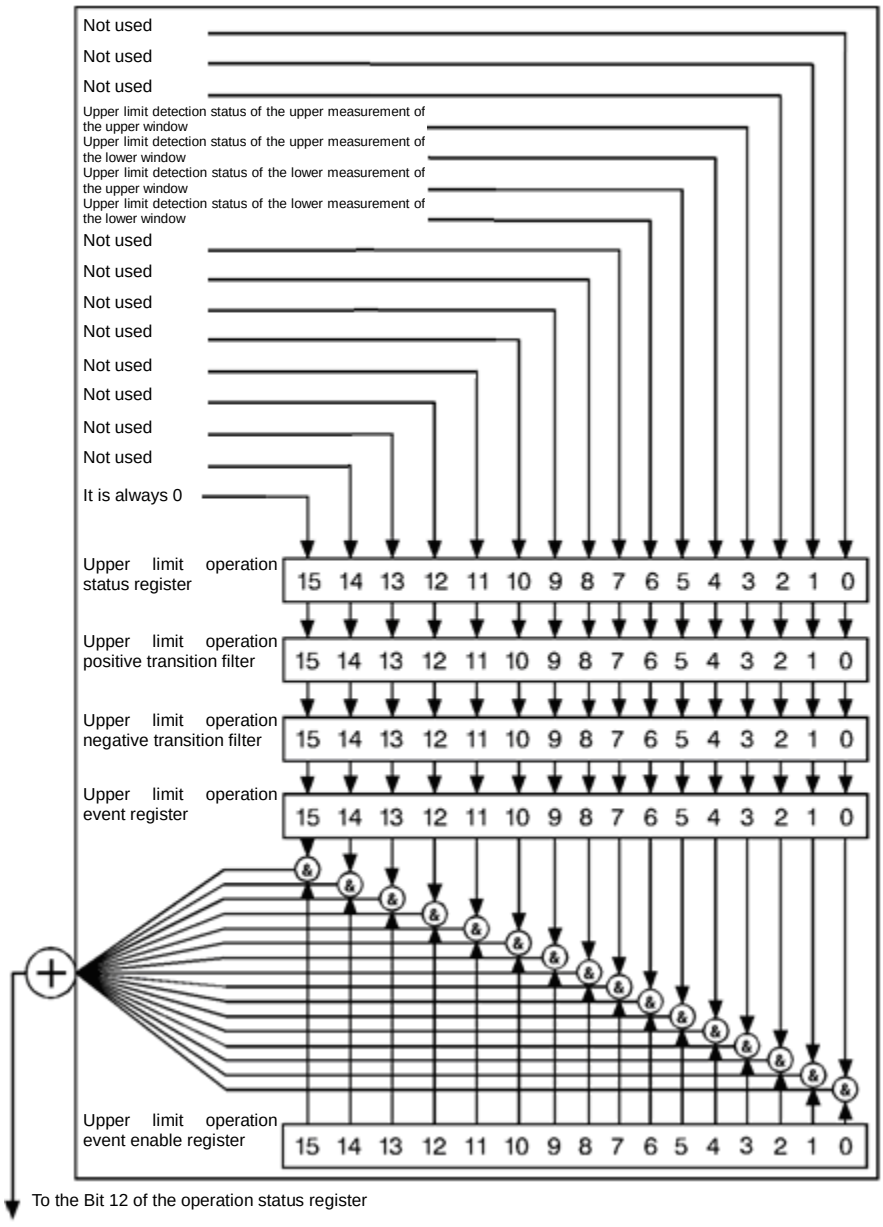


Fig.3.11 Upper Limit Detection Operation Status register

3.3.12.10 Summary of questionable status register (Status:QUEStionable)

Table3.18 Summary of Questionable Status register

Bit	Value	Definition
0-2	-	Not used
3	8	Power summary
4-7	-	Not used
8	256	Calibration summary

9	512	Power-on self-test
10-14	-	Not used
15	-	It is always 0

It includes 3 groups of operation registers:

- Status:QUEStionable
- Status:QUEStionable:Power[:SUMMary]
- Status:QUEStionable:CALibration[:SUMMary]

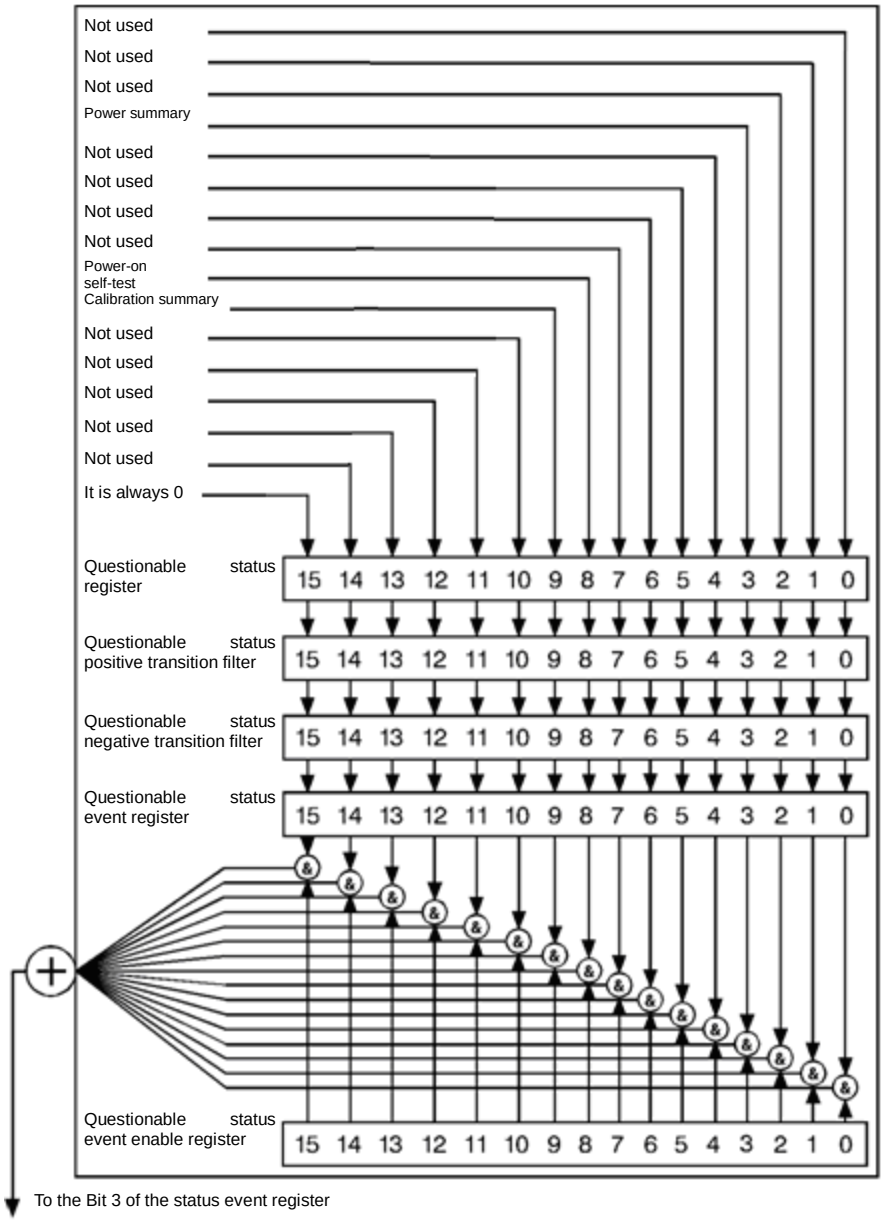


Fig.3.12 Questionable Status register

3.3.10.11 Summary of calibration questionable status register (Status:QUEStionable:CALibration[:SUMMary])

Table3.19 Summary of Calibration Questionable Status register

Bit	Value	Definition
0	1	Not used
1	2	Zero and calibration error of channel A
2	4	Zero and calibration error of channel B
3-14	-	Not used
15	-	It is always 0

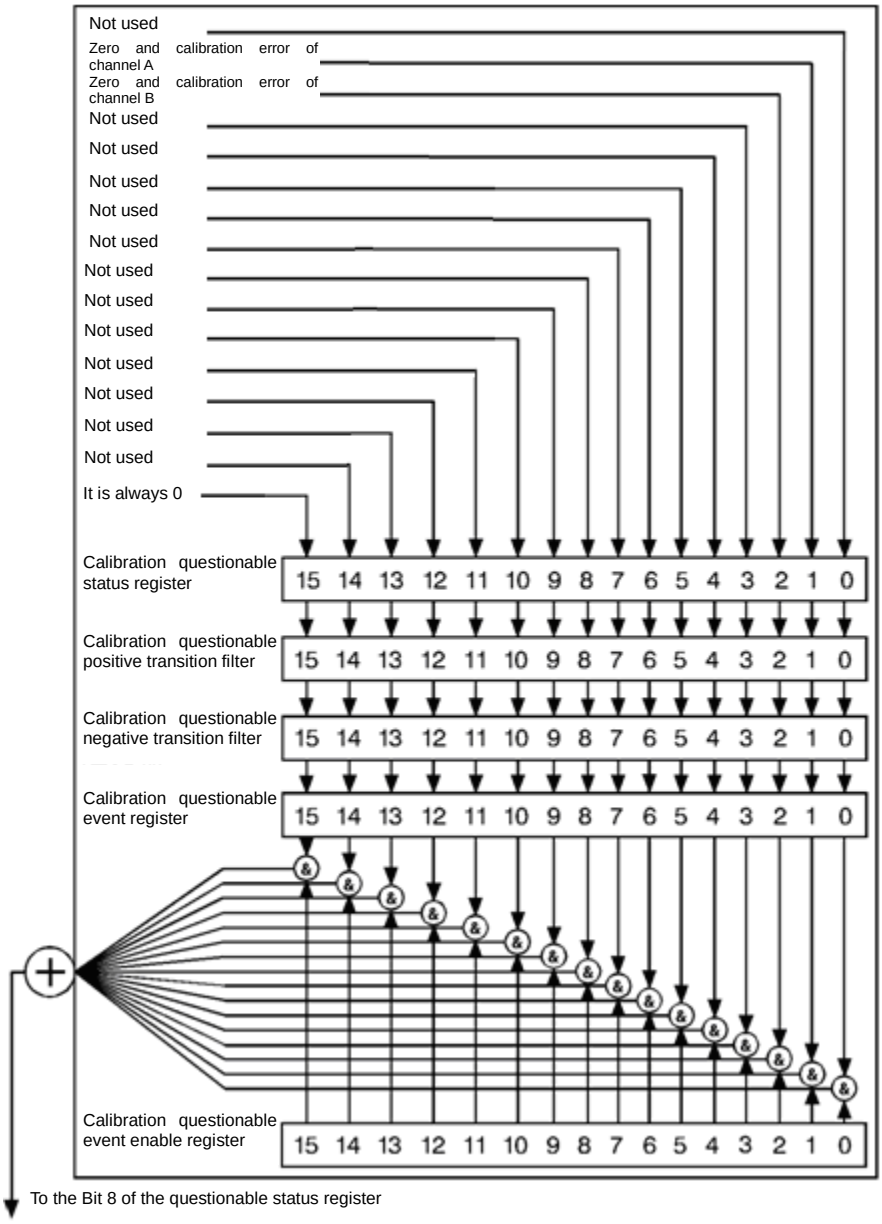


Fig.3.13 Calibration Questionable Status register

3.3.10.12 Summary of power questionable status register (Status:QUEStionable:POWer[:SUMMary])

Table3.20 Summary of Power Questionable Status register

Bit	Value	Definition
0	1	Not used

1	2	Input Overload Ch1
2	4	Input Overload Ch2
3	8	The channel A shall be zeroed
4	16	The channel B shall be zeroed
5	32	The data of the upper measurement of the upper window is invalid, or the log error occurs
6	64	The data of the upper measurement of the lower window is invalid, or the log error occurs
7	128	The data of the lower measurement of the upper window is invalid, or the log error occurs
8	256	The data of the lower measurement of the lower window is invalid, or the log error occurs
9-14	-	Not used
15	-	It is always 0

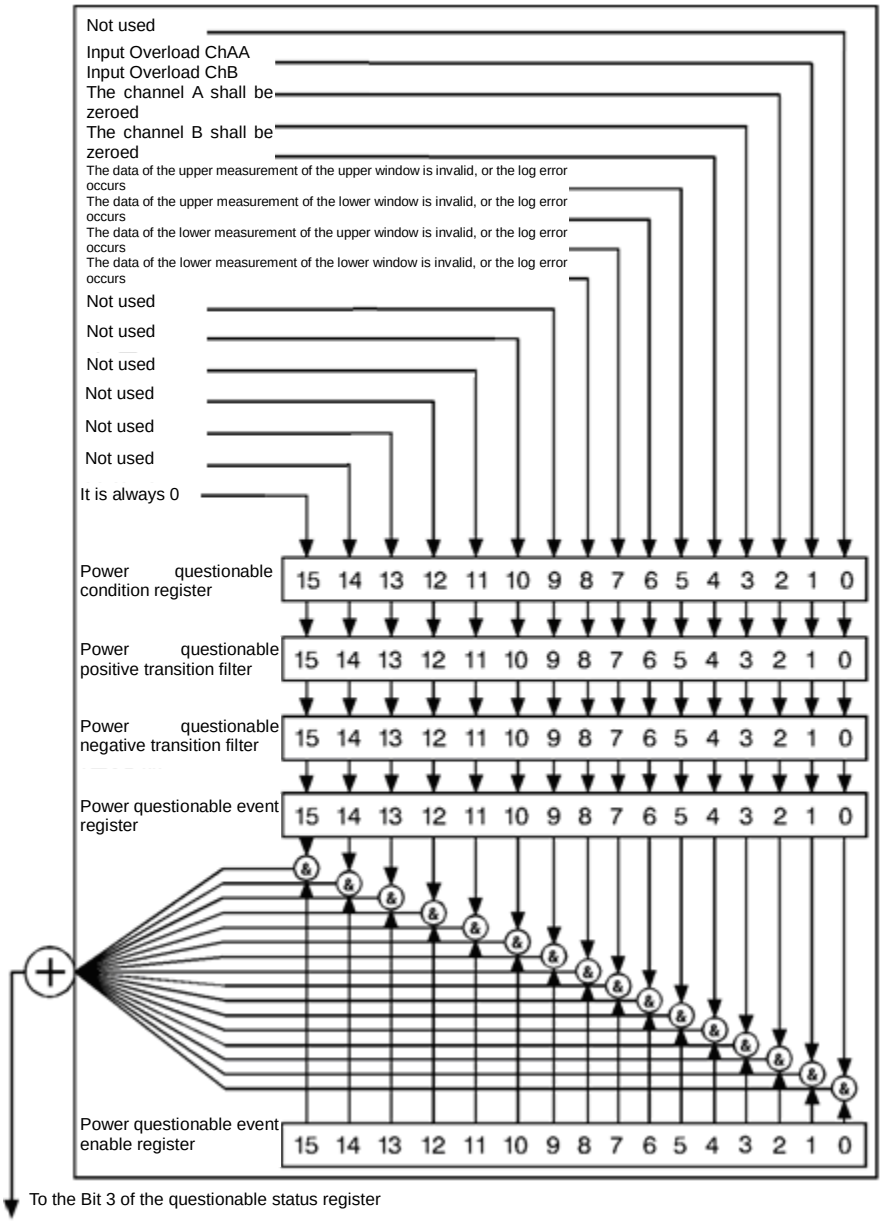


Fig.3.14 Power Questionable Status register

:Status:DEVice:CONDition?

Function: Query the value in the device status condition register.

For the returned value, if the Bit 1 is non-zero, it means that channel A detects the sensor; if the Bit 2 is non-zero, it means that channel B detects the sensor; if the Bit 3 is non-zero, it means that channel A sensor has error; if the Bit 4 is non-zero, it means that channel B sensor has error.

Query: :Status:DEVice:CONDition?

Setting: Not supported

Example: STAT:DEV:COND?

:Status:DEVice:ENABle

Function: Query or set the device status event enable register. Carry out bitwise-operation. 0 means that it is forbidden to report the status event to the Bit 1 of the upper level status byte. 1

represents enable.

Query: :Status:DEVice:ENABle?

Setting: :Status:DEVice:ENABle <NRf>|<Non-decimal>
The range of the parameter is 0 - 32767.

Example:

STAT:DEV:ENAB?	Query the device status event enable register.
STAT:DEV:ENAB 6	Enable the Bit 1 and Bit 2, namely, allow reporting the sensor detection event to the status byte.
STAT:DEV:ENAB #B0110	The meaning is the same as above, and binary number is used.
STAT:DEV:ENAB #H06	The meaning is the same as above, and hexadecimal number is used.

:Status:DEVice[:EVENt]?

Function: Query the device event register. The microwave power meter will automatically reset the register after the query.

Query: :Status:DEVice[:EVENt]?

Setting: Not supported

Example: STAT:DEV?

:Status:DEVice:NTRansition

Function: Query or set the device negative transition filter.

Query: :Status:DEVice:NTRansition?

Setting: :Status:DEVice:NTRansition <NRf>|<Non-decimal>
The range of the parameter is 0 - 32767.

Example: STAT:DEV:NTR?

STAT:DEV:NTR #H06	Report the status of the Bit 1 and Bit 2 of the negative transition filter to the event register.
STAT:DEV:NTR #B0110	The meaning is the same as above, and binary number is used.
STAT:DEV:NTR 6	The meaning is the same as above, and decimal number is used.

:Status:DEVice:PTRansition

Function: Query or set the device positive transition filter.

Query: :Status:DEVice:PTRansition?

Setting: :Status:DEVice:PTRansition <NRf>|<Non-decimal>
The range of the parameter is 0 - 32767.

Example: STAT:DEV:PTR?

STAT:DEV:PTR #H06	Report the status of the Bit 1 and Bit 2 of the positive transition filter to the event register.
STAT:DEV:PTR #B0110	The meaning is the same as above, and binary number is used.
STAT:DEV:PTR 6	The meaning is the same as above, and decimal number is used.

:Status:OPERation:CALibrating[:SUMMary]:CONDition?

Function: Query the value in the calibration status condition register.

For the returned value, if the Bit 1 is non-zero, it means that channel A is being zeroed or calibrated; if the Bit 2 is non-zero, it means that channel B is being zeroed or calibrated. If 2 is returned, it means that channel A is being zeroed and calibrated.

Query: :Status:OPERation:CALibrating[:SUMMary]:CONDition?

Setting: Not supported

Example: STAT:OPER:CAL:COND?

:Status:OPERation:CALibrating[:SUMMary]:ENABle

Function: Query or set the calibration operation event enable register. Carry out bitwise-operation. 0 means that it is forbidden to report the status event to the Bit 0 of the operation status. 1 represents enable.

Query: :Status:OPERation:CALibrating[:SUMMary]:ENABle?

Setting: :Status:OPERation:CALibrating[:SUMMary]:ENABle <NRf>|<Non-decimal>

The range of the parameter is 0 - 32767.

Example: STAT:OPER:CAL:ENAB?

STAT:OPER:CAL:ENAB 6	Enable the Bit 1 and Bit 2, namely, allow reporting the calibration operation event to the operation status.
STAT:OPER:CAL:ENAB #B0110	The meaning is the same as above, and binary number is used.
STAT:OPER:CAL:ENAB #H06	The meaning is the same as above, and hexadecimal number is used.

:Status:OPERation:CALibrating[:SUMMary][:EVENt]?

Function: Query the calibration operation event register. The microwave power meter will automatically reset the register after the query.

Query: :Status:OPERation:CALibrating[:SUMMary][:EVENt]?

Setting: Not supported

Example: STAT:OPER:CAL?

:Status:OPERation:CALibrating[:SUMMary]:NTRansition

Function: Query or set the calibration operation negative transition filter.

Query: :Status:OPERation:CALibrating[:SUMMary]:NTRansition?

Setting: :Status:OPERation:CALibrating[:SUMMary]:NTRansition <NRf>|<Non-decimal>

The range of the parameter is 0 - 32767.

Example: STAT:OPER:CAL:NTR?

STAT:OPER:CAL:NTR 6	Report the status of the Bit 1 and Bit 2 of the negative transition filter to the event register.
STAT:OPER:CAL:NTR #B0110	The meaning is the same as above, and binary number is used.
STAT:OPER:CAL:NTR #H06	The meaning is the same as above, and hexadecimal number is used.

:Status:OPERation:CALibrating[:SUMMary]:PTRansition

Function: Query or set the calibration operation positive transition filter.

Query: :Status:OPERation:CALibrating[:SUMMary]:PTRansition?

Setting: :Status:OPERation:CALibrating[:SUMMary]:PTRansition <NRf>|<Non-decimal>

The range of the parameter is 0 - 32767.

Example: STAT:OPER:CAL:PTR?

STAT:OPER:CAL:PTR 6	Report the status of the Bit 1 and Bit 2 of the positive transition filter to the event register.
STAT:OPER:CAL:PTR #B0110	The meaning is the same as above, and binary number is used.
STAT:OPER:CAL:PTR #H06	The meaning is the same as above, and hexadecimal number is used.

:Status:OPERation:CONDition?

Function: Query the value in the operation status condition register.

For the returned value, if the Bit 0 is non-zero, it means that the calibration event is detected; if the Bit 5 is non-zero, it means that the waiting trigger event is detected; if the Bit 10 is non-zero, it means that sensor connection or removal event is detected; if the Bit 11 is non-zero, it means that the lower limit detection event is detected; if the Bit 12 is non-zero, it means that the upper limit detection event is detected.

For example, if the calibration event is detected through this group of registers, the corresponding bit of the calibration enable register (STAT:OPER:CAL:ENAB) shall be set to non-zero. The others are similar.

Query: :Status:OPERation:CONDition?

Setting: Not supported

Example: STAT:OPER:COND?

:Status:OPERation:ENABle

Function: Query or set the operation status event enable register. Carry out bitwise-operation. 0 means that it is forbidden to report the status event to the Bit 7 of the status byte. 1 represents enable.

Query: :Status:OPERation:ENABle?

Setting: :Status:OPERation:ENABle <NRf>|<Non-decimal>

The range of the parameter is 0 - 32767.

Example: STAT:OPER:ENAB?

STAT:OPER:ENAB 1	Enable the Bit 1, namely, allow reporting the operation event to the status byte.
STAT:OPER:ENAB #B0001	The meaning is the same as above, and binary number is used.
STAT:OPER:ENAB #H01	The meaning is the same as above, and hexadecimal number is used.

:Status:OPERation[:EVENt]?

Function: Query the operation status event register. The microwave power meter will automatically reset the register after the query.

Query: :Status:OPERation[:EVENt]?

Setting: Not supported

Example: STAT:OPER?

:Status:OPERation:NTRansition

Function: Query or set the operation status negative transition filter.

Query: :Status:OPERation:NTRansition?

Setting: :Status:OPERation:NTRansition <NRf>|<Non-decimal>
The range of the parameter is 0 - 32767.

Example: STAT:OPER:NTR?

STAT:OPER:NTR 1	Report the status of the Bit 0 of the negative transition filter to the event register.
STAT:OPER:NTR #B0001	The meaning is the same as above, and binary number is used.
STAT:OPER:NTR #H01	The meaning is the same as above, and hexadecimal number is used.

:Status:OPERation:PTRansition

Function: Query or set the operation status positive transition filter.

Query: :Status:OPERation:NTRansition?

Setting: :Status:OPERation:NTRansition <NRf>|<Non-decimal>
The range of the parameter is 0 - 32767.

Example: STAT:OPER:NTR?

STAT:OPER:NTR #H06	Report the status of the Bit 1 and Bit 2 of the positive transition filter to the event register.
STAT:OPER:NTR #B0110	The meaning is the same as above, and binary number is used.
STAT:OPER:NTR 6	The meaning is the same as above, and decimal number is used.

:Status:OPERation:LLFail[:SUMMary]:CONDition?

Function: Query the value in the lower limit detection operation status condition register.
For the returned value, if the Bit 3 is non-zero, it represents the lower limit detection failure status of the upper measurement of the upper window; if the Bit 4 is non-zero, it represents the lower limit detection failure status of the upper measurement of the lower window; if the Bit 5 is non-zero, it represents the lower limit detection failure status of the lower measurement of the upper window; if the Bit 6 is non-zero, it represents the lower limit detection failure status of the lower measurement of the lower window.

Query: :Status:OPERation:LLFail[:SUMMary]:CONDition?

Setting: Not supported

Example: STAT:OPER:LLF:COND?

:Status:OPERation:LLFail[:SUMMary]:ENABle

Function: Query or set the lower limit detection operation event enable register. Carry out bitwise-operation. 0 means that it is forbidden to report the status event to the Bit 0 of the operation status. 1 represents enable.

Query: :Status:OPERation:LLFail[:SUMMary]:ENABle?

Setting: :Status:OPERation:LLFail[:SUMMary]:ENABle <NRf>|<Non-decimal>
The range of the parameter is 0 - 32767.

Example: STAT:OPER:LLF:ENAB?

STAT:OPER:LLF:ENAB 8	Enable the Bit 3, namely, allow reporting the lower detection operation event to the operation status.
STAT:OPER:LLF:ENAB #B1000	The meaning is the same as above, and binary

number is used.

STAT:OPER:LLF:ENAB #H08	The meaning is the same as above, and hexadecimal number is used.

:Status:OPERation:LLFail[:SUMMary][:EVENt]?

Function: Query the lower limit detection operation event register. The power meter will automatically reset the register after the query.

Query: :Status:OPERation:LLFail[:SUMMary][:EVENt]?

Setting: Not supported

Example: STAT:OPER:LLF?

:Status:OPERation:LLFail[:SUMMary]:NTRansition

Function: Query or set the lower detection operation negative transition filter.

Query: :Status:OPERation:LLFail[:SUMMary]:NTRansition?

Setting: :Status:OPERation:LLFail[:SUMMary]:NTRansition <NRf>|<Non-decimal>
The range of the parameter is 0 - 32767.

Example: STAT:OPER:LLF:NTR?

STAT:OPER:LLF:NTR 8	Report the status of the Bit 3 of the negative transition filter to the event register.
STAT:OPER:LLF:NTR #B1000	The meaning is the same as above, and binary number is used.
STAT:OPER:LLF:NTR #H08	The meaning is the same as above, and hexadecimal number is used.

:Status:OPERation:LLFail[:SUMMary]:PTRansition

Function: Query or set the lower detection operation positive transition filter.

Query: :Status:OPERation:LLFail[:SUMMary]:PTRansition?

Setting: :Status:OPERation:LLFail[:SUMMary]:PTRansition <NRf>|<Non-decimal>
The range of the parameter is 0 - 32767.

Example: STAT:OPER:LLF:PTR?

STAT:OPER:LLF:PTR 8	Report the status of the Bit 3 of the positive transition filter to the event register.
STAT:OPER:LLF:PTR #B1000	The meaning is the same as above, and binary number is used.
STAT:OPER:LLF:PTR #H08	The meaning is the same as above, and decimal number is used.

:Status:OPERation:SENSe[:SUMMary]:CONDition?

Function: Query the value in the sense operation status condition register.
For the returned value, if the Bit 1 is non-zero, it represents the reading sensor EEPROM status of channel A; if the Bit 2 is non-zero, it represents the reading sensor EEPROM status of channel B.

Query: :Status:OPERation:SENSe[:SUMMary]:CONDition?

Setting: Not supported

Example: STAT:OPER:SENS:COND?

:Status:OPERation:SENSe[:SUMMary]:ENABle

Function: Query or set the sense operation event enable register. Carry out bitwise-operation. 0 means that it is forbidden to report the sense operation status event to the Bit 10 of the operation status. 1 represents enable.

Query: :Status:OPERation:SENSe[:SUMMary]:ENABle?

Setting: :Status:OPERation:SENSe[:SUMMary]:ENABle <NRf>|<Non-decimal>
The range of the parameter is 0 - 32767.

Example: STAT:OPER:SENS:ENAB?

STAT:OPER:SENS:ENAB 6	Enable the Bit 1 and Bit 2, namely, allow reporting the sense operation event to the operation status.
STAT:OPER:SENS:ENAB #B0110	The meaning is the same as above, and binary number is used.
STAT:OPER:SENS:ENAB #H06	The meaning is the same as above, and hexadecimal number is used.

:Status:OPERation:SENSe[:SUMMary][:EVENt]?

Function: Query the sense operation event register. The microwave power meter will automatically reset the register after the query.

Query: :Status:OPERation:SENSe[:SUMMary][:EVENt]?

Setting: Not supported

Example: STAT:OPER:SENS?

:Status:OPERation:SENSe[:SUMMary]:NTRansition

Function: Query or set the sense operation negative transition filter.

Query: :Status:OPERation:SENSe[:SUMMary]:NTRansition?

Setting: :Status:OPERation:SENSe[:SUMMary]:NTRansition <NRf>|<Non-decimal>
The range of the parameter is 0 - 32767.

Example: STAT:OPER:SENS:NTR?

STAT:OPER:SENS:NTR 6	Report the status of the Bit 1 and Bit 2 of the negative transition filter to the event register.
STAT:OPER:SENS:NTR #B0110	The meaning is the same as above, and binary number is used.
STAT:OPER:SENS:NTR #H06	The meaning is the same as above, and hexadecimal number is used.

:Status:OPERation:SENSe[:SUMMary]:PTRansition

Function: Query or set the sense operation positive transition filter.

Query: :Status:OPERation:SENSe[:SUMMary]:PTRansition?

Setting: :Status:OPERation:SENSe[:SUMMary]:PTRansition <NRf>|<Non-decimal>
The range of the parameter is 0 - 32767.

Example: STAT:OPER:SENS:PTR?

STAT:OPER:SENS:PTR 6	Report the status of the Bit 1 and Bit 2 of the positive transition filter to the event register.
STAT:OPER:SENS:PTR #B0110	The meaning is the same as above, and binary number is used.
STAT:OPER:SENS:PTR #H06	The meaning is the same as above, and

hexadecimal number is used.

:Status:OPERation:TRIGger[:SUMMary]:CONDition?

Function: Query the value in the trigger operation status condition register.

For the returned value, if the Bit 1 is non-zero, it means that channel A is waiting for trigger; if the Bit 2 is non-zero, it means that channel B is waiting for trigger. For example, if 2 is returned, it means that channel A is waiting for trigger.

Query: :Status:OPERation:CALibrating[:SUMMary]:CONDition?

Setting: Not supported

Example: STAT:OPER:CAL:COND?

:Status:OPERation:TRIGger[:SUMMary]:ENABle

Function: Query or set the trigger operation event enable register. Carry out bitwise-operation. 0 means that it is forbidden to report the status event to the Bit 5 of the operation status. 1 represents enable.

Query: :Status:OPERation:TRIGger[:SUMMary]:ENABle?

Setting: :Status:OPERation:TRIGger[:SUMMary]:ENABle <NRf>|<Non-decimal>

The range of the parameter is 0 - 32767.

Example: STAT:OPER:TRIG:ENAB?

STAT:OPER:TRIG:ENAB 6	Enable the Bit 1 and Bit 2, namely, allow reporting the trigger operation event to the operation status.
STAT:OPER:TRIG:ENAB #B0110	The meaning is the same as above, and binary number is used.
STAT:OPER:TRIG:ENAB #H06	The meaning is the same as above, and hexadecimal number is used.

:Status:OPERation:TRIGger[:SUMMary][:EVENt]?

Function: Query the trigger operation event register. The microwave power meter will automatically reset the register after the query.

Query: :Status:OPERation:TRIGger[:SUMMary][:EVENt]?

Setting: Not supported

Example: STAT:OPER:TRIG?

:Status:OPERation:TRIGger[:SUMMary]:NTRansition

Function: Query or set the trigger operation negative transition filter.

Query: :Status:OPERation:TRIGger[:SUMMary]:NTRansition?

Setting: :Status:OPERation:TRIGger[:SUMMary]:NTRansition <NRf>|<Non-decimal>

The range of the parameter is 0 - 32767.

Example: STAT:OPER:TRIG:NTR?

STAT:OPER:TRIG:NTR 6	Report the status of the Bit 1 and Bit 2 of the negative transition filter to the event register.
STAT:OPER:TRIG:NTR #B0110	The meaning is the same as above, and binary number is used.
STAT:OPER:TRIG:NTR #H06	The meaning is the same as above, and hexadecimal number is used.

:Status:OPERation:TRIGger[:SUMMary]:PTRansition

Function: Query or set the trigger operation positive transition filter.

Query: :Status:OPERation:TRIGger[:SUMMary]:PTRansition?

Setting: :Status:OPERation:TRIGger[:SUMMary]:PTRansition <NRf>|<Non-decimal>
The range of the parameter is 0 - 32767.

Example: STAT:OPER:TRIG:PTR?

STAT:OPER:TRIG:PTR 6	Report the status of the Bit 1 and Bit 2 of the positive transition filter to the event register.
STAT:OPER:TRIG:PTR #B0110	The meaning is the same as above, and binary number is used.
STAT:OPER:TRIG:PTR #H06	The meaning is the same as above, and hexadecimal number is used.

:Status:OPERation:ULFail[:SUMMary]:CONDition?

Function: Query the value in the upper limit detection operation status condition register.
For the returned value, if the Bit 3 is non-zero, it represents the upper limit detection failure status of the upper measurement of the upper window; if the Bit 4 is non-zero, it represents the upper limit detection failure status of the upper measurement of the lower window; if the Bit 5 is non-zero, it represents the upper limit detection failure status of the lower measurement of the upper window; if the Bit 6 is non-zero, it represents the upper limit detection failure status of the lower measurement of the lower window.

Query: :Status:OPERation:ULFail[:SUMMary]:CONDition?

Setting: Not supported

Example: STAT:OPER:ULF:COND?

:Status:OPERation:ULFail[:SUMMary]:ENABle

Function: Query or set the upper limit detection operation event enable register. Carry out bitwise-operation. 0 means that it is forbidden to report the status event to the Bit 12 of the operation status. 1 represents enable.

Query: :Status:OPERation:ULFail[:SUMMary]:ENABle?

Setting: :Status:OPERation:ULFail[:SUMMary]:ENABle <NRf>|<Non-decimal>
The range of the parameter is 0 - 32767.

Example:

STAT:OPER:ULF:ENAB?	Query the value in the upper limit detection operation event enable register.
STAT:OPER:ULF:ENAB 8	Enable the Bit 3, and allow reporting the upper detection operation event to the operation status.
STAT:OPER:ULF:ENAB #B1000	The meaning is the same as above, and binary number is used.
STAT:OPER:ULF:ENAB #H08	The meaning is the same as above, and hexadecimal number is used.

:Status:OPERation:ULFail[:SUMMary][:EVENt]?

Function: Query the upper limit detection operation event register. The power meter will automatically reset the register after the query.

Query: :Status:OPERation:ULFail[:SUMMary][:EVENt]?

Setting: Not supported

Example: STAT:OPER:ULF?

:Status:OPERation:ULFail[:SUMMary]:NTRansition

Function: Query or set the upper detection operation negative transition filter.

Query: :Status:OPERation:ULFail[:SUMMary]:NTRansition?

Setting: :Status:OPERation:ULFail[:SUMMary]:NTRansition <NRf>|<Non-decimal>
The range of the parameter is 0 - 32767.

Example: STAT:OPER:ULF:NTR?

STAT:OPER:ULF:NTR 8	Report the status of the Bit 3 of the negative transition filter to the event register.
STAT:OPER:ULF:NTR #B1000	The meaning is the same as above, and binary number is used.
STAT:OPER:ULF:NTR #H08	The meaning is the same as above, and hexadecimal number is used.

:Status:OPERation:ULFail[:SUMMary]:PTRansition

Function: Query or set the upper detection operation positive transition filter.

Query: :Status:OPERation:ULFail[:SUMMary]:PTRansition?

Setting: :Status:OPERation:ULFail[:SUMMary]:PTRansition <NRf>|<Non-decimal>
The range of the parameter is 0 - 32767.

Example: STAT:OPER:ULF:PTR?

STAT:OPER:ULF:PTR 8	Report the status of the Bit 1 and Bit 2 of the positive transition filter to the event register.
STAT:OPER:ULF:PTR #B1000	The meaning is the same as above, and binary number is used.
STAT:OPER:ULF:PTR #H08	The meaning is the same as above, and decimal number is used.

:Status:PRESet

Function: Preset some status registers as follows, and other registers will be kept unchanged.

Query: Not supported

Setting: :Status:PRESet

Example: STAT:PRES

Table3.21 Summary of Reset Status of Status register

Register	Sub-register	Preset Status
OPERation	ENABle	All is set to 0
	PTR	All is set to 1
	NTR	All is set to 0
QUEStionable	ENABle	All is set to 0
	PTR	All is set to 1
	NTR	All is set to 0
Others	ENABle	All is set to 0
	PTR	All is set to 1
	NTR	All is set to 0

:Status:QUEStionable:CALibration[:SUMMary]:CONDition?

Function: Query the value in the calibration questionable status condition register.

For the returned value, if the Bit 1 is non-zero, it represents zero and calibration error of channel A; if the Bit 2 is non-zero, it represents zero and calibration error of channel B. If 2 is returned, it represents zero and calibration error of channel A.

Query: :Status:OPERation:CALibrating[:SUMMary]:CONDition?

Setting: Not supported

Example: STAT:OPER:CAL:COND?

:Status:QUEStionable:CALibration[:SUMMary]:ENABle

Function: Query or set the calibration questionable event enable register. Carry out bitwise-operation. 0 means that it is forbidden to report the status event to the Bit 8 of the questionable status. 1 represents enable.

Query: :Status:QUEStionable:CALibration[:SUMMary]:ENABle?

Setting: :Status:QUEStionable:CALibration[:SUMMary]:ENABle <NRf>|<Non-decimal>

The range of the parameter is 0 - 32767.

Example: STAT:QUES:CAL:ENAB?

STAT:QUES:CAL:ENAB 6	Enable the Bit 1 and Bit 2, and allow reporting the calibration questionable event to the questionable status.
STAT:QUES:CAL:ENAB #B0110	The meaning is the same as above, and binary number is used.
STAT:QUES:CAL:ENAB #H06	The meaning is the same as above, and hexadecimal number is used.

:Status:QUEStionable:CALibration[:SUMMary][:EVENt]?

Function: Query the calibration questionable event register. The microwave power meter will automatically reset the register after the query.

Query: :Status:QUEStionable:CALibration[:SUMMary][:EVENt]?

Setting: Not supported

Example: STAT:QUES:CAL?

:Status:QUEStionable:CALibration[:SUMMary]:NTRansition

Function: Query or set the calibration questionable negative transition filter.

Query: :Status:QUEStionable:CALibration[:SUMMary]:NTRansition?

Setting: :Status:QUEStionable:CALibration[:SUMMary]:NTRansition <NRf>|<Non-decimal>

The range of the parameter is 0 - 32767.

Example: STAT:QUES:CAL:NTR?

STAT:QUES:CAL:NTR 6	Report the status of the Bit 1 and Bit 2 of the negative transition filter to the event register.
STAT:QUES:CAL:NTR #B0110	The meaning is the same as above, and binary number is used.
STAT:QUES:CAL:NTR #H06	The meaning is the same as above, and hexadecimal number is used.

:Status:QUEStionable:CALibration[:SUMMary]:PTRansition

Function: Query or set the calibration questionable positive transition filter.

Query: :Status:QUEStionable:CALibration[:SUMMary]:PTRansition?

Setting: :Status:QUEStionable:CALibration[:SUMMary]:PTRansition <NRf>|<Non-decimal>
The range of the parameter is 0 - 32767.

Example: STAT:QUES:CAL:PTR?

STAT:QUES:CAL:PTR 6	Report the status of the Bit 1 and Bit 2 of the positive transition filter to the event register.
STAT:QUES:CAL:PTR #B0110	The meaning is the same as above, and binary number is used.
STAT:QUES:CAL:PTR #H06	The meaning is the same as above, and hexadecimal number is used.

:Status:QUEStionable:CONDition?

Function: Query the value in the questionable status condition register.
For the returned value, if the Bit 3 is non-zero, it means that the power questionable event is detected; if the Bit 8 is non-zero, it means that the calibration questionable event is detected; if the Bit 9 is non-zero, it means that the power-on self-test fails.
For example, if the calibration questionable event is detected through this group of registers, the corresponding bit of the calibration questionable enable register (STAT:QUES:CAL:ENAB) shall be set to non-zero. The others are similar.

Query: :Status:QUEStionable:CONDition?

Setting: Not supported

Example: STAT:QUES:COND?

:Status:QUEStionable:ENABle

Function: Query or set the questionable status event enable register. Carry out bitwise-operation. 0 means that it is forbidden to report the status event to the Bit 3 of the status byte. 1 represents enable.

Query: :Status:QUEStionable:ENABle?

Setting: :Status:QUEStionable:ENABle <NRf>|<Non-decimal>
The range of the parameter is 0 - 32767.

Example: STAT:QUES:ENAB?

STAT:QUES:ENAB 8	Enable the Bit 1, namely, allow reporting the calibration questionable event to the status byte.
STAT:QUES:ENAB #B1000	The meaning is the same as above, and binary number is used.
STAT:QUES:ENAB #H08	The meaning is the same as above, and hexadecimal number is used.

:Status:QUEStionable[:EVENt]?

Function: Query the questionable status event register. The microwave power meter will automatically reset the register after the query.

Query: :Status:QUEStionable[:EVENt]?

Setting: Not supported

Example: STAT:QUES?

:Status:QUEStionable:NTRansition

Function: Query or set the questionable status negative transition filter.

Query: :Status:QUEStionable:NTRansition?

Setting: :Status:QUEStionable:NTRansition <NRf>|<Non-decimal>
The range of the parameter is 0 - 32767.

Example: STAT:QUES:NTR?

STAT:QUES:NTR 8	Report the status of the Bit 3 of the negative transition filter to the event register.
STAT:QUES:NTR #B1000	The meaning is the same as above, and binary number is used.
STAT:QUES:NTR #H08	The meaning is the same as above, and hexadecimal number is used.

:Status:QUEStionable:PTRansition

Function: Query or set the questionable status positive transition filter.

Query: :Status:QUEStionable:PTRansition?

Setting: :Status:QUEStionable:PTRansition <NRf>|<Non-decimal>
The range of the parameter is 0 - 32767.

Example: STAT:QUES:PTR?

STAT:QUES:PTR 8	Report the status of the Bit 3 of the positive transition filter to the event register.
STAT:QUES:PTR #B0110	The meaning is the same as above, and binary number is used.
STAT:QUES:PTR #H08	The meaning is the same as above, and hexadecimal number is used.

:Status:QUEStionable:POWer[:SUMMary]:CONDition?

Function: Query the value in the power questionable status condition register.
For the returned value,
if the Bit 1 is non-zero, it represents Input Overload Ch1;
if the Bit 2 is non-zero, it represents Input Overload Ch2;
if the Bit 3 is non-zero, it means that channel A shall be zeroed;
if the Bit 4 is non-zero, it means that channel B shall be zeroed;
if the Bit 5 is non-zero, it means that the data of the upper measurement of the upper window is invalid, or the log error occurs;
if the Bit 6 is non-zero, it means that the data of the upper measurement of the lower window is invalid, or the log error occurs;
if the Bit 7 is non-zero, it means that the data of the lower measurement of the upper window is invalid, or the log error occurs;
if the Bit 8 is non-zero, it means that the data of the lower measurement of the lower window is invalid, or the log error occurs.
if 8 is returned, it means that channel A shall be zeroed.

Query: :Status:QUEStionable:POWer[:SUMMary]:CONDition?

Setting: Not supported

Example: STAT:QUES:POW:COND?

:Status:QUEStionable:POWer[:SUMMary]:ENABle

Function: Query or set the power questionable event enable register. Carry out bitwise-operation. 0 means that it is forbidden to report the status event to the Bit 3 of the questionable status. 1 represents enable.

Query: :Status:QUEStionable:POWer[:SUMMary]:ENABle?

Setting: :Status:QUEStionable:POWer[:SUMMary]:ENABle <NRf>|<Non-decimal>
The range of the parameter is 0 - 32767.

Example: STAT:QUES:POW:ENAB?

STAT:QUES:POW:ENAB 6	Enable the Bit 1 and Bit 2, namely, allow reporting the power questionable event to the questionable status.
STAT:QUES:POW:ENAB #B0110	The meaning is the same as above, and binary number is used.
STAT:QUES:POW:ENAB #H06	The meaning is the same as above, and hexadecimal number is used.

:Status:QUEStionable:POWer[:SUMMary][:EVENt]?

Function: Query the power questionable event register. The power meter will automatically reset the register after the query.

Query: :Status:QUEStionable:POWer[:SUMMary][:EVENt]?

Setting: Not supported

Example: STAT:QUES:POW?

:Status:QUEStionable:POWer[:SUMMary]:NTRansition

Function: Query or set the power questionable negative transition filter.

Query: :Status:QUEStionable:POWer[:SUMMary]:NTRansition?

Setting: :Status:QUEStionable:POWer[:SUMMary]:NTRansition <NRf>|<Non-decimal>
The range of the parameter is 0 - 32767.

Example: STAT:QUES:POW:NTR?

STAT:QUES:POW:NTR 6	Report the status of the Bit 1 and Bit 2 of the negative transition filter to the event register.
STAT:QUES:POW:NTR #B0110	The meaning is the same as above, and binary number is used.
STAT:QUES:POW:NTR #H06	The meaning is the same as above, and hexadecimal number is used.

:Status:QUEStionable:POWer[:SUMMary]:PTRansition

Function: Query or set the power questionable positive transition filter.

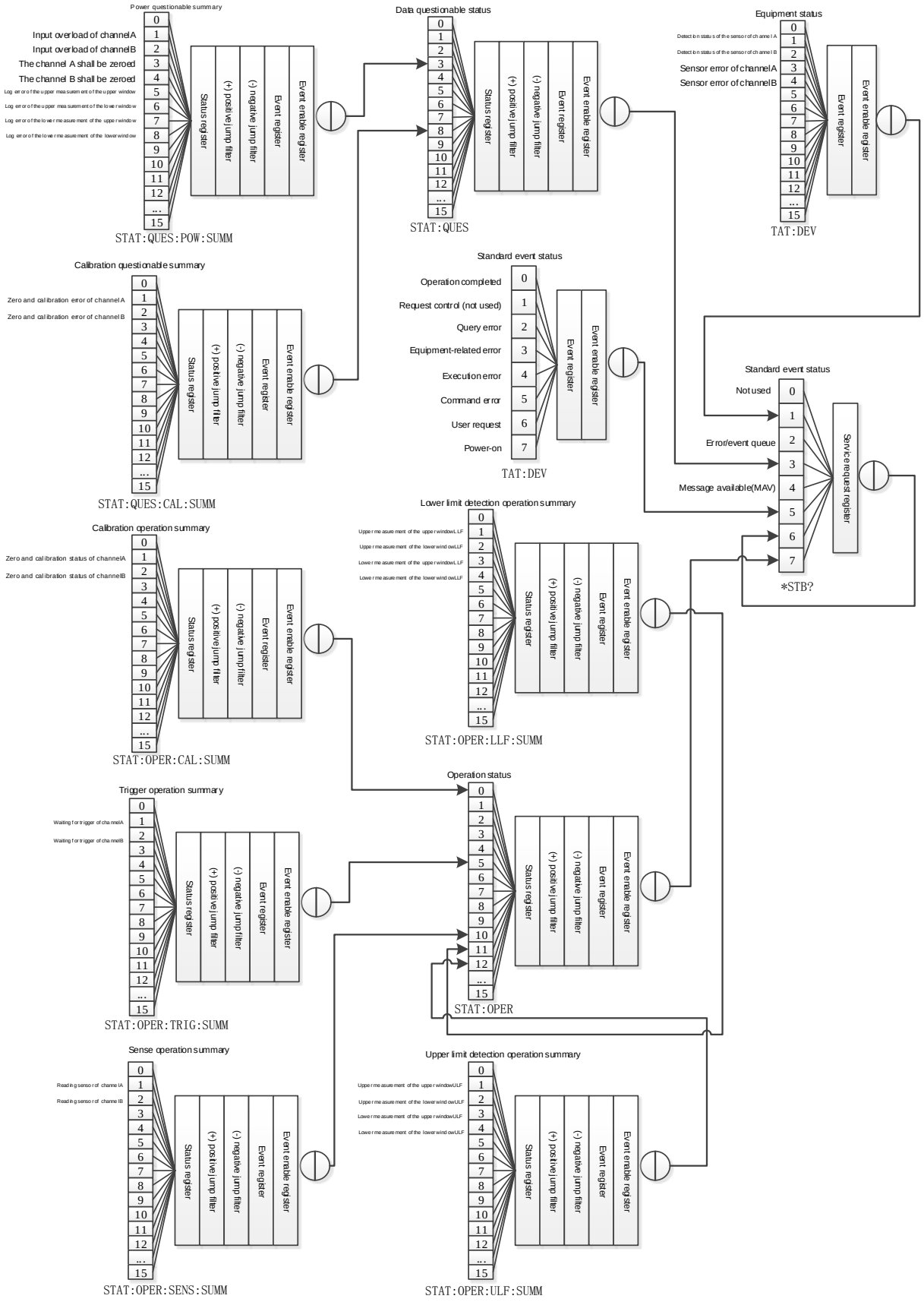
Query: :Status:QUEStionable:POWer[:SUMMary]:PTRansition?

Setting: :Status:QUEStionable:POWer[:SUMMary]:PTRansition <NRf>|<Non-decimal>
The range of the parameter is 0 - 32767.

Example: STAT:QUES:POW:PTR?

STAT:QUES:POW:PTR 6	Report the status of the Bit 1 and Bit 2 of the positive transition filter to the event register.
STAT:QUES:POW:PTR #B0110	The meaning is the same as above, and binary number is used.
STAT:QUES:POW:PTR #H06	The meaning is the same as above, and hexadecimal number is used.

Attached: Status Block Diagram


Power questionable summary
Input overload of channelA
Input overload of channelB
The channel A shall be zeroed
The channel B shall be zeroed
Log error of the upper measurement of the upper window
Log error of the upper measurement of the lower window
Log error of the lower measurement of the upper window
Log error of the lower measurement of the lower window
Status register
(+) positive jump filter
(-) negative jump filter
Event register
Event enable register
STAT:QUES:POW:SUMM
Data questionable status
STAT:QUES
Equipment status
Detection status of the sensor of channel A
Detection status of the sensor of channel B
Sensor error of channelA
Sensor error of channelB
TAT:DEV
Calibration questionable summary
Zero and calibration error of channel A
Zero and calibration error of channel B
STAT:QUES:CAL:SUMM
Standard event status
Operation completed
Request control (not used)
Query error
Equipment-related error
Execution error
Command error
User request
Power-on
TAT:DEV
Standard event status
Not used
Error/event queue
Message available(MAV)
Service request register
*STB?
Lower limit detection operation summary
Upper measurement of the upper window LLF
Upper measurement of the lower window LLF
Lower measurement of the upper window LLF
Lower measurement of the lower window LLF
STAT:OPER:LLF:SUMM
Calibration operation summary
Zero and calibration status of channelA
Zero and calibration status of channelB
STAT:OPER:CAL:SUMM
Operation status
STAT:OPER
Trigger operation summary
Waiting for trigger of channelA
Waiting for trigger of channelB
STAT:OPER:TRIG:SUMM
Sense operation summary
Reading sensor of channelA
Reading sensor of channelB
STAT:OPER:SENS:SUMM
Upper limit detection operation summary
Upper measurement of the upper window ULF
Upper measurement of the lower window ULF
Lower measurement of the upper window ULF
Lower measurement of the lower window ULF
STAT:OPER:ULF:SUMM

3.3.11 System (SYSTem)

:SYSTem:BEEPer[:Status]

Function: Query or set the switch state of the beeper.

Query: :SYSTem:BEEPer[:Status]?

Setting: :SYSTem:BEEPer[:Status] <Boolean Data>

Example:

SYST:BEEP:STAT?	Query the switch state of the beeper.
SYST:BEEP:STAT ON	Turn on the beeper.

Setting: The command is not supported by 2438, which is used for extension.

Reset status: Turn on the beeper.

:SYSTem:COMMunicate:GPIB[:SELF]:ADDRess

Function: Query or set GPIB address.

Query: :SYSTem:COMMunicate:GPIB[:SELF]:ADDRess? [MIN|MAX]

Setting: :SYSTem:COMMunicate:GPIB[:SELF]:ADDRess <Numeric Data>

The valid value of the numeric data includes: DEF, MIN, MAX and <NRf>, and DEF and <NRf> are only used for setting.

The range of <NRf> is 0 - 30,

The DEF is 13
The MIN is 0
The MAX is 30

Example:	SYST:COMM:GPIB:ADDR?	Query GPIB address of the power meter.
	SYST:COMM:GPIB:ADDR? MAX	Query the maximum settable GPIB address of the power meter.
	SYST:COMM:GPIB:ADDR 28	Set GPIB address of the power meter to 28.

Reset status: Not affected.

:SYSTem:COMMunicate:LAN:ADDRess

Function: Query or set LAN address, namely IP address.

Query: :SYSTem:COMMunicate:LAN:ADDRess?

Setting: :SYSTem:COMMunicate:LAN:ADDRess <String>
The form of <String> is: “A.B.C.D”. The range of A is 1 - 233, excluding 127; the range of B, C, D is 0 - 255.

Example:	SYST:COMM:LAN:ADDR?	Query IP address.
	SYST:COMM:LAN:ADDR "192.168.6.78"	Set IP address to 192.168.6.78.

Reset status: Not affected.

:SYSTem:COMMunicate:LAN:CURRent:ADDRess?

Function: Query the current LAN address, namely IP address.

Query: :SYSTem:COMMunicate:LAN:CURRent:ADDRess?

Setting: Not supported

Example: SYST:COMM:LAN:CURR:ADDR?

:SYSTem:COMMunicate:LAN:CURRent:DGATeway?

Function: Query gateway of the current LAN.

Query: :SYSTem:COMMunicate:LAN:CURRent:DGATeway?

Setting: Not supported

Example: SYST:COMM:LAN:CURR:DGAT?

:SYSTem:COMMunicate:LAN:CURRent:SMASk?

Function: Query the sub-network mask of the current LAN.

Query: :SYSTem:COMMunicate:LAN:CURRent:SMASk?

Setting: Not supported

Example: SYST:COMM:LAN:CURR:SMAS?

:SYSTem:COMMunicate:LAN:DGATeway

Function: Query or set gateway of LAN.

Query: :SYSTem:COMMunicate:LAN:DGATeway?

Setting: :SYSTem:COMMunicate:LAN:DGATeway <String
The form of <String> is: “A.B.C.D”. The range of A is 1 - 233, excluding 127; the range of B, C, D is 0 - 255.

Example: SYST:COMM:LAN:DGAT? Query gateway.

SYST:COMM:LAN:DGAT "192.168.1.78" Set gateway to 192.168.1.78.

:SYSTem:COMMunicate:LAN:MAC?

Function: Query MAC address of LAN.

Query: :SYSTem:COMMunicate:LAN:MAC?

Setting: Not supported

Example: SYST:COMM:LAN:MAC?

:SYSTem:COMMunicate:LAN:RESTart

Function: Restart the network.

Query: Not supported

Setting: :SYSTem:COMMunicate:LAN:RESTart

Example: SYST:COMM:LAN:REST

:SYSTem:COMMunicate:LAN:SMASk

Function: Query or set the sub-network mask of LAN.

Query: :SYSTem:COMMunicate:LAN:SMASk?

Setting: :SYSTem:COMMunicate:LAN:SMASk <String

The form of <String> is: “A.B.C.D”. The range of A, B, C, D is 0 - 255.

Example: SYST:COMM:LAN:SMAS? Query the sub-network mask.

SYST:COMM:LAN:SMAS "255.255.255.0" Set the sub-network mask to 255.255.255.0.

Reset status: Not affected.

:SYSTem:COMMunicate:TCPip:CONTrol?

Function: Obtain the SOCKET port number, and return 5000 in this case.

Query: :SYSTem:COMMunicate:TCPip:CONTrol?

Setting: Not supported

Example: SYST:COMM:TCP:CONT?

Reset status: Not affected.

:SYSTem:DATE

Function: Query or set the date.

Query: :SYSTem:DATE? [MIN|MAX, MIN|MAX, MIN|MAX]

Setting: :SYSTem:DATE <Numeric Data 1>, <Numeric Data 2>, <Numeric Data 3>

The <Numeric Data 1>, <Numeric Data 2>, <Numeric Data 3> respectively represents year, month, day, in the form of MIN, MAX, DEF, UP, DOWN and <NR1>

The DEF, UP, DOWN and <NR1> are only used for setting.

The UP means an increase of one year, one month and one day on the basis of the current year, month and day.

The DOWN means a decrease of one year, one month and one day on the basis of the current year, month and day.

DEF indicates no change.

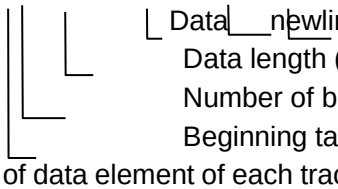
Example:	SYST:DATE?		Query the current date.
	SYST:DATE?	MAX,MAX,MIN	Query the settable maximum year, maximum month and minimum day.
	SYST:DATE	UP,DEF,DEF	The current date is increased by one year.
	SYST:DATE	DEF,UP,DEF	The current date is increased by one month.
	SYST:DATE	DEF,DEF,DOWN	The current date is decreased by one day.
	SYST:DATE	DEF,DEF,1	Both the year and month are unchanged, and the date is set to 1.
	SYST:DATE	2010,6,11	Set it to 2010-6-11.

:SYSTem:DISPlay:BMP?

Function: Return image of the microwave power meter in BMP format.

The format of the returned data is <Arbitrary Data Block> as shown in section 7.7.6 of the IEEE 488.2.

#nNNN...Nddd……ddd<LF>



The format of data element of each trace is IEEE 754 32-bit floating point data, namely, 4 bytes. The form of the data block is #44004…..In <LF>, n = 4, N = 4004.

Query: :SYSTem:DISPlay:BMP?

Setting: Not supported

Example: SYST:DISP:BMP? The format of the returned data block is as shown in (Arbitrary Data Block) of section 2.1.3.2-5. The binary data after the format is removed can be saved as the bitmap file.

Description: A newline character (0x0A) may be included in the binary data block. When using the VISA library, VI_ATTR_TERMCHAR_EN shall be set to VI_FALSE after sending the command and before reading the data. Firstly read the first two bytes (#n) to determine the length of the subsequent data block. After that, read n bytes, calculate number of subsequent bytes N, and finally read N bytes. N bytes are the real bitmap information, which can be saved as the bitmap file.

:SYSTem:ERRor:CODE?

Function: Return the error code of the microwave power meter from its error queue. When an error occurs, the error code can be saved in the error queue. After the command is executed once, the information in the error queue will be removed. The order removing the error information from the queue is FIFO, namely, the oldest information will be removed from the queue first. The *CLS command can be used to clear the error queue. When the error queue is null and the command is executed, 0 will be returned. The error queue can contain up to 1023 pieces of error information.

Query: :SYSTem:ERRor:CODE?

Setting: Not supported

Example: SYST:ERR:CODE?

Limit: The command is not supported by 2436.

Reset status: Not affected.

3.3 Instrument subsystem command

:SYSTem:ERRor[:NEXT]?

Function: Return the error code and error information of the microwave power meter from its error queue. When an error occurs, the error code and error information can be saved in the error queue. After the command is executed once, the information in the error queue will be removed. The order removing the error information from the queue is FIFO, namely, the oldest information will be removed from the queue first. The *CLS command can be used to clear the error queue. When the error queue is null and the command is executed, “0, "No Error"” will be returned. The error queue can contain up to 1023 pieces of error information.

Query: :SYSTem:ERRor[:NEXT]?

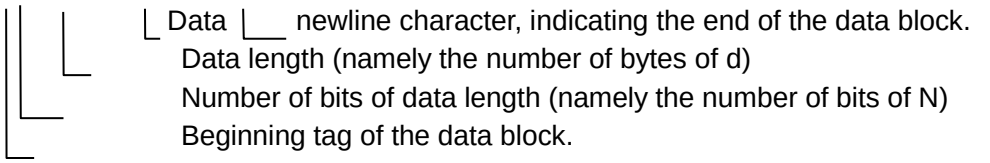
Setting: Not supported

Example: SYST:ERR?

Reset status: Not affected.

:SYSTem:HELP:HEADers?

Function: Query the command list of the microwave power meter. The format of the data is <Arbitrary Data Block> See section 7.7.6 of the IEEE 488.2. #nNNN...Nddd……ddd<LF>



The form of the data block is #510331…..In <LF>, n = 5, N = 10331.

Query: :SYSTem:HELP:HEADers?

Setting: Not supported

Example: SYST:HELP:HEAD?

:SYSTem:KEY

Function: Remote key input (this function is not supported by 2436).

Query: Query the code of the most recently keypress.

Setting: :SYSTem:KEY <Numeric Data>

The valid value of the numeric data includes: DEF, MIN, MAX and <NRf>, and DEF and <NRf> are only used for setting.

The range of <NRf> is 0 - 255, and the effective key code is as follows:

Table3.22 Key Code Description

Key Code	Description	Key Code	Description
112	Soft key 1	99	Numerical key 3
113	Soft key 2	100	Numerical key 4
114	Soft key 3	101	Numerical key 5
115	Soft key 4	102	Numerical key 6
116	Soft key 5	103	Numerical key 7
18	Menu key	104	Numerical key 8
122	Channel key	105	Numerical key 9
123	Window key	110	Decimal point.
124	Calibration key	109	Minus or backspace -
125	Frequency key	38	Direction key ↑

126	Back key	40	Direction key ↓
96	Numerical key 0	37	Direction key ←
97	Numerical key 1	39	Direction key →
98	Numerical key 2		

The DEF is 0
The MIN is 0
The MAX is 255

Example: SYST:KEY? Query the code of the most recently keypress. Return 0 if no key is pressed down.

SYST:KEY 18 Press down “Menu” key.

Limit: It is not supported by 2436 but supported by 2438.

:SYSTem:LOCal

Function: This command can unlock the front panel keyboard and allow controlling the microwave power meter with the front panel keyboard. Display “Local” (LCL) in the status bar. The equivalent keyboard operation of this command is the “Local” key on the front panel.

Query: Not supported

Setting: :SYSTem:LOCal

Example: SYST:LOC

:SYSTem:PRESet

Function: Reset the power meter to the status specified by the parameter. 22 kinds of status are provided in this case.

Query: Not supported

Setting: :SYSTem:PRESet [Character Data]

The form of [Character Data] is as follows (DEFault is a default parameter, namely the parameter without parameters.) :

Example: SYST:PRES GSM900 The reset status is GSM900.

Description: **Description of main channel and secondary channel**

The double-channel power meter is defined as a main or a secondary channel. The main channel occupies more display windows than the secondary channel.

If the power meter is only connected with one peak sensor, the channel is the main channel. The other channel is the secondary channel. The main channel may be channel A or channel B.

If the power meter is only connected with two peak sensors, channel A is the main channel. The channel B is the secondary channel.

Reset status: See the following table.

1) DEFault

Table3.23 Default reset status (DEFault)

Command	Setting	Description
CALC[1]|2|3|4:FEED[1]|2	"POW:AVER"	Set the average measurement mode
CALC[1]|2|3|4:GAIN[:MAGN]	0.000dB	Set the display offset to 0
CALC[1]|2|3|4:GAIN:STAT	OFF	Disable the display offset
CALC[1]|2|3|4:LIM:CLE:AUTO	ON	Clear the limit detection status during the measurement initialization
CALC[1]|2|3|4:LIM:LOW[:DATA]	-90 dBm	Lower limit
CALC[1]|2|3|4:LIM:STAT	OFF	Disable the limit detection of the window
CALC[1]|2|3|4:LIM:UPP[:DATA]	90 dBm	Upper limit
CALC[1]|2|3|4:MATH[:EXPR]	Upper window: Channel A Lower window: Channel B	Measurement expression (on condition that both channels have sensors).
CALC[1]|2|3|4:REL[:MAGN]:AUTO	OFF	Disable relative measurement reference value.
CALC[1]|2|3|4:REL:STAT	OFF	Disable relative measurement.
CAL[1]|2:RCAL	Not affected	The “Must Cal” switch shall not be affected.
DISP:SCR:FORM	WIND	Set the display mode of the screen to “Split Window Display”
DISP[:WIND[1]|2]:FORM	Both the upper	Window display mode

	and lower windows are displayed in single value.	
DISP[:WIND[1]|2][:NUM[1]|2]:RES	3	Set the window display resolution to 3
DISP[:WIND[1]|2]:SEL[1]|2	Upper window	Currently selected window
DISP[:WIND[1]|2][:STAT]	ON	It will be displayed in both the upper and lower windows
FORM[:READ]:BORD	NORMal	The binary data byte order is normal.
FORM[:READ][:DATA]	ASCii	The data format is ASCII
INIT[1]|2:CONT	ON	It is in the waiting for trigger status
MEM:TABL:SEL	Not affected	Current FDO table
OUTP:REC[1]|2:FEED (not supported by 2438)	Not affected	Measurement window recorded by the recorder
OUTP:REC[1]|2:LIM:LOW (not supported by 2438)	-70 dBm	Lower limit of the recorder
OUTP:REC[1]|2:LIM:UPP (not supported by 2438)	20 dBm	Upper limit of the recorder
OUTP:ROSC:STAT	OFF	Disable the output of the calibrator
PST:CCDF:GAUS[:STAT]	ON	Open Gaussian probability curve
PST:CCDF:TRAC:MARK[1]|2[:SET]	Set it to channel A	Set the mark to the measurement curve A
PST:CCDF:MARK[1]|2:X	0	Cursor-located horizontal coordinates
PST:CCDF:COUNt	100E+06	The number of statistical terminations is 100 M
PST:CCDF:TIME	0	The statistical termination time is OFF.
PST:CCDF:END:ACTion	STOP	Set the statistical termination to “STOP”
PST:CCDF:REF[:STAT]	OFF	Close the statistics reference curve
PST:CCDF:DATA:MAX	12dB	Maximum value of X axis
[SENS[1]]|SENS2:AVER:COUN	8	Filtering length
[SENS[1]]|SENS2:AVER:COUN:AUTO	CW sensor: ON Others: Not affected	For the CW sensor, enable the automatic average.
[SENS[1]]|SENS2:AVER:SDET	CW sensor: ON Others: Not affected	For the CW sensor, enable the step detection
[SENS[1]]|SENS2:AVER[:STAT]	ON	Enable average
[SENS[1]]|SENS2:CORR:CSET2[:SEL]	Not affected	Currently selected FDO table
[SENS[1]]|SENS2:CORR:CSET2:STAT	Not affected	Switch state of the currently

		selected FDO table
[SENS[1]]|SENS2:CORR:FDOF|GAIN4 [:INP][:MAGN]	Not affected	Return the FDO value
[SENS[1]]|SENS2:CORR:GAIN2:STAT	OFF	Disable the channel offset
[SENS[1]]|SENS2:CORR:GAIN2: [:INPut][:MAGNitude]	0.00dB	The channel offset is 0
[SENS[1]]|SENS2:FREQ[:CW|:FIX]	50MHz	The frequency of channel is 50 MHz
[SENS[1]]|SENS2:POW:AC:RANG	CW sensor: High Others: Not affected	For the CW sensor, it is high range
[SENS[1]]|SENS2:POW:AC:RANG:AUTO	CW sensor: Automatic Others: Not affected	For the CW sensor, it is automatic range control
[SENS[1]]|SENS2:SWE[1]|2|3|4:OFFS:TIME	0	Set the start time of the gate
[SENS[1]]|SENS2:SWE[1]|2|3|4:TIME	Gate 1: 100 us Others: 0	Set the length of the gate
[SENS[1]]|SENS2:TRAC:LIM:LOW	-60 dBm	Lower limit of the trace display
[SENS[1]]|SENS2:TRAC:LIM:UPP	20 dBm	Upper limit of the trace display
[SENS[1]]|SENS2:TRACe:OFFSet:TIME	0	Set the minimum display time of the trace
[SENS[1]]|SENS2:TRACe:TIME	100us	Set the display time length of the trace to 100 μs
SYST:COMM:GPIB[:SELF]ADDR	Not affected	GPIB address
SYST:COMM:LAN:ADDR	Not affected	IP address
SYST:COMM:LAN:DGAT	Not affected	Gateway
SYST:COMM:LAN:SMAS	Not affected	Sub-network mask
TRAC[1]|2:UNIT	dBm	Trace display unit
TRACe[1]|2:DEFine:TRANsition:REFerence	10%, 90%	Pulse transition reference.
TRIG[:SEQ]:DEL	0	Trigger Delay
TRIG[:SEQ]:LEV	-5 dBm	Trigger level
TRIG[:SEQ]:SLOP	POS	Signal's rising edge
TRIG[:SEQ[1]|2]:SOUR	IMM	Trigger source
UNIT:POW	dBm	Power unit
UNIT:POW:RAT	dB	Ratio unit

2) GSM900

The Global System for Mobile Communications is commonly known as GSM

It is adopted with a digital modulation method called as 0.3 GMSK (Gaussian minimum frequency shift keying). 0.3 represents the ratio between Gaussian filter bandwidth and bit rate. The GMSK is a special digital FM modulation mode. The RF carrier frequency plus or minus 67.708 KHz represents 1 and 0. The modulation technology with two frequencies representing 1 and 0 are called as FSK (frequency shift keying).

In GSM, the data rate is 270.833 kbit/sec, which is exactly 4 times the RF frequency offset. In this case,

the modulation spectrum can be minimized and the channel efficiency can be improved.

The bit rate is the FSK modulation with 4 times of the frequency offset, which is called as MSK (minimum frequency shift keying). In GSM, the Gaussian pre-modulation filter is used to further reduce the modulation spectrum. It can reduce the frequency conversion speed, otherwise the fast frequency conversion will result in energy radiation towards adjacent channels. The unlisted portion in the following settings is the same as DEFault.

Table3.24 GSM900 Preset Status

Command	Setting	Description
[SENS[1]]|SENS2:FREQ[:CW|:FIX]	900MHz	Frequency of channel
[SENS[1]]|SENS2:SWE[1]|2|3|4:OFFS:TIME	Gate 1: 20 us Others: 0	Set the start time of the gate
[SENS[1]]|SENS2:SWE[1]|2|3|4:TIME	Gate 1: 520 us Others: 0	Set the length of the gate
[SENS[1]]|SENS2:TRAC:LIM:LOW	-50 dBm	Lower limit of the trace display
[SENS[1]]|SENS2:TRAC:LIM:UPP	30 dBm	Upper limit of the trace display
[SENS[1]]|SENS2:TRACe:OFFSet:TIME	0	Set the minimum display time of the trace
[SENS[1]]|SENS2:TRACe:TIME	1ms	Set the display time length of the trace to 1 ms
TRIG[:SEQ]:DEL	-20 μs	Trigger Delay
TRIG[:SEQ]:LEV	-5 dBm	Trigger level
TRIG[:SEQ]:SLOP	POS	Signal's rising edge
TRIG[:SEQ[1]|2]:SOUR	INT1	Trigger source

Table3.25 GSM900 Window Measurement Setting

Function	Setting
Display setting	
Upper window	Main channel trace display
Lower window	See Table 3.26
Window/measurement setting	
Upper measurement of the upper window (UU)	
Input	N/A
Measurement	N/A
Lower measurement of the upper window (UL)	
Input	N/A
Measurement	N/A
Upper measurement of the lower window (LU)	
Input	Main channel gate 1
Measurement	Average power
Lower measurement of the lower window (LL)	
Input	See Table 3.26
Measurement	See Table 3.26

Table3.26 GSM900 Secondary Channel Preset Status

Function	Secondary channel sensor		
	Unconnected sensor	CW sensor	Peak sensor
Display setting			
Lower window	Single value	Double-value	Double-value
Window/measurement setting			
Lower measurement of the lower window (LL)			
Input	DEF	Secondary channel	Secondary channel gate 1
Measurement	DEF	Average power	Average power

3) EDGE

Enhanced Data for Global Evolution or Enhanced Data for GSM Evolution.

The EDGE is a transition technology from GSM to 3G. It mainly adopts a new modulation method in GSM system, namely the most advanced multi-slot operation and 8PSK modulation technology. As 8PSK can extend the signal space of GMSK modulation technology for the existing GSM network to 8 from 2, the information contained in each symbol is 4 times as much as before.

The unlisted portion in the following settings is the same as DEFault.

Table3.27 EDGE Preset Status

Command	Setting	Description
[SENS[1]]|SENS2:FREQ[:CW|:FIX]	900MHz	Frequency of channel
[SENS[1]]|SENS2:SWE[1]|2|3|4:OFFS:TIME	Gate 1: 20 us Others: 0	Set the start time of the gate
[SENS[1]]|SENS2:SWE[1]|2|3|4:TIME	Gate 1: 520 us Others: 0	Set the length of the gate
[SENS[1]]|SENS2:TRAC:LIM:LOW	-50 dBm	Lower limit of the trace display
[SENS[1]]|SENS2:TRAC:LIM:UPP	30 dBm	Upper limit of the trace display
[SENS[1]]|SENS2:TRACe:OFFSet:TIME	0	Set the minimum display time of the trace
[SENS[1]]|SENS2:TRACe:TIME	1ms	Set the display time length of the trace to 1 ms
TRIG[:SEQ]:DEL	-40 μs	Trigger Delay
TRIG[:SEQ]:LEV	-5 dBm	Trigger level
TRIG[:SEQ]:SLOP	POS	Signal's rising edge
TRIG[:SEQ[1]|2]:SOUR	INT1	Trigger source

Table3.28 EDGE Window Measurement Setting

Function	Setting
Display setting	
Upper window	Main channel trace display
Lower window	See Table 3.29
Window/measurement setting	

Upper measurement of the upper window (UU)	
Input	N/A
Measurement	N/A
Lower measurement of the upper window (UL)	
Input	N/A
Measurement	N/A
Upper measurement of the lower window (LU)	
Input	Main channel gate 1
Measurement	Average power
Lower measurement of the lower window (LL)	
Input	See Table 3.29
Measurement	See Table 3.29

Table3.29 EDGE Secondary Channel Preset Status

Function	Secondary channel sensor		
	Unconnected sensor	CW sensor	Peak sensor
Display setting			
Lower window	Double-value	Double-value	Double-value
Window/measurement setting			
Lower measurement of the lower window (LL)			
Input	Main channel gate 1	Secondary channel	Secondary channel gate 1
Measurement	PAR	Average power	Average power

4) CDMAone

The CDMAone is a 2G mobile communication standard, and the basic signaling standard is IS-95. It is a 2G mobile communication standard based on CDMA technology developed by Qualcomm and TIA . The CDG has applied the trade mark of cdmaOne for the technology. The cdmaOne and its relevant standards are the first commercial mobile communication standards based on CDMA technology.

The IS-95 is the number assigned for the air interface standard of the most important 2G mobile communication based on CDMA technology by TIA, namely the Interim Standard 95.

The unlisted portion in the following settings is the same as DEFault.

Table3.30 CDMAone Preset Status

Command	Setting	Description
[SENS[1]]|SENS2:FREQ[:CW|:FIX]	850MHz	Frequency of channel
[SENS[1]]|SENS2:SWE[1]|2|3|4:OFFS:TIME	0	Set the start time of the gate
[SENS[1]]|SENS2:SWE[1]|2|3|4:TIME	Gate1：10ms Others: 0	Set the length of the gate
[SENS[1]]|SENS2:TRAC:LIM:LOW	-50 dBm	Lower limit of the trace display
[SENS[1]]|SENS2:TRAC:LIM:UPP	30 dBm	Upper limit of the trace display
[SENS[1]]|SENS2:TRACe:OFFSet:TIME	0	Set the minimum display time of the trace

[SENS[1]]|SENS2:TRACe:TIME	10ms	Set the display time length of the trace
TRIG[:SEQ]:DEL	0	Trigger Delay
TRIG[:SEQ]:LEV	-5 dBm	Trigger level
TRIG[:SEQ]:SLOP	POS	Signal's rising edge
TRIG[:SEQ[1]|2]:SOUR	INT1	Trigger source

Table3.31 CDMAone Window Measurement Setting

Function	Setting
Display setting	
Upper window	See Table 3.32
Lower window	See Table 3.32
Window/measurement setting	
Upper measurement of the upper window (UU)	
Input	Main channel gate 1
Measurement	Average power
Lower measurement of the upper window (UL)	
Input	See Table 3.32
Measurement	See Table 3.32
Upper measurement of the lower window (LU)	
Input	See Table 3.32
Measurement	See Table 3.32
Lower measurement of the lower window (LL)	
Input	See Table 3.32
Measurement	See Table 3.32

Table3.32 CDMAone Secondary Channel Preset Status

Function	Secondary channel sensor		
	Unconnected sensor	CW sensor	Peak sensor
Display setting			
Upper window	Single value	Double-value	Double-value
Lower window	Double-value	Double-value	Double-value
Window/measurement setting			
Lower measurement of the upper window (UL)			
Input	DEF	Main channel gate 1	Main channel gate 1
Measurement	DEF	Peak	Peak
Upper measurement of the lower window (LU)			
Input	Main channel gate 1	Main channel gate 1	Secondary channel gate 1
Measurement	Peak	PAR	Average power
Lower measurement of the lower window (LL)			

Input	Main channel gate 1	Secondary channel	Secondary channel gate 1
Measurement	PAR	Average power	PAR

5）CDMA2000 和 WCDMA

It is known as 3G 1X or 1xRTT, which is the core of 3G CDMA2000 technology. The 1x is usually used to refer to CDMA2000 wireless technology with a pair of 1.25 MHz radio channels.

The unlisted portion in the following settings is the same as DEFault.

Table3.33 CDMA2000 and WCDMA: Preset Status

Command	Setting	Description
[SENS[1]]|SENS2:FREQ[:CW|:FIX]	1.9GHz	Frequency of channel
[SENS[1]]|SENS2:SWE[1]|2|3|4:OFFS:TIME	0	Set the start time of the gate
[SENS[1]]|SENS2:SWE[1]|2|3|4:TIME	Gate1：10ms Others: 0	Set the length of the gate
[SENS[1]]|SENS2:TRAC:LIM:LOW	-50 dBm	Lower limit of the trace display
[SENS[1]]|SENS2:TRAC:LIM:UPP	30 dBm	Upper limit of the trace display
[SENS[1]]|SENS2:TRACe:OFFSet:TIME	0	Set the minimum display time of the trace
[SENS[1]]|SENS2:TRACe:TIME	10ms	Set the display time length of the trace
TRIG[:SEQ]:DEL	0	Trigger Delay
TRIG[:SEQ]:LEV	-5 dBm	Trigger level
TRIG[:SEQ]:SLOP	POS	Signal’s rising edge
TRIG[:SEQ[1]|2]:SOUR	INT1	Trigger source

Table3.34 CDMA2000 and WCDMA: Window Measurement Setting

Function	Setting
Display setting	
Upper window	See Table 3.35
Lower window	See Table 3.35
Window/measurement setting	
Upper measurement of the upper window (UU)	
Input	Main channel gate 1
Measurement	Average power
Lower measurement of the upper window (UL)	
Input	See Table 3.35
Measurement	See Table 3.35
Upper measurement of the lower window (LU)	
Input	See Table 3.35
Measurement	See Table 3.35
Lower measurement of the lower window (LL)	
Input	See Table 3.35

Measurement	See Table 3.35

Table3.35 CDMA2000 and WCDMA: Secondary Channel Preset Status

Function	Secondary channel sensor		
	Unconnected sensor	CW sensor	Peak sensor
Display setting			
Upper window	Single value	Double-value	Double-value
Lower window	Double-value	Double-value	Double-value
Window/measurement setting			
Lower measurement of the upper window (UL)			
Input	DEF	Main channel gate 1	Main channel gate 1
Measurement	DEF	Peak	Peak
Upper measurement of the lower window (LU)			
Input	Main channel gate 1	Main channel gate 1	Secondary channel gate 1
Measurement	Peak	PAR	Average power
Lower measurement of the lower window (LL)			
Input	Main channel gate 1	Secondary channel	Secondary channel gate 1
Measurement	PAR	Average power	PAR

6) BLUetooth

The unlisted portion in the following settings is the same as DEFault.

Table3.36 BLUetooth Preset Status

Command	Setting	Description
[SENS[1]]|SENS2:FREQ[:CW|:FIX]	2.4GHz	Frequency of channel
[SENS[1]]|SENS2:SWE[1]|2|3|4:OFFS:TIME	Gate1：200ns Others: 0	Set the start time of the gate
[SENS[1]]|SENS2:SWE[1]|2|3|4:TIME	Gate 1: 366 us Others: 0	Set the length of the gate
[SENS[1]]|SENS2:TRAC:LIM:LOW	-50 dBm	Lower limit of the trace display
[SENS[1]]|SENS2:TRAC:LIM:UPP	30 dBm	Upper limit of the trace display
[SENS[1]]|SENS2:TRACe:OFFSet:TIME	0	Set the minimum display time of the trace
[SENS[1]]|SENS2:TRACe:TIME	500us	Set the display time length of the trace
TRIG[:SEQ]:DEL	0	Trigger Delay
TRIG[:SEQ]:LEV	-5 dBm	Trigger level
TRIG[:SEQ]:SLOP	POS	Signal's rising edge
TRIG[:SEQ[1]|2]:SOUR	INT1	Trigger source

Table3.37 BLUetooth Window Measurement Setting

Function	Setting
Display setting	
Upper window	Main channel trace display
Lower window	See Table 3.38
Window/measurement setting	
Upper measurement of the upper window (UU)	
Input	N/A
Measurement	N/A
Lower measurement of the upper window (UL)	
Input	N/A
Measurement	N/A
Upper measurement of the lower window (LU)	
Input	Main channel gate 1
Measurement	Average power
Lower measurement of the lower window (LL)	
Input	See Table 3.38
Measurement	See Table 3.38

Table3.38 BLUetooth Secondary Channel Preset Status

Function	Secondary channel sensor		
	Unconnected sensor	CW sensor	Peak sensor
Display setting			
Lower window	Double-value	Double-value	Double-value
Window/measurement setting			
Lower measurement of the lower window (LL)			
Input	Main channel gate 1	Secondary channel	Secondary channel gate 1
Measurement	Peak power	Average power	Average power

7) MCPa

Multi-Carrier Power Amplifier.

The ideal software radio synthesizes a number of carriers into a single signal in the transmission direction, and after the upconverter, a kind of MCPA is used to amplify the low noise of analog mixed signals of the broadband. As the envelope amplitude difference between different mixed signals is significant, it is very sensitive to the amplifier nonlinearity. The MCPA power can be effectively utilized by suppressing the unnecessary intermodulation carrier with forward feedback technology. It is necessary to select the device and use circuit CAD optimization technology in a better way.

The unlisted portion in the following settings is the same as DEFault.

Table3.39 MCPa Preset Status

Command	Setting	Description
[SENS[1]]|SENS2:FREQ[:CW|:FIX]	1.9GHz	Frequency of channel
[SENS[1]]|SENS2:SWE[1]|2|3|4:OFFS:TIME	0	Set the start time of the gate

[SENS[1]]|SENS2:SWE[1]|2|3|4:TIME	Gate 1：10ms Others: 0	Set the length of the gate
[SENS[1]]|SENS2:TRAC:LIM:LOW	-50 dBm	Lower limit of the trace display
[SENS[1]]|SENS2:TRAC:LIM:UPP	30 dBm	Upper limit of the trace display
[SENS[1]]|SENS2:TRACe:OFFSet:TIME	0	Set the minimum display time of the trace
[SENS[1]]|SENS2:TRACe:TIME	10ms	Set the display time length of the trace
TRIG[:SEQ]:DEL	0	Trigger Delay
TRIG[:SEQ]:LEV	-5 dBm	Trigger level
TRIG[:SEQ]:SLOP	POS	Signal's rising edge
TRIG[:SEQ[1]|2]:SOUR	INT1	Trigger source

Table3.40 MCPa Window Measurement Setting

Function	Setting
Display setting	
Upper window	See Table 3.41
Lower window	See Table 3.41
Window/measurement setting	
Upper measurement of the upper window (UU)	
Input	Main channel gate 1
Measurement	Average power
Lower measurement of the upper window (UL)	
Input	See Table 3.41
Measurement	See Table 3.41
Upper measurement of the lower window (LU)	
Input	See Table 3.41
Measurement	See Table 3.41
Lower measurement of the lower window (LL)	
Input	See Table 3.41
Measurement	See Table 3.41

Table3.41 MCPa Secondary Channel Preset Status

Function	Secondary channel sensor		
	Unconnected sensor	CW sensor	Peak sensor
Display setting			
Upper window	Single value	Double-value	Double-value
Lower window	Double-value	Double-value	Double-value
Window/measurement setting			
Lower measurement of the upper window (UL)			

Input	DEF	Main channel gate 1	Main channel gate 1
Measurement	DEF	Peak	Peak
Upper measurement of the lower window (LU)			
Input	Main channel gate 1	Main channel gate 1	Secondary channel gate 1
Measurement	Peak	PAR	Average power
Lower measurement of the lower window (LL)			
Input	Main channel gate 1	Secondary channel	Secondary channel gate 1
Measurement	PAR	Average power	PAR

8) RADar

The unlisted portion in the following settings is the same as DEFault.

Table3.42 RADAR: Preset Status

Command	Setting	Description
[SENS[1]]|SENS2:FREQ[:CW|:FIX]	10GHz	Frequency of channel
[SENS[1]]|SENS2:SWE[1]|2|3|4:OFFS:TIME	Gate3：750ns Others: 0	Set the start time of the gate
[SENS[1]]|SENS2:SWE[1]|2|3|4:TIME	Gate 1: 1 us Gate2：250ns Gate3：250ns Others: 0	Set the length of the gate
[SENS[1]]|SENS2:TRAC:LIM:LOW	-50 dBm	Lower limit of the trace display
[SENS[1]]|SENS2:TRAC:LIM:UPP	30 dBm	Upper limit of the trace display
[SENS[1]]|SENS2:TRACe:OFFSet:TIME	0	Set the minimum display time of the trace
[SENS[1]]|SENS2:TRACe:TIME	2us	Set the display time length of the trace
TRIG[:SEQ]:DEL	-252ns	Trigger Delay
TRIG[:SEQ]:LEV	-5 dBm	Trigger level
TRIG[:SEQ]:SLOP	POS	Signal's rising edge
TRIG[:SEQ[1]|2]:SOUR	INT1	Trigger source

Table3.43 ADAR: Window Measurement Setting

Function	Setting
Display setting	
Upper window	See Table 3.44
Lower window	Double-digit
Window/measurement setting	
Upper measurement of the upper window (UU)	
Input	See Table 3.44
Measurement	See Table 3.44

Lower measurement of the upper window (UL)	
Input	See Table 3.44
Measurement	See Table 3.44
Upper measurement of the lower window (LU)	
Input	See Table 3.44
Measurement	See Table 3.44
Lower measurement of the lower window (LL)	
Input	See Table 3.44
Measurement	See Table 3.44

Table3.44 RADAR: Secondary Channel Preset Status

Function	Secondary channel sensor		
	Unconnected sensor	CW sensor	Peak sensor
Display setting			
Upper window	Main channel trace	Double-value	Double-value
Lower window	Double-value	Double-value	Double-value
Window/measurement setting			
Upper measurement of the upper window (UU)			
Input	Main channel gate 1	Main channel gate 1	Main channel gate 1
Measurement	PAR	Peak	Peak
Lower measurement of the upper window (UL)			
Input	Main channel gate 2	Main channel gate 1	Main channel gate 1
Measurement	Average power	Average power	Average power
Upper measurement of the lower window (LU)			
Input	Main channel gate 1	Main channel gate 2	Secondary channel gate 1
Measurement	Peak	Average power	Peak
Lower measurement of the lower window (LL)			
Input	Main channel gate 1	Secondary channel	Secondary channel gate 1
Measurement	Average power	Average power	Average power

9) 802.11a (WL802DOT11A) and HIPERLAN2

The unlisted portion in the following settings is the same as DEFault.

Table3.45 802.11a and HiperLan2 Preset Status

Command	**Setting**	**Description**
[SENS[1]]|SENS2:FREQ[:CW|:FIX]	5.2GHz	Frequency of channel
[SENS[1]]|SENS2:SWE[1]|2|3|4:OFFS:TIME	0	Set the start time of the gate
[SENS[1]]|SENS2:SWE[1]|2|3|4:TIME	Gate 1: 25 us Others: 0	Set the length of the gate
[SENS[1]]|SENS2:TRAC:LIM:LOW	-50 dBm	Lower limit of the trace display

[SENS[1]]|SENS2:TRAC:LIM:UPP	30 dBm	Upper limit of the trace display
[SENS[1]]|SENS2:TRACe:OFFSet:TIME	0	Set the minimum display time of the trace
[SENS[1]]|SENS2:TRACe:TIME	50us	Set the display time length of the trace
TRIG[:SEQ]:DEL	0	Trigger Delay
TRIG[:SEQ]:LEV	-5 dBm	Trigger level
TRIG[:SEQ]:SLOP	POS	Signal's rising edge
TRIG[:SEQ[1]|2]:SOUR	INT1	Trigger source

Table3.46 802.11a and HiperLan2 Window Measurement Setting

Function	**Setting**
Display setting	
Upper window	See Table 3.47
Lower window	See Table 3.47
Window/measurement setting	
Upper measurement of the upper window (UU)	
Input	Main channel gate 1
Measurement	Average power
Lower measurement of the upper window (UL)	
Input	See Table 3.47
Measurement	See Table 3.47
Upper measurement of the lower window (LU)	
Input	See Table 3.47
Measurement	See Table 3.47
Lower measurement of the lower window (LL)	
Input	See Table 3.47
Measurement	See Table 3.47

Table3.47 802.11a and HiperLan2 Secondary Channel Preset Status

Function	Secondary channel sensor		
	Unconnected sensor	CW sensor	Peak sensor
Display setting			
Upper window	Single value	Double-value	Double-value
Lower window	Double-value	Double-value	Double-value
Window/measurement setting			
Lower measurement of the upper window (UL)			
Input	DEF	Main channel gate 1	Main channel gate 1
Measurement	DEF	Peak	Peak
Upper measurement of the lower window (LU)			
Input	Main channel gate 1	Main channel gate 1	Secondary channel gate 1

Measurement	Peak	PAR	Average power
Lower measurement of the lower window (LL)			
Input	Main channel gate 1	Secondary channel	Secondary channel gate 1
Measurement	PAR	Average power	PAR

10) 802.11b/g (WL802DOT11B)

The unlisted portion in the following settings is the same as DEFault.

Table3.48 802.11b/g Preset Status

Command	Setting	Description
[SENS[1]]|SENS2:FREQ[:CW|:FIX]	2.4GHz	Frequency of channel
[SENS[1]]|SENS2:SWE[1]|2|3|4:OFFS:TIME	0	Set the start time of the gate
[SENS[1]]|SENS2:SWE[1]|2|3|4:TIME	Gate 1: 100us Others: 0	Set the length of the gate
[SENS[1]]|SENS2:TRAC:LIM:LOW	-50 dBm	Lower limit of the trace display
[SENS[1]]|SENS2:TRAC:LIM:UPP	30 dBm	Upper limit of the trace display
[SENS[1]]|SENS2:TRACe:OFFSet:TIME	0	Set the minimum display time of the trace
[SENS[1]]|SENS2:TRACe:TIME	100us	Set the display time length of the trace
TRIG[:SEQ]:DEL	0	Trigger Delay
TRIG[:SEQ]:LEV	-5 dBm	Trigger level
TRIG[:SEQ]:SLOP	POS	Signal's rising edge
TRIG[:SEQ[1]|2]:SOUR	INT1	Trigger source

Table3.49 802.11b/g Window Measurement Setting

Function	Setting
Display setting	
Upper window	See Table 3.50
Lower window	See Table 3.50
Window/measurement setting	
Upper measurement of the upper window (UU)	
Input	Main channel gate 1
Measurement	Average power
Lower measurement of the upper window (UL)	
Input	See Table 3.50
Measurement	See Table 3.50
Upper measurement of the lower window (LU)	
Input	See Table 3.50
Measurement	See Table 3.50

Lower measurement of the lower window (LL)	
Input	See Table 3.50
Measurement	See Table 3.50

Table3.50 802.11b/g Secondary Channel Preset Status

Function	Secondary channel sensor		
	Unconnected sensor	CW sensor	Peak sensor
Display setting			
Upper window	Single value	Double-value	Double-value
Lower window	Double-value	Double-value	Double-value
Window/measurement setting			
Lower measurement of the upper window (UL)			
Input	DEF	Main channel gate 1	Main channel gate 1
Measurement	DEF	Peak	Peak
Upper measurement of the lower window (LU)			
Input	Main channel gate 1	Main channel gate 1	Secondary channel gate 1
Measurement	Peak	PAR	Average power
Lower measurement of the lower window (LL)			
Input	Main channel gate 1	Secondary channel	Secondary channel gate 1
Measurement	PAR	Average power	PAR

11) 1xeV-DO (XEVDO), 1xeV-DV (XEVDV) and TDSCdma

Evolution-Data Only, the first stage of CDMA2000 1xEV

When a wireless channel is used to transmit high speed data packet, the data rate of the downstream (forward link) and the upstream (reverse link) can be up to 3.1 Mbps and 1.8 Mbps.

The 1xEV-DO has been put in commercial operation. It has been launched in the European market slightly earlier than the American market. Since the summer of 2004, Eurotel, a Czech mobile operator, has begun to operate sinceCDMA2000 1xEV-DO network, and its uplink rate is about 1 Mbps. The service will cost about 30 euros a month, with unlimited traffic. If adopting this service, you will need to buy a Gtran GPC-6420 modem for about 300 euros.

The unlisted portion in the following settings is the same as DEFault.

Table3.51 1xeV-DO (XEVDO), 1xeV-DV (XEVDV) and TDSCdma Preset Status

Command	Setting	Description
[SENS[1]]|SENS2:FREQ[:CW|:FIX]	1.9GHz	Frequency of channel
[SENS[1]]|SENS2:SWE[1]|2|3|4:OFFS:TIME	Gate 1: 10 us Others: 0	Set the start time of the gate
[SENS[1]]|SENS2:SWE[1]|2|3|4:TIME	Gate 1: 810 us Others: 0	Set the length of the gate
[SENS[1]]|SENS2:TRAC:LIM:LOW	-50 dBm	Lower limit of the trace display
[SENS[1]]|SENS2:TRAC:LIM:UPP	30 dBm	Upper limit of the trace display

[SENS[1]]|SENS2:TRACe:OFFSet:TIME	0	Set the minimum display time of the trace
[SENS[1]]|SENS2:TRACe:TIME	1ms	Set the display time length of the trace to 1 ms
TRIG[:SEQ]:DEL	-40 μs	Trigger Delay
TRIG[:SEQ]:LEV	-5 dBm	Trigger level
TRIG[:SEQ]:SLOP	POS	Signal's rising edge
TRIG[:SEQ[1]|2]:SOUR	INT1	Trigger source

Table3.52 1xeV-DO (XEVDO), 1xeV-DV (XEVDV) and TDSCdma Window Measurement Setting

Function	Setting
Display setting	
Upper window	Main channel trace display
Lower window	See Table 3.53
Window/measurement setting	
Upper measurement of the upper window (UU)	
Input	N/A
Measurement	N/A
Lower measurement of the upper window (UL)	
Input	N/A
Measurement	N/A
Upper measurement of the lower window (LU)	
Input	Main channel gate 1
Measurement	Average power
Lower measurement of the lower window (LL)	
Input	See Table 3.53
Measurement	See Table 3.53

Table3.53 1xeV-DO (XEVDO), 1xeV-DV (XEVDV) and TDSCdma Secondary Channel Preset Status

Function	Secondary channel sensor		
	Unconnected sensor	CW sensor	Peak sensor
Display setting			
Lower window	Double-value	Double-value	Double-value
Window/measurement setting			
Lower measurement of the lower window (LL)			
Input	Main channel gate 1	Secondary channel	Secondary channel gate 1
Measurement	PAR	Average power	Average power

12）NADC

NADC -- North American Digital Cellular

The unlisted portion in the following settings is the same as DEFault.

Table3.54 NADC Preset Status

Command	Setting	Description
[SENS[1]]|SENS2:FREQ[:CW|:FIX]	800MHz	Frequency of channel
[SENS[1]]|SENS2:SWE[1]|2|3|4:OFFS:TIME	Gate 1: 123.5 us Gate 2：20.123ms Others: 0	Set the start time of the gate
[SENS[1]]|SENS2:SWE[1]|2|3|4:TIME	Gate 1/2: 6.46 ms Others: 0	Set the length of the gate
[SENS[1]]|SENS2:TRAC:LIM:LOW	-50 dBm	Lower limit of the trace display
[SENS[1]]|SENS2:TRAC:LIM:UPP	30 dBm	Upper limit of the trace display
[SENS[1]]|SENS2:TRACe:OFFSet:TIME	0	Set the minimum display time of the trace
[SENS[1]]|SENS2:TRACe:TIME	50ms	Set the display time length of the trace to 1 ms
TRIG[:SEQ]:DEL	-200 μs	Trigger Delay
TRIG[:SEQ]:LEV	-5 dBm	Trigger level
TRIG[:SEQ]:SLOP	POS	Signal's rising edge
TRIG[:SEQ[1]|2]:SOUR	INT1	Trigger source

Table3.55 NADC Window Measurement Setting

Function	Setting
Display setting	
Upper window	Main channel trace display
Lower window	See Table 3.56
Window/measurement setting	
Upper measurement of the upper window (UU)	
Input	N/A
Measurement	N/A
Lower measurement of the upper window (UL)	
Input	N/A
Measurement	N/A
Upper measurement of the lower window (LU)	
Input	Main channel gate 1
Measurement	Average power
Lower measurement of the lower window (LL)	
Input	See Table 3.56
Measurement	See Table 3.56

Table3.56 NADC Secondary Channel Preset Status

Function	Secondary channel sensor		
	Unconnected sensor	CW sensor	Peak sensor
Display setting			

Lower window	Double-value	Double-value	Double-value
Window/measurement setting			
Lower measurement of the lower window (LL)			
Input	Main channel gate 2	Secondary channel	Secondary channel gate 1
Measurement	Average power	Average power	Average power

13) iDEN

The unlisted portion in the following settings is the same as DEFault.

Table3.57 iDEN Preset Status

Command	Setting	Description
[SENS[1]]|SENS2:AVER:COUN	64	Filtering length
[SENS[1]]|SENS2:FREQ[:CW|:FIX]	800MHz	Frequency of channel
[SENS[1]]|SENS2:SWE[1]|2|3|4:OFFS:TIME	0	Set the start time of the gate
[SENS[1]]|SENS2:SWE[1]|2|3|4:TIME	Gate1：15ms Gate2：90ms Gate 3: 160 us Others: 0	Set the length of the gate
[SENS[1]]|SENS2:TRAC:LIM:LOW	-50 dBm	Lower limit of the trace display
[SENS[1]]|SENS2:TRAC:LIM:UPP	30 dBm	Upper limit of the trace display
[SENS[1]]|SENS2:TRACe:OFFSet:TIME	0	Set the minimum display time of the trace
[SENS[1]]|SENS2:TRACe:TIME	100ms	Set the display time length of the trace
TRIG[:SEQ]:DEL	0	Trigger Delay
TRIG[:SEQ]:LEV	-5 dBm	Trigger level
TRIG[:SEQ]:SLOP	POS	Signal’s rising edge
TRIG[:SEQ[1]|2]:SOUR	INT1	Trigger source

Table3.58 iDEN Window Measurement Setting

Function	Setting
Display setting	
Upper window	See Table 3.59
Lower window	See Table 3.59
Window/measurement setting	
Upper measurement of the upper window (UU)	
Input	Main channel gate 1
Measurement	Average power
Lower measurement of the upper window (UL)	
Input	See Table 3.59
Measurement	See Table 3.59

Upper measurement of the lower window (LU)	
Input	See Table 3.59
Measurement	See Table 3.59
Lower measurement of the lower window (LL)	
Input	See Table 3.59
Measurement	See Table 3.59

Table3.59 iDEN Secondary Channel Preset Status

Function	Secondary channel sensor		
	Unconnected sensor	CW sensor	Peak sensor
Display setting			
Upper window	Single value	Double-value	Double-value
Lower window	Double-value	Double-value	Double-value
Window/measurement setting			
Lower measurement of the upper window (UL)			
Input	DEF	Main channel gate 1	Main channel gate 1
Measurement	DEF	Peak	Peak
Upper measurement of the lower window (LU)			
Input	Main channel gate 1	Main channel gate 1	Secondary channel gate 1
Measurement	Peak	PAR	Average power
Lower measurement of the lower window (LL)			
Input	Main channel gate 1	Secondary channel	Secondary channel gate 1
Measurement	PAR	Average power	PAR

14）DVB

The unlisted portion in the following settings is the same as DEFault.

Table3.60 DVB: Preset Status

Command	Setting	Description
[SENS[1]]|SENS2:AVER:COUN	8	Filtering length
[SENS[1]]|SENS2:FREQ[:CW|:FIX]	660MHz	Frequency of channel
[SENS[1]]|SENS2:SWE[1]|2|3|4:OFFS:TIME	Gate 1: 10 us Others: 0	Set the start time of the gate
[SENS[1]]|SENS2:SWE[1]|2|3|4:TIME	Gate1：15ms Gate2：90ms Others: 0	Set the length of the gate
[SENS[1]]|SENS2:TRAC:LIM:LOW	-50 dBm	Lower limit of the trace display
[SENS[1]]|SENS2:TRAC:LIM:UPP	30 dBm	Upper limit of the trace display
[SENS[1]]|SENS2:TRACe:OFFSet:TIME	0	Set the minimum display time of the trace

[SENS[1]]|SENS2:TRACe:TIME	100ms	Set the display time length of the trace
TRIG[:SEQ]:DEL	0	Trigger Delay
TRIG[:SEQ]:LEV	-5 dBm	Trigger level
TRIG[:SEQ]:SLOP	POS	Signal's rising edge
TRIG[:SEQ[1]|2]:SOUR	INT1	Trigger source

Table3.61 DVB: Window Measurement Setting

Function	Setting
Display setting	
Upper window	See Table 3.62
Lower window	See Table 3.62
Window/measurement setting	
Upper measurement of the upper window (UU)	
Input	Main channel gate 1
Measurement	Average power
Lower measurement of the upper window (UL)	
Input	See Table 3.62
Measurement	See Table 3.62
Upper measurement of the lower window (LU)	
Input	See Table 3.62
Measurement	See Table 3.62
Lower measurement of the lower window (LL)	
Input	See Table 3.62
Measurement	See Table 3.62

Table3.62 DVB: Secondary Channel Preset Status

Function	Secondary channel sensor		
	Unconnected sensor	CW sensor	Peak sensor
Display setting			
Upper window	Single value	Double-value	Double-value
Lower window	Double-value	Double-value	Double-value
Window/measurement setting			
Lower measurement of the upper window (UL)			
Input	DEF	Main channel gate 1	Main channel gate 1
Measurement	DEF	Peak	Peak
Upper measurement of the lower window (LU)			
Input	Main channel gate 1	Main channel gate 2	Secondary channel gate 1
Measurement	PAR	Average power	Average power
Lower measurement of the lower window (LL)			

Input	Main channel gate 2	Secondary channel	Secondary channel gate 1
Measurement	Average power	Average power	PAR

15) WiMAX

Worldwide Interoperability for Microwave Access.

Due to low cost, the broadband wireless market will be expanded and the recognition of enterprising and service providers will be improved after combining the technology with microwave device with/without authorization requirement.

The unlisted portion in the following settings is the same as DEFault.

Table3.63 WiMAX Preset Status

Command	Setting	Description
[SENS[1]]|SENS2:FREQ[:CW|:FIX]	3.5GHz	Frequency of channel
[SENS[1]]|SENS2:SWE[1]|2|3|4:OFFS:TIME	Gate 2: 102 us Others: 0	Set the start time of the gate
[SENS[1]]|SENS2:SWE[1]|2|3|4:TIME	Gate 1: 102 us Gate 2: 306 us Others: 0	Set the length of the gate
[SENS[1]]|SENS2:TRAC:LIM:LOW	-50 dBm	Lower limit of the trace display
[SENS[1]]|SENS2:TRAC:LIM:UPP	30 dBm	Upper limit of the trace display
[SENS[1]]|SENS2:TRACe:OFFSet:TIME	0	Set the minimum display time of the trace
[SENS[1]]|SENS2:TRACe:TIME	1ms	Set the display time length of the trace
TRIG[:SEQ]:DEL	-200us	Trigger Delay
TRIG[:SEQ]:LEV	-5 dBm	Trigger level
TRIG[:SEQ]:SLOP	POS	Signal's rising edge
TRIG[:SEQ[1]|2]:SOUR	INT1	Trigger source

Table3.64 WiMAX Window Measurement Setting

Function	Setting
Display setting	
Upper window	Double-digit
Lower window	Double-digit
Window/measurement setting	
Upper measurement of the upper window (UU)	
Input	Main channel gate 1
Measurement	Average power
Lower measurement of the upper window (UL)	
Input	Main channel gate 1
Measurement	PAR
Upper measurement of the lower window (LU)	
Input	See Table 3.65

Measurement	See Table 3.65
Lower measurement of the lower window (LL)	
Input	See Table 3.65
Measurement	See Table 3.65

Table3.65 WiMAX Secondary Channel Preset Status

Function	Secondary channel sensor		
	Unconnected sensor	CW sensor	Peak sensor
Window/measurement setting			
Upper measurement of the lower window (LU)			
Input	Main channel gate 2	Main channel gate 2	Secondary channel gate 1
Measurement	Average power	Average power	Average power
Lower measurement of the lower window (LL)			
Input	Main channel gate 2	Secondary channel	Secondary channel gate 1
Measurement	PAR	Average power	PAR

16）DME

The unlisted portion in the following settings is the same as DEFault.

Table3.66 DME Preset Status

Command	Setting	Description
[SENS[1]]|SENS2:AVER:COUN	32	Filtering length
[SENS[1]]|SENS2:FREQ[:CW|:FIX]	1.1GHz	Frequency of channel
[SENS[1]]|SENS2:SWE[1]|2|3|4:OFFS:TIME	Gate 1: -2 us Gate 2: 8 us Others: 0	Set the start time of the gate
[SENS[1]]|SENS2:SWE[1]|2|3|4:TIME	Gate 1: 8 us Gate 2: 50 us Others: 0	Set the length of the gate
[SENS[1]]|SENS2:TRAC:LIM:LOW	-50 dBm	Lower limit of the trace display
[SENS[1]]|SENS2:TRAC:LIM:UPP	30 dBm	Upper limit of the trace display
[SENS[1]]|SENS2:TRACe:OFFSet:TIME	0	Set the minimum display time of the trace
[SENS[1]]|SENS2:TRACe:TIME	100us	Set the display time length of the trace
TRACe[1]|2:DEFine:TRANsition:REFerence	1%, 81%	Pulse transition reference.
TRIG[:SEQ]:DEL	-3us	Trigger Delay
TRIG[:SEQ]:LEV	-5 dBm	Trigger level
TRIG[:SEQ]:SLOP	POS	Signal’s rising edge
TRIG[:SEQ[1]|2]:SOUR	INT1	Trigger source

Table3.67 DME Window Measurement Setting

Function	Setting
Display setting	
Upper window	See Table 3.68
Lower window	See Table 3.68
Window/measurement setting	
Upper measurement of the upper window (UU)	
Input	See Table 3.68
Measurement	See Table 3.68
Lower measurement of the upper window (UL)	
Input	See Table 3.68
Measurement	See Table 3.68
Upper measurement of the lower window (LU)	
Input	See Table 3.68
Measurement	See Table 3.68
Lower measurement of the lower window (LL)	
Input	See Table 3.68
Measurement	See Table 3.68

Table3.68 DME Secondary Channel Preset Status

Function	Secondary channel sensor		
	Unconnected sensor	CW sensor	Peak sensor
Display setting			
Upper window	Trace display	Double-value	Double-value
Lower window	Double-value	Double-value	Double-value
Window/measurement setting			
Upper measurement of the upper window (UU)			
Input	Main channel gate 1	Main channel gate 1	Main channel gate 1
Measurement	Average power	Peak	Peak
Lower measurement of the upper window (UL)			
Input	Main channel gate 1	Main channel gate 2	Main channel gate 1
Measurement	Average power	Peak	Peak
Upper measurement of the lower window (LU)			
Input	Main channel gate 2	Main channel gate 1	Secondary channel gate 1
Measurement	Average power	Average power	Average power
Lower measurement of the lower window (LL)			
Input	Main channel gate 1	Secondary channel	Secondary channel gate 2
Measurement	Peak	Average power	Average power

17）DMEPRT

The unlisted portion in the following settings is the same as DEFault.

Table3.69 DME-PRT Preset Status

Command	Setting	Description
[SENS[1]]|SENS2:AVER:COUN	32	Filtering length
[SENS[1]]|SENS2:FREQ[:CW|:FIX]	1.1GHz	Frequency of channel
[SENS[1]]|SENS2:SWE[1]|2|3|4:OFFS:TIME	Gate 2: 8 us Others: 0	Set the start time of the gate
[SENS[1]]|SENS2:SWE[1]|2|3|4:TIME	Gate 1: 6 us Gate 2: 50 us Others: 0	Set the length of the gate
[SENS[1]]|SENS2:TRAC:LIM:LOW	-50 dBm	Lower limit of the trace display
[SENS[1]]|SENS2:TRAC:LIM:UPP	30 dBm	Upper limit of the trace display
[SENS[1]]|SENS2:TRACe:OFFSet:TIME	0	Set the minimum display time of the trace
[SENS[1]]|SENS2:TRACe:TIME	100us	Set the display time length of the trace
TRACe[1]|2:DEFine:TRANsition:REFerence	0.25%, 9%	Pulse transition reference.
TRIG[:SEQ]:DEL	-2us	Trigger Delay
TRIG[:SEQ]:LEV	-5 dBm	Trigger level
TRIG[:SEQ]:SLOP	POS	Signal’s rising edge
TRIG[:SEQ[1]|2]:SOUR	INT1	Trigger source

Table3.70 DME-PRT Window Measurement Setting

Function	Setting
Display setting	
Upper window	See Table 3.71
Lower window	See Table 3.71
Window/measurement setting	
Upper measurement of the upper window (UU)	
Input	See Table 3.71
Measurement	See Table 3.71
Lower measurement of the upper window (UL)	
Input	See Table 3.71
Measurement	See Table 3.71
Upper measurement of the lower window (LU)	
Input	See Table 3.71
Measurement	See Table 3.71
Lower measurement of the lower window (LL)	
Input	See Table 3.71

Measurement	See Table 3.71

Table3.71 DME-PRT Secondary Channel Preset Status

Function	Secondary channel sensor		
	Unconnected sensor	CW sensor	Peak sensor
Display setting			
Upper window	Trace display	Double-value	Double-value
Lower window	Double-value	Double-value	Double-value
Window/measurement setting			
Upper measurement of the upper window (UU)			
Input	Main channel gate 1	Main channel gate 1	Main channel gate 1
Measurement	Average power	Peak	Peak
Lower measurement of the upper window (UL)			
Input	Main channel gate 1	Main channel gate 2	Main channel gate 1
Measurement	Average power	Peak	Peak
Upper measurement of the lower window (LU)			
Input	Main channel gate 2	Main channel gate 1	Secondary channel gate 1
Measurement	Average power	Average power	Average power
Lower measurement of the lower window (LL)			
Input	Main channel gate 1	Secondary channel	Secondary channel gate 2
Measurement	Peak	Average power	Average power

18）HSDPA

The unlisted portion in the following settings is the same as DEFault.

Table3.72 HSDPA Preset Status

Command	Setting	Description
[SENS[1]]|SENS2:AVER:COUN	64	Filtering length
[SENS[1]]|SENS2:FREQ[:CW|:FIX]	1.9GHz	Frequency of channel
[SENS[1]]|SENS2:SWE[1]|2|3|4:OFFS:TIME	0	Set the start time of the gate
[SENS[1]]|SENS2:SWE[1]|2|3|4:TIME	Gate1：10ms Others: 0	Set the length of the gate
[SENS[1]]|SENS2:TRAC:LIM:LOW	-50 dBm	Lower limit of the trace display
[SENS[1]]|SENS2:TRAC:LIM:UPP	30 dBm	Upper limit of the trace display
[SENS[1]]|SENS2:TRACe:OFFSet:TIME	0	Set the minimum display time of the trace
[SENS[1]]|SENS2:TRACe:TIME	10ms	Set the display time length of the trace
TRIG[:SEQ]:DEL	0	Trigger Delay
TRIG[:SEQ]:LEV	-5 dBm	Trigger level

TRIG[:SEQ]:SLOP	POS	Signal's rising edge
TRIG[:SEQ[1]|2]:SOUR	INT1	Trigger source

Table3.73 HSDPA Window Measurement Setting

Function	Setting
Display setting	
Upper window	See Table 3.74
Lower window	See Table 3.74
Window/measurement setting	
Upper measurement of the upper window (UU)	
Input	Main channel gate 1
Measurement	Average power
Lower measurement of the upper window (UL)	
Input	See Table 3.74
Measurement	See Table 3.74
Upper measurement of the lower window (LU)	
Input	See Table 3.74
Measurement	See Table 3.74
Lower measurement of the lower window (LL)	
Input	See Table 3.74
Measurement	See Table 3.74

Table3.74 HSDPA Secondary Channel Preset Status

Function	Secondary channel sensor		
	Unconnected sensor	CW sensor	Peak sensor
Display setting			
Upper window	Single value	Double-value	Double-value
Lower window	Double-value	Double-value	Double-value
Window/measurement setting			
Lower measurement of the upper window (UL)			
Input	DEF	Main channel gate 1	Main channel gate 1
Measurement	DEF	Peak	Peak
Upper measurement of the lower window (LU)			
Input	Main channel gate 1	Main channel gate 1	Secondary channel gate 1
Measurement	Peak	PAR	Average power
Lower measurement of the lower window (LL)			
Input	Main channel gate 1	Secondary channel	Secondary channel gate 1
Measurement	PAR	Average power	PAR

:SYSTem:REMote

Function: Lock other keys except the “Local” key. Display “Remote Control” (RMT) in the status bar. When the keyboard operation of the front panel is disabled and it shall be unlocked, please press down “Local” key. Or send “SYST:LOC” command.

Query: Not supported

Setting: :SYSTem:REMote

Example: SYST:REM

:SYSTem:RWLock

Function: The locking includes all keys of “Local” key. Display “Remote Control” (RMT) in the status bar. When the keyboard operation of the front panel is disabled and it shall be unlocked, there in only one method, namely, send “SYST:LOC” command.

Query: Not supported

Setting: :SYSTem:RWLock

Example: SYST:RWL

:SYSTem:TIME

Function: Query or set the time.

Query: :SYSTem:TIME? [MIN|MAX, MIN|MAX, MIN|MAX]

Setting: :SYSTem:TIME <Numeric Data 1>, <Numeric Data 2>, <Numeric Data 3>

The <Numeric Data 1>, <Numeric Data 2>, <Numeric Data 3> respectively represents hour, minute, second, in the form of MIN, MAX, DEF, UP, DOWN and <NR1>

The DEF, UP, DOWN and <NR1> are only used for setting.

The UP means an increase of one hour, one minute and one second on the basis of the current hour, minute and second.

The DOWN means a decrease of one hour, one minute and one second on the basis of the current hour, minute and second.

DEF indicates no change.

Example:

SYST:TIME?	Query the current time.
SYST:TIME? MAX,MAX,MIN	Query the settable maximum hour, maximum minute and minimum second.
SYST:TIME UP,DEF,DEF	Increase the current time by one hour.
SYST:TIME DEF,UP,DEF	Increase the current time by one minute.
SYST:TIME DEF,DEF,DOWN	Decrease the current time by one second.
SYST:TIME DEF,DEF,1	Keep the hour and minute unchanged, and set the second to 1.
SYST:TIME 18,58,26	Set it to 18:58:26.

:SYSTem:VERSion?

Function: Query SCPI version number of the microwave power meter. The returned form is YYYY.X, YYYY represents year and X represents version number. 1999.0 will be returned in this case.

Query: :SYSTem:VERSion?

Setting: Not supported

Example: SYST:VERS?

3.3.12 Trace (TRACe)

:TRACe[1]|2[:DATA]?

Function: Query the pulse measurement trace data of the specified channel.

The inputted parameters will not be considered, and the directory of reserved parameters is intended for compatibility with N1911/2 command.

The format of the returned data is <Arbitrary Data Block> as shown in section 7.7.6 of the IEEE 488.2.

#nNNN...Nddd……ddd<LF>

- Data
- newline character, indicating the end of the data block.
- Data length (namely the number of bytes of d)
- Number of bits of data length (namely the number of bits of N)
- Beginning tag of the data block.

The format of data element of each trace is IEEE 754 32-bit floating point data, namely, 4 bytes. As number of the trace points is always 501, the form of the data block is #42004…..In <LF>, n = 4, N = 4004.

Query: :TRACe[1]|2[:DATA]? <Character Data>

The form of <Character Data> is: HRESolution; MRESolution; LRESolution

No consideration will be given to parameters.

Setting: Not supported

Example: TRAC2? MRES — Query the pulse measurement trace data of channel B.

Limit: It is only valid for the peak sensor (8170X).

Error information: If the given channel has no waveform display, it will prompt “-221, ”Settings Conflict”.

:TRACe[1]|2:DEFine:DURation:REFerence

Function: Query or set the reference value for calculating the pulse duration (namely the pulse width).

Query: :TRACe[1]|2:DEFine:DURation:REFerence? [MIN|MAX]

Setting: :TRACe[1]|2:DEFine:DURation:REFerence <Numeric Data>

The valid value of the numeric data includes: DEF, MIN, MAX and <NRf>, and DEF and <NRf> are only used for setting.

The range of <NRf> is 0 - 100, and DEF is 50.

Example:	TRAC1:DEF:DUR:REF?	Query the reference value for calculating the pulse duration of channel A.
	TRAC2:DEF:DUR:REF 50	Set the reference value for calculating the pulse duration of channel B to 50%.

Limit: It is only valid for the peak sensor (8170X).

Reset status: The default value is 50% (DEF).

:TRACe[1]|2:DEFine:TRANsition:REFerence

Function: Query or set the reference value for calculating the pulse transition duration (rising time or falling time).

Query: :TRACe[1]|2:DEFine:TRANsition:REFerence?

Setting: :TRACe[1]|2:DEFine:TRANsition:REFerence <Numeric Data 1>, <Numeric Data 2>

The valid value of the numeric data 1 and 2 includes: DEF, MIN, MAX and <NRf>, and DEF and <NRf> are only used for setting.

The range of <NRf> is 0 - 100,

The DEF of <Numeric Data 1> is 10,

The DEF of <Numeric Data 2> is 90

Example:	TRAC1:DEF:TRAN:REF?	Query the reference value for calculating the pulse transition duration of channel A.
	TRAC1:DEF:TRAN:REF 20,80	Set the reference value for calculating the pulse transition duration of channel A to 20% and 80%.
	TRAC2:DEF:TRAN:REF DEF,DEF	Set the reference value for calculating the pulse transition duration of channel B to 10% and 90%.

Limit: It is only valid for the peak sensor (8170X).

Reset status: The default value is 10% and 90% respectively

:TRACe[1]|2:MEASurement:INSTant:REFerence?

Function: Query the time when the trace waveform intersects with a given reference value. The parameter is percentage, for example 10 represents 10%.

Calculate the moment at the given power (marked as Px), and record it as tx,

Px = Pbot + (Ptop - Pbot) * x / 100

Ptop and Pbot refer to the top power and bottom power respectively, both of which are adopted with linear units, such as mW. X is a percentage form, with a range of -25 - 125

If the calculated Px is smaller than the minimum power in the current power buffer area, the minimum power will be taken; if the calculated Px is larger than the peak power, the peak power will be taken.

Px = max(Pmin, min(Pmax, Px))

If there are a number of moments, only the first moment will be returned.

Find two points in the whole power buffer area. Remember that the power of the two points is P1, P2 and time is t1 and t2 respectively. There are two conditions:

1) Make the power of the first point smaller than or equal to Px, and the power of the next point larger than or equal to Px.

2) Make the power of the first point larger than or equal to Px, and the power of the next point smaller than or equal to Px.

Use the linear interpolation tx = t1 + (t2 - t1) * (Px - P1) / (P2 - P1)

Query: :TRACe[1]|2:MEASurement:INSTant:REFerence? <Numeric Data>

The valid value of the numeric data is MIN, MAX and <NRf>.

The range of <NRf> is -25 - 125.

Setting: Not supported

Example: TRAC2:MEAS:INST:REF? 28 Query the time when the trace waveform of channel B intersects with a reference value of 28%.

Limit: It is only valid for the peak sensor (8170X).

:TRACe[1]|2:MEASurement:PULSe:DCYCle?

Function: Query the pulse duty cycle.

Query: :TRACe[1]|2:MEASurement:PULSe:DCYCle?

Setting: Not supported

Example: TRAC:MEAS:PULS:DCYC? Query the pulse duty cycle of channel A.

Limit: It is only valid for the peak sensor (8170X).

Description: If the measured duty cycle is invalid, “9.91E37” will be returned

Error information: If the given channel is not connected with the sensor or it is connected with the CW sensor, it will prompt “-241, “Hardware Missing"”;

If it is a kind of free running mode, it will prompt “-221, "Settings Conflict"”.

:TRACe[1]|2:MEASurement:PULSe:DURation?

Function: Query the pulse duration (namely the pulse width).

Query: :TRACe[1]|2:MEASurement:PULSe:DURation?

Setting: Not supported

Example: TRAC2:MEAS:PULS:DUR? Query the pulse duration of channel B.

Limit: It is only valid for the peak sensor (8170X).

Description: If the measured pulse width is invalid, “9.91E37” will be returned

Error information: If the given channel is not connected with the sensor or it is connected with the CW sensor, it will prompt “-241, “Hardware Missing"”;

If it is a kind of free running mode, it will prompt “-221, "Settings Conflict"”.

:TRACe[1]|2:MEASurement:PULSe:PERiod?

Function: Query the pulse period.

Query: :TRACe[1]|2:MEASurement:PULSe:PERiod?

Setting: Not supported

Example: TRAC2:MEAS:PULS:PER? Query the pulse period of channel B.

Limit: It is only valid for the peak sensor (8170X).

Description: If the measured cycle is invalid, “9.91E37” will be returned

Error information: If the given channel is not connected with the sensor or it is connected with the CW sensor, it will prompt “-241, “Hardware Missing"”;

If it is a kind of free running mode, it will prompt “-221, "Settings Conflict"”.

:TRACe[1]|2:MEASurement:PULSe:SEParation?

Function: Query the pulse interval time (or pulse closing time).

Query: :TRACe[1]|2:MEASurement:PULSe:SEParation?

Setting: Not supported

Example: TRAC2:MEAS:PULS:SEP? Query the pulse interval time (pulse closing time) of channel B.

Limit: It is only valid for the peak sensor (8170X).

Description: If the measured value is invalid, “9.91E37” will be returned

Error information: If the given channel is not connected with the sensor or it is connected with the CW sensor, it will prompt “-241, “Hardware Missing"”;
If it is a kind of free running mode, it will prompt “-221, "Settings Conflict"”.

:TRACe[1]|2:MEASurement:REFerence?

Function: Query the power of the given reference value.

Algorithm: $P_{x\%} = P_{0\%} + x/100 \times (P_{100\%} - P_{0\%})$

All the units are linear units.

Query: :TRACe[1]|2:MEASurement:REFerence? <Numeric Data>
The valid value of the numeric data is 0 - 100.

Setting: Not supported

Example: TRAC1:MEAS:REF? 100 Query the top power of channel A.

Limit: It is only valid for the peak sensor (8170X).

Error information: If the given channel is not connected with the sensor or it is connected with the CW sensor, it will prompt “-241, “Hardware Missing"”;
If it is a kind of free running mode, it will prompt “-221, "Settings Conflict"”.

:TRACe[1]|2:MEASurement:TRANsition:NEGative:DURation?

Function: Query the pulse negative transition duration (namely falling time).

Query: :TRACe[1]|2:MEASurement:TRANsition:NEGative:DURation?

Setting: Not supported

Example: TRAC1:MEAS:TRAN:NEG:DUR? Query the falling time.

Description: If the measured value is invalid, “9.91E37” will be returned

Limit: It is only valid for the peak sensor (8170X).

Error information: If the given channel is not connected with the sensor or it is connected with the CW sensor, it will prompt “-241, “Hardware Missing"”;
If it is a kind of free running mode, it will prompt “-221, "Settings Conflict"”.

:TRACe[1]|2:MEASurement:TRANsition:NEGative:OCCurence?

Function: Query the pulse negative transition (namely falling) moment.

Query: :TRACe[1]|2:MEASurement:TRANsition:NEGative:OCCurence?

Setting: Not supported

Example: TRAC1:MEAS:TRAN:NEG:OCC?

Limit: It is only valid for the peak sensor (8170X).

Error information: If the given channel is not connected with the sensor or it is connected with the CW sensor, it will prompt “-241, “Hardware Missing"”;
If it is a kind of free running mode, it will prompt “-221, "Settings Conflict"”.

:TRACe[1]|2:MEASurement:TRANsition:POSitive:DURation?

Function: Query the pulse positive transition duration (namely rising time).

Query: :TRACe[1]|2:MEASurement:TRANsition:POSitive:DURation?

Setting: Not supported

Example: TRAC1:MEAS:TRAN:POS:DUR? Query the rising time.

Limit: It is only valid for the peak sensor (8170X).

Error information: If the given channel is not connected with the sensor or it is connected with the CW sensor, it will prompt “-241, “Hardware Missing"”;
If it is a kind of free running mode, it will prompt “-221, "Settings Conflict"”.

:TRACe[1]|2:MEASurement:TRANsition:POSitive:OCCurence?

Function: Query the pulse positive transition (namely rising) moment.

Query: :TRACe[1]|2:MEASurement:TRANsition:POSitive:OCCurence?

Setting: Not supported

Example: TRAC1:MEAS:TRAN:POS:OCC?

Limit: It is only valid for the peak sensor (8170X).

Error information: If the given channel is not connected with the sensor or it is connected with the CW sensor, it will prompt “-241, “Hardware Missing"”;
If it is a kind of free running mode, it will prompt “-221, "Settings Conflict"”.

:TRACe[1]|2:UNIT

Function: Query or set the trace unit of the given channel.

Query: :TRACe[1]|2:UNIT?

Setting: :TRACe[1]|2:UNIT <DBM|W>

Example: TRAC2:UNIT DBM Set the trace unit of channel B to dBm.

Limit: It is only valid for the peak sensor (8170X).

3.3.15. Trigger (INITiate/TRIGger)

:ABORt[1]|2

Function: Stop measurement of corresponding channel of the microwave power meter. Restart measurement after sending INITiate:CONTinuous ON.

Query: Not supported

Setting: ABORt[1]|2

Example:

ABOR	Stop measurement of channel A.
ABOR2	Stop measurement of channel B.

Description: The microwave power meter doesn't have the trigger idle status, namely, the trigger is always in the waiting status.

:INITiate[1]|2:CONTinuous

Function: Query or set the trigger status of the specified channel of the power meter: Single step and continuous

When it is set to single step (OFF), wait for trigger until it is set to continuous (ON) or INITiate:IMMediate is received.

The command is equivalent to INITiate:CONTinuous:SEQuence[1]|2

Query: :INITiate[1]|2:CONTinuous?

Setting: :INITiate[1]|2:CONTinuous <Boolean Data>

OFF|0 Single step

ON|1 Continuous

Example:

INIT2:CONT?	Query the trigger status of channel B, 0 single step; 1 continuous.
INIT:CONT ON	Set channel A to the continuous trigger status.

Description: For the CW sensor, it can't be set to single step trigger and continuous trigger; for the parameter OFF, it is equivalent to stopping the measurement, and for the parameter ON, it is equivalent to starting the measurement.

Reset status: Set it to ON

:INITiate:CONTinuous:ALL

Function: Query or set the trigger status of all the channels of the microwave power meter: Single step and continuous

When it is set to single step (OFF), wait for trigger until it is set to continuous (ON) or INITiate:IMMediate is received.

Query: :INITiate:CONTinuous:ALL?

Setting: :INITiate:CONTinuous:ALL <Boolean Data>

OFF|0 Single step

ON|1 Continuous

Example:

INIT:CONT:ALL?	Query the trigger status of all the channels. When all channels are continuously triggered, it will be 1, otherwise, it will be 0.
INIT:CONT:ALL ON	Set all the channels to the continuous trigger status.

Reset status: Set it to ON

:INITiate:CONTinuous:SEQuence[1]|2

Function: Query or set the trigger status of the specified channel of the power meter: Single step and continuous

When it is set to single step (OFF), wait for trigger until it is set to continuous (ON) or INITiate:IMMediate is received.

The command is equivalent to INITiate[1]|2:CONTinuous

Query: :INITiate:CONTinuous:SEQuence[1]|2?

Setting: :INITiate:CONTinuous:SEQuence[1]|2 <Boolean Data>

OFF|0 Single step

ON|1 Continuous

Example: INIT:CONT:SEQ2? Query the trigger status of channel B, 0 single step; 1 continuous.

INIT:CONT:SEQ1 ON Set channel A to the continuous trigger status.

:INITiate[1]|2[:IMMediate]

Function: Set the specified channel of the power meter to the waiting for trigger status. The measurement will start when trigger event is received.

The equivalent command is INITiate:[IMMediate]:SEQuence[1]|2

Query: Not supported

Setting: :INITiate[1]|2[:IMMediate]

Example: INIT2 Set channel B of the power meter to the waiting for trigger status.

:INITiate[:IMMediate]:ALL

Function: Set all the channels of the microwave power meter to the waiting for trigger status. The measurement will start when trigger event is received.

Query: Not supported

Setting: :INITiate[:IMMediate][:ALL]

Example: INIT:ALL Set all the channels of the microwave power meter to the waiting for trigger status.

:INITiate[:IMMediate]:SEQuence[1]|2

Function: Set the specified channel of the power meter to the waiting for trigger status. The measurement will start when trigger event is received.

The equivalent command :INITiate[1]|2[:IMMediate]

Query: Not supported

Setting: :INITiate[:IMMediate]:SEQuence[1]|2

Example: INIT:SEQ2 Set channel B of the power meter to the waiting for trigger status.

:TRIGger[1]|2[:IMMediate]

Function: The command sets the specified channel of the power meter to the trigger waiting status immediately.

The equivalent command:

INITiate[1]|2:[IMMediate]

TRIGger[:SEQuence[1]|2][:IMMediate]

Query: Not supported

Setting: :TRIGger[1]|2[:IMMediate]

Example: TRIG2 It sets channel B to the trigger waiting status immediately.

:TRIGger:MODE

Function: Query or set the trigger mode of the microwave power meter.

Query: :TRIGger:MODE?

Setting: :TRIGger:MODE <AUTO|NORMal|ALEVel|0|1|2>

AUTO or 0: Set the automatic trigger mode (if no trigger signal is detected, the microwave power meter can still be used for measurement, but the waveform display may be unstable.) ;

NORMal or 1: Set the normal trigger mode (if no trigger signal is detected, the microwave power meter will stop measurement till the trigger signal is detected again);

ALEVel or 2: Set the automatic level trigger mode (if no trigger signal is detected, the microwave power meter will automatically search for the trigger level). The ALEVel is composed of AUTO and LEVEL. (It is not supported by 2436).

Example: TRIG:MODE? Query the trigger mode (0 represents AUTO, 1 represents NORMal and 2 represents ALEVel).

TRIG:MODE AUTO Set it to automatic trigger

Limit: It is only valid for the peak sensor (8170X). The automatic level trigger mode is not supported by 2436.

Reset status: Set the trigger mode to automatic trigger mode.

:TRIGger:POSition

Function: Query or set the position of the trigger event on the screen. Assuming that the trigger delay time is 0, if the trigger position is set to LEFT, the whole trace will be post-triggered; if it is set to RIGHT, the whole trace will be pre-triggered; if it is set to MIDDLE, the trace before and after the trigger event will be displayed at the same time. Note that TRIGger:DELay command will affect the position of the trigger event.

Query: :TRIGger:POSition?

If 0 - 2 is returned, it means the LEFT, MIDDLE and RIGHT trigger positions.

Setting: :TRIGger:POSition <Character Data>

The valid character data includes:

LEFT or 0: Left trigger;

MIDDle or 1: Middle trigger;

RIGHt or 2: Right trigger.

Example: TRIG:POS? Query the trigger position.

TRIG:POS MIDD Set the trigger position to MIDDLE trigger.

TRIG:POS 1 Set the trigger position to MIDDLE trigger.

Limit: It is only used for the pulse measurement mode

Reset status: Set the trigger position to MIDDLE trigger.

:TRIGger[:SEQuence[1]|2]:DELay

Function: Query or set the trigger delay.

Query: :TRIGger[:SEQuence[1]|2]:DELay? [MIN|MAX]

Setting: :TRIGger[:SEQuence[1]|2]:DELay <Numeric Data>

The valid value of the numeric data includes: DEF, MIN, MAX and <NRf>, and DEF and <NRf> are only used for setting.

The range of <NRf> is -40 - 100 s

The DEF is 0

The MIN is related to the currently set time base, and the minimum value is larger than or equal to -40 (for example, this value will be -0.04 in case of 10 us/Div);

The MAX is related to the currently set time base, and the maximum value is smaller than or equal to 100 (for example, this value will be 0.04 in case of 10 us/Div).

Example:

TRIG:DEL?	Query the trigger delay.
TRIG:DEL? MIN	Query the settable minimum trigger delay.
TRIG:DEL 1E-4	Set the trigger delay to 100 us.
TRIG:DEL DEF	Set the trigger delay to the default value (0 s).

Limit: It is only valid for the peak sensor (8170X).

Description: For 2436: The trigger delay of two channels shares settings; for 2438: The trigger delay of two channels is independent.

Reset status: Set the trigger delay to 0 s.

:TRIGger[:SEQuence[1]|2]:HOLDoff

Function: The command sets the trigger holdoff of the power meter, unit: s.

Query: :TRIGger[:SEQuence[1]|2]:HOLDoff? [MIN|MAX]

Setting: :TRIGger[:SEQuence[1]|2]:HOLDoff <Numeric Data>

The valid value of the numeric data includes: DEF, MIN, MAX and <NRf>, and DEF and <NRf> are only used for setting.

The range of <NRf> is 1e-6 - 1, and DEF is 1e-6.

Example:

TRIG:HOLD?	Query the current trigger holdoff.
TRIG:HOLD 0.01	Set the trigger holdoff to 10 ms.

Limit: It is only applicable to 2438 peak sensor (8170X).

Reset status: Set the trigger holdoff to 1e-6 s.

:TRIGger[:SEQuence[1]|2]:IMMediate

Function: The command sets the specified channel of the power meter to the trigger waiting status immediately.

The equivalent command :INITiate[1]|2:[IMMediate]

TRIGger[1]|2[:IMMediate]

Query: Not supported

Setting: :TRIGger[:SEQuence[1]|2]:IMMediate

Example:

TRIG:IMM	It sets channel A to the trigger waiting status immediately.

:TRIGger[:SEQuence]:LEVel

Function: Query or set the trigger level.

Query: :TRIGger[:SEQuence]:LEVel? [MIN|MAX]

Setting: :TRIGger[:SEQuence]:LEVel <Numeric Data>

The valid value of the numeric data includes: DEF, MIN, MAX and <NRf>, and DEF and <NRf> are only used for setting.

The range of <NRf> is -40 - 20 dBm (depending on the sensor), and DEF is 0 dBm.

Example: TRIG:LEV? Query the current trigger level.

TRIG:LEV -3 Set the trigger level to -3 dBm.

Limit: It is only applicable to the peak sensor (8170X).

Reset status: Set the trigger level to 0 dBm.

:TRIGger[:SEQuence]:LEVel:AUTO

Function: Set the microwave power meter to the automatic level trigger status.

Query: :TRIGger[:SEQuence]:LEVel:AUTO?

Setting: :TRIGger[:SEQuence]:LEVel:AUTO <Boolean Data>|ONCE|2

The effective form of <Boolean Data> includes 0, OFF, 1 and ON.

For “OFF” or “0”, the trigger mode is set to the automatic trigger: namely, the trigger level will not be searched, and if it is not triggered, the waveform display will be unstable.

For “ON” or “1”, the trigger mode is set to the automatic level trigger, and the trigger level will be automatically searched according to the power of the detected signal.

For “ONCE” or “2”, the trigger mode is set to the automatic level trigger, and the trigger level will be automatically searched once, and then the trigger mode will be set to the automatic trigger after searching is completed.

Example: TRIG:LEVel:AUTO? Query the automatic level trigger mode (0 represents OFF, 1 represents ON and 2 represents OFF).

TRIG:LEVel:AUTO 2 Set it to once automatic level trigger, and then disable the automatic level trigger.

Limit: It is only valid for the peak sensor (8170X). It is not supported by 2436 but supported by 2438.

Reset status: Set the automatic level trigger to OFF, namely set the trigger mode to automatic trigger.

:TRIGger[:SEQuence]:SLOPe

Function: Query or set the trigger slope.

Query: :TRIGger[:SEQuence]:SLOPe?

Setting: :TRIGger[:SEQuence]:SLOPe <Character Data>

The valid value of the character data is:

0 or POSitive: Capture trigger event in signal’s rising edge.

1 or NEGative: Capture trigger event in signal’s falling edge.

Example: TRIG:SLOP? Query the trigger slope.

TRIG:SLOP NEG Set the last transition trigger.

Limit: It is only valid for the peak sensor (8170X).

Reset status: Set the trigger slope to the signal’s rising edge (POSitive).

:TRIGger[:SEQuence[1]|2]:SOURce

Function: Query or set the trigger source.

The equivalent command: TRIGger[1]|2:SOURce

Query: :TRIGger[:SEQuence[1]|2]:SOURce?

Setting: :TRIGger[:SEQuence[1]|2]:SOURce <Character Data>

The valid value of the character data is:

BUS: The trigger source is a "*TRG" common command, or "TRIGger:IMMediate"SCPI.

EXTernal1: The trigger source is trigger FEED1 on the rear panel.

EXTernal 2: The trigger source is trigger FEED1 on the rear panel.

HOLD: Suspend trigger, and trigger power meter with "TRIGger:IMMediate" command.

IMMediate: The trigger system is running. If "INITiate:CONTinous" is set to "ON", the power meter will run under a free running mode; otherwise, after the measurement after "INITiate:IMMediate" is sent, it will enter the measurement stop status (IDLE status).

The INTernal[1]|2:INTernal[1] means that the trigger source is channel A, and INTernal2 means that the trigger source is channel B.

Example:

TRIG:SOUR?	Query the trigger source.
TRIG:SOUR INT2	Set the trigger source to channel B.

Reset status: Set the trigger source to channel A (INT1).

:TRIGger[1]|2:SOURce

Function: Query or set the trigger source.

The equivalent command :TRIGger[:SEQuence[1]|2]:SOURce

Query: :TRIGger[1]|2:SOURce?

Setting: :TRIGger[1]|2:SOURce <Character Data>

The valid value of the character data is:

BUS: The trigger source is a "*TRG" common command, or "TRIGger:IMMediate"SCPI.

EXTernal1: The trigger source is trigger FEED1 on the rear panel.

EXTernal 2: The trigger source is trigger FEED2 on the rear panel.

HOLD: Suspend trigger, and trigger power meter with "TRIGger:IMMediate" command.

IMMediate: The trigger system is running. If "INITiate:CONTinous" is set to "ON", the power meter will run under a free running mode; otherwise, after the measurement after "INITiate:IMMediate" is sent, it will enter the measurement stop status (IDLE status).

The INTernal[1]|2:INTernal[1] means that the trigger source is channel A, and INTernal2 means that the trigger source is channel B.

Example:

TRIG:SOUR?	Query the trigger source.
TRIG:SOUR INT2	Set the trigger source to channel B.

Reset status: Set the trigger source to channel A (INT1).

3.3.16 Unit (UNIT)

:UNIT[1]|2|3|4:POWer

Function: Query or set the power measurement unit of the specified window. The linearity and logarithm are in the menu operation.

The absolute power measurement unit is W and dBm, which correspond to linearity and logarithm respectively.

The ratio measurement and relative power measurement unit are % and dB, which correspond to linearity and logarithm respectively.

The UNIT1 corresponds to the upper measurement of the upper window;
The UNIT2 corresponds to the upper measurement of the lower window;
The UNIT3 corresponds to the lower measurement of the upper window;
The UNIT4 corresponds to the lower measurement of the lower window

Query: :UNIT[1]|2|3|4:POWer?

Setting: :UNIT[1]|2|3|4:POWer <Character Data>
The valid character data includes:
DBM or 0: Logarighmic display.
W or 1: Linear display

Example:

UNIT2:POW?	Query the power unit of the upper measurement of the lower window.
UNIT1:POW W	Set the power unit of the upper measurement of the upper window to W.

:UNIT[1]|2|3|4:POWer:RATio

Function: Query or set the ratio measurement power unit of the specified window. The linearity and logarithm are in the menu operation.
The UNIT1 corresponds to the upper measurement of the upper window;
The UNIT2 corresponds to the upper measurement of the lower window;
The UNIT3 corresponds to the lower measurement of the upper window;
The UNIT4 corresponds to the lower measurement of the lower window.

Query: :UNIT[1]|2|3|4:POWer:RATio?

Setting: :UNIT[1]|2|3|4:POWer:RATio <Character Data>
The valid character data includes:
DBM or 0: Logarighmic display.
PCT or 1: Linear display (PCT represents %)

Example:

UNIT2:POW:RAT?	Query the power unit of the upper measurement of the lower window.
UNIT1:POW:RAT PCT	Set the power unit of the upper measurement of the upper window to PCT.

3.3.17 Service (SERVice)

:SERVice:LANGuage

Function: Query or set the language selection.

Query: :SERVice:LANGuage?

Setting: :SERVice:LANGuage <CHINese|ENGLish|0|1>

CHINese or 0: Select Chinese
ENGLish or 1: Select English

Example: SERV:LANG? Query the language selection.
SERV:LANG CHIN Set the language to Chinese

Reset status: Not affected.

:SERVice:SECure:ERASe

Function: Erase the user storage information of the microwave power meter, including save recall status and last user configuration status.

Query: Not supported

Setting: :SERVice:SECure:ERASe

Example: SERV:SEC:ERAS

:SERVice:SENSor[1]|2:CDATe?

Function: Query the sensor calibration date. The calibration date is saved in the sensor EEPROM.

Query: :SERVice:SENSor[1]|2:CDATe?

Setting: Not supported

Example: SERV:SENS2:CDAT? Query the sensor calibration date of channel B.

Error information: If the channel is not connected with the sensor, it will prompt “-241, "Hardware Missing"”.

:SERVice:SENSor[1]|2:CPLace?

Function: Query the sensor calibration address. The calibration address is saved in the sensor EEPROM.

Query: :SERVice:SENSor[1]|2:CPLace?

Setting: Not supported

Example: SERV:SENS2:CPL? Query the sensor calibration address of channel B.

Error information: If the channel is not connected with the sensor, it will prompt “-241, "Hardware Missing"”.

:SERVice:SENSor[1]|2:FREQuency:MAXimum?

Function: Query the maximum frequency of the sensor of the specified channel. The maximum frequency is saved in the sensor EEPROM.

Query: :SERVice:SENSor[1]|2:FREQuency:MAXimum?

Setting: Not supported

Example: SERV:SENS2:FREQ:MAX? Query the maximum frequency of the sensor of channel B.

Error information: If the channel is not connected with the sensor, it will prompt “-241, "Hardware Missing"”.

:SERVice:SENSor[1]|2:FREQuency:MINimum?

Function: Query the minimum frequency of the sensor of the specified channel. The minimum frequency is saved in the sensor EEPROM.

Query: :SERVice:SENSor[1]|2:FREQuency:MINimum?

Setting: Not supported

Example: SERV:SENS2:FREQ:MIN? Query the minimum frequency of the sensor of channel B.

Error information: If the channel is not connected with the sensor, it will prompt “-241, "Hardware Missing"”.

:SERVice:SENSor[1]|2:SNUMber?

Function: Query the serial number of the sensor of the specified channel. The serial number of the sensor is saved in the sensor EEPROM.

Query: :SERVice:SENSor[1]|2:SNUMber?

Setting: Not supported

Example: SERV:SENS2:SNUM? Query the sensor serial number of channel B.

Error information: If the channel is not connected with the sensor, it will prompt “-241, "Hardware Missing"”.

:SERVice:SENSor[1]|2:TYPE?

Function: Query the type of the sensor of the specified channel. The type of the sensor is saved in the sensor EEPROM.

Query: :SERVice:SENSor[1]|2:TYPE?

Setting: Not supported

Example: SERV:SENS2:TYPE? Query the sensor type of channel B.

Error information: If the channel is not connected with the sensor, it will prompt “-241, "Hardware Missing"”.

:SERVice:SNUMber

Function: Query or set the serial number of the microwave power meter.

Query: :SERVice:SNUMber?

Setting: :SERVice:SNUMber <Character Data>
It will be kept temporarily.

Example: SERV:SNUM?

4 Programming example

4.1 Basic operation example

The basic methods for programming of remote control of the instrument through the VISA library are illustrated hereinafter. Take the C++ language as an example.

4.1.1 VISA library

VISA is a general term for standard I/O function library and its related specifications. The VISA library function is a set of functions that can be easily called. Its core function can control different types of devices without considering the interface types of devices and the operation methods of different sets of I/O interface software. These library functions are used to write the driver of the instrument as well as complete the command and data transmission between the computer and the instrument, so as to realize the remote control of the instrument. The instruments with remote interfaces (LAN, USB, GPIB and RS-232) can be connected through initializing the addressing string (“VISA Resource String”).

At first, it is necessary to install the VISA library so as to achieve remote control. The VISA library packages the underlying transfer functions of underlying VXI, GPIB, LAN and USB interfaces so that the user can call them directly. The microwave power meter supports the programming interfaces including GPIB, LAN and RS-232 which are used in combination with the VISA library and programming language for remote control of the microwave power meter. Currently, Keysight I/O Library of Keysight Company is often used as the underlying I/O library.

In Figure 4.1, GPIB interface is made as an example to show the relationship between the remote interface, VISA library, programming language and microwave power meter.

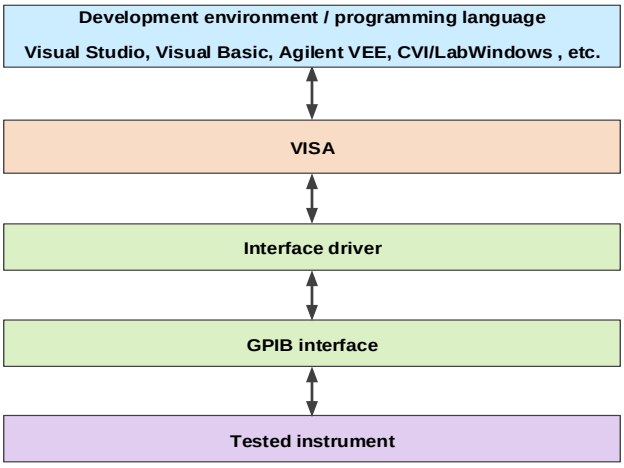


Fig.4.1 Remote control hardware and software layer

4.1.2 Example running environment

4.1.2.1 Configuration requirements

The programming examples described in this chapter have been successfully run on the computers with the following configuration.

- IBM compatible, Pentium PC and above;
- Windows 2000, Windows XP, Windows7 or Windows8 and Windows10 operating systems;
- Visual Studio 2010/2012 integrated development environment;
- NI PCI-GPIB interface card or Keysight GPIB interface card;
- NI VISA library or Keysight VISA library;
- GPIB card;
- Network card;
- Available serial ports COM1 and COM2.

4.1.2.2 Included Files

To run C/C++ program example, you shall include the necessary files in VC project

If you use VISA library, you must perform the following steps:

- Add visa32.lib to the source file;
- Add visa.h to the header file.

If using the NI-488.2 library, you must do the following operations:

- Add GPIB-32.OBJ file to the source file;
- Add windows.h file to the header file;
- Add Deci-32.h file to the header file.

For more information about NI-488.2 and VISA libraries, please browse in the websites of NI company and Keysight company respectively.

4.1.3 Initialization and default status setting

When the program starts, firstly initialize VISA resource manager, and then enable and establish the communication connection between VISA library and the instrument. The specific steps are as follows:

4.1.3.1 Generation of global variable

Firstly, generate the global variable to be called by other program modules, such as the instrument handle variable. The following example program shall contain the following global variables:

ViSession iDevHandle;

ViSession iDefaultRM;

const char rgcDevResource[VI_FIND_BUFLEN] = "GPIB0::20::INSTR";

Const analyzerTimeout = 5000;

The constant rgcDevResource represents the instrument descriptor, “GPIB0” represents the controller and “20” represents the instrument connected to the controller. If supposing that the instrument is connected with LAN and IP address is “192.168.1.1”, the variable will be:

const char rgcDevResource[VI_FIND_BUFLEN] = "TCPIP::192.168.1.1::INSTR";

4.1.3.2 Controller initialization

/**

The following example shows how to open and establish a communication connection between VISA library and the instrument (specified by instrument descriptor).

Controller initialization: Turn on the default resource manager and return the device handle iDevHandle.

**/

void InitController()

```
{
ViStatus iStatus;
iStatus = viOpenDefaultRM(&iDefaultRM);
iStatus = viOpen(iDefaultRM, rgcDevResource, VI_NULL, VI_NULL, &iDevHandle);
}
```

4.1.3.3 Instrument initialization

/***/

The following example shows how to initialize the instrument default status and clear status registers.

```
/*****************************************************************************/
void InitDevice()
{
ViStatus iStatus;
ViUInt32 uiRetCnt;
iStatus = viWrite(iDevHandle, "*CLS\n", strlen("*CLS\n"), &uiRetCnt); //reset status register
iStatus = viWrite(iDevHandle, "*RST\n", strlen("*RST\n"), &uiRetCnt); //reset instrument
}
```

4.1.4 Sending of setting command

/***/

The following example describes how to set the frequency of 2438 series microwave power meter.

```
/*****************************************************************************/
void SimpleSettings()
{
ViStatus iStatus;
ViUInt32 uiRetCnt;
//Set the frequency as 128 MHz
iStatus = viWrite(iDevHandle, "FREQ 1.28e8\n", strlen("FREQ 1.28e8\n"), &uiRetCnt);
}
```

4.1.5 Reading of instrument status

/***/

The following example shows how to read the setting status of the instrument.

```
/*****************************************************************************/
void ReadSettings()
{
ViStatus iStatus;
ViUInt32 uiRetCnt;
char rgcBuf[256];

//Query the frequency
```

```
iStatus = viWrite(iDevHandle, "FREQ?\n", strlen("FREQ?\n"), &uiRetCnt);
Sleep(10);
iStatus = viRead(iDevHandle, rgcBuf, size of(rgcBuf), &uiRetCnt);
//Print debugging information
printf("frequency %s", rgcBuf);
}
```

4.1.6 Synchronization of command

```
/*************************************************************************/
```

The methods for command synchronization are illustrated hereinafter by taking sweep as an example.

```
/*************************************************************************/
void SweepSync()
{
ViStatus iStatus;
ViUInt32 uiRetCnt;
ViEventType eType;
ViEvent eEvent;
int iStat;
char rgcOpcOk[2];

/*************************************************************************/
/*Command INITiate[:IMMediate] initiates a single sweep (INIT:CONT OFF when continuous sweep is OFF)*/
/* When a single scanning is completed, next command in the command buffer area can be executed. */
/*************************************************************************/
iStatus = viWrite(iDevHandle, "INIT:CONT OFF", 13, &uiRetCnt);
//Method 1 of waiting for sweep completion: use *WAI
iStatus = viWrite(iDevHandle, "ABOR;INIT:IMM;*WAI", 18, &uiRetCnt);
//Method 2 of waiting for sweep completion: use *OPC?
iStatus = viWrite(iDevHandle, "ABOR;INIT:IMM; *OPC?", 20, &uiRetCnt);
iStatus = viRead(iDevHandle, rgcOpcOk, 2, &uiRetCnt); //wait for *OPC to return “1”
//Method 3 of waiting for sweep completion: use *OPC
//To use the GPIB service request, set "Disable Auto Serial Poll” as "yes"
iStatus = viWrite(iDevHandle, "*SRE 32", 7, &uiRetCnt);
iStatus = viWrite(iDevHandle, "*ESE 1", 6, &uiRetCnt); //enable service request ESR
//Set the event enable bit, the operation is completed
iStatus = viEnableEvent(iDevHandle, VI_EVENT_SERVICE_REQ, VI_QUEUE, VI_NULL);
//Enable SRQ event
iStatus = viWrite(iDevHandle, "ABOR;INIT:IMM;*OPC", 18, &uiRetCnt);
//Start sweep synchronously with OPC
```

```
iStatus = viWaitOnEvent(iDevHandle, VI_EVENT_SERVICE_REQ, 10000, &eType, &eEvent)
//Wait for service request
iStatus = viReadSTB(iDevHandle, &iStat);
iStatus = viClose(eEvent); //close the event handle
//Disable the SRQ event
iStatus = viDisableEvent(iDevHandle, VI_EVENT_SERVICE_REQ, VI_QUEUE);
//Continue running the main program……
}
```

4.2 Advanced operation example

4.2.1 Network remote control example

4.2.1.1 Before using the example

In order to correctly use the following example, you shall match your host address with IP address of the microwave power meter, and two IP addresses shall be located on the same network segment. For example, if the host IP is 192.168.1.168, the IP of the microwave power meter shall be set to the form of 192.168.1.X, and X can be 0 ~ 167/169 ~ 254.

If you use VISA library for network remote control, you shall install VISA library, such as KeysightIO17.2 and NI VISA5.0.

Note that the low version VISA library will not support remote control functions of the network.

4.2.1.2 Example

1) Realize network remote control with VISA library and C++ language

```
/************************************************************
In this case, the network remote control is realized with VISA library.
Start VC6.0 or VC2013, and add necessary files. Enter following codes into your .cpp file
************************************************************/
#include "stdafx.h"
#include <visa.h>
#include <stdio.h>
#include <stdlib.h>

#define PM_IP_ADDR_A      "192.168.1.199"     //IP address of the microwave power meter
#define PM_SOCKET_PORT    5000                //port number of the microwave power meter

void ShowMsg(PCHAR lpszText)
{
```

```
#ifdef _UNICODE
    AfxMessageBox((CString)lpszText);
#else
    AfxMessageBox(lpszText);
#endif
}

void SocketTest1(void)
{
    ViSession defaultRM;
    ViSession vi;
    ViStatus iStatus = 0;
    ViChar rgcSocket[VI_FIND_BUFLEN]; //for example:"TCPIP0::192.168.1.2::21::SOCKET"
    ViChar rgcBuf[256];
    ViReal64 dFreq;

    iStatus = viOpenDefaultRM(&defaultRM);
    if (iStatus < VI_SUCCESS)
    {
        ShowMsg("Could not open a session to the VISA Resource Manager!\n");
    }
    else
    {
        sprintf(rgcSocket, "TCPIP0::%s::%d::SOCKET", PM_IP_ADDR_A, PM_SOCKET_PORT);
        iStatus = viOpen(defaultRM, rgcSocket, VI_NULL, 6000, &vi);
        if (VI_SUCCESS > iStatus)
        {
            ShowMsg("An error occurred opening the session：SOCKET\n");
        }
        else
        {
            viSetAttribute(vi, VI_ATTR_TERMCHAR, '\n');//set the terminator to LF
            viSetAttribute(vi, VI_ATTR_TERMCHAR_EN, VI_TRUE);//enable the terminator
            viSetAttribute(vi, VI_ATTR_TMO_VALUE, 5000);//set overtime to s

            Query the frequency of channel A
            viPrintf(vi, ":SENS1:FREQ?\n");
            viScanf(vi, "%t", rgcBuf);
```

```
            sscanf(rgcBuf, "%lf", &dFreq);
            sprintf(rgcBuf, "Freq of Channel A is：%lg\n", dFreq);
            ShowMsg(rgcBuf);

            viClose(vi); //turn off the device
        }
        viClose(defaultRM); //close the default task
    }
}
```

2) Realize network remote control with socket and C++

```
/*************************************************************
In this case, the network remote control is realized with socket.
Start VC6.0 or VC2013, and add necessary files. Enter following codes into your .cpp file
*************************************************************/
#include "stdafx.h"
#include <afxsock.h>
#include <stdio.h>
#include <stdlib.h>

#ifdef _UNICODE
#define PM_IP_ADDR      L"192.168.1.199"    //IP address of the microwave power meter
#else
#define PM_IP_ADDR      "192.168.1.199"     //IP address of the microwave power meter
#endif
#define PM_SOCKET_PORT  5000                //port number of the microwave power meter

void ShowMsg(PCHAR lpszText)
{
#ifdef _UNICODE
    AfxMessageBox((CString)lpszText);
#else
    AfxMessageBox(lpszText);
#endif
}

void SocketTest2(void)
{
    CSocket client;
```

```
int iFlag;
char rgcBuf[256];
int iBufLen;

if (!AfxSocketInit())      //Internet access initialization
{
ShowMsg("Initialization Fails");
}
else
{
iFlag = client.Create();
if (!iFlag)
{
      ShowMsg("Socket Creation Fails");
}
else
{
      ShowMsg("Socket Creation Succeeds");
      iFlag = client.Connect(PM_IP_ADDR, PM_SOCKET_PORT); //connect the network port
      if (!iFlag)
      {
      ShowMsg("Connection Fails");
      }

            enable the calibrator
            sprintf(rgcBuf, "%s\n", "OUTP:ROSC 1");
            iBufLen = (int)strlen(rgcBuf);
      iFlag = client.Send(rgcBuf, iBufLen);
      if (!iFlag)
      {
      ShowMsg("Sending Fails");
      }
      else
      {
                  //Query the frequency value of channel A
                sprintf(rgcBuf, "%s\n", "SENS1:FREQ?");
                iBufLen = (int)strlen(rgcBuf);
          iFlag = client.Send(rgcBuf, iBufLen);
```

```
            if (!iFlag)
            {
                ShowMsg("Sending Fails");
            }
            else
            {
                iFlag= client.Receive(rgcBuf, sizeof(rgcBuf), 0); //read from the network
                if (!iFlag)
                {
                ShowMsg("Connection Fails");
                }
            }
            }
        }
        client.Close();
        }
}
```

4.2.2 GPIB remote control example

4.2.2.1 Before using the example

If you use Keysight GPIB interface card, you must install Keysight VISA library correctly. Similarly, if you use NI PCI-GPIB interface card, you must also install NI-488.2 library correctly.

This program supposes that only one GPIB card is connected to the system. If there are a number of GPIB cards, GPIB0 represents the first GPIB card, GPIB1 represents the second one, and so on.

Set GPIB address of the instrument to 13.

4.2.2.2 Realize setting and query functions with VISA library and C language

```
/*************************************************************
This example is used to query and set the frequency of channel A, and finally resume it to the frequency before setting.
Start VC6.0 or VC2013, and add necessary files. Enter following codes into your .cpp file
*************************************************************/

#include "stdafx.h"
#include <visa.h>
#include <stdio.h>
#include <stdlib.h>


#define GPIB_CARD_ID        0       //GPIB card number
#define MY_GPIB_ADDR     13      //GPIB address of the instrument
```

```
void GpibTest1(void)
{
    ViSession defaultRM;
    ViSession vi;
    ViStatus iStatus = 0;
    ViChar rgcBuf[256];
    ViByte cRead[256];
    ViReal64 rgdFreq[2];
    ViUInt32 uiRetCnt;

    sprintf(rgcBuf, "GPIB%d::%d::INSTR", GPIB_CARD_ID, MY_GPIB_ADDR);
    iStatus = viOpenDefaultRM(&defaultRM); //open GPIB task
    if (iStatus)
    {
        ShowMsg("The Task can’t be Opened, Please Recheck the Device and Connect It\n");
    }
    else
    {
        iStatus = viOpen(defaultRM, rgcBuf, VI_NULL, 5000, &vi);
        if (iStatus)
        {
            ShowMsg("The Device can’t be Turned on, Please Recheck the Device and Connect It\n");
        }
        else
        {
            //1) Firstly query the frequency of channel A, and save it into rgdFreq[0]
            viPrintf(vi, "SENS1:FREQ?\n");
            Sleep(10);
            viRead(vi, cRead, sizeof(cRead), &uiRetCnt);
            cRead[uiRetCnt] = 0;
            ShowMsg((PCHAR)cRead);

            sscanf((PCHAR)&cRead[0], "%lf", &rgdFreq[0]);
            sprintf(rgcBuf, "The Frequency of Channel A is: %lg\n", rgdFreq[0]);
            ShowMsg(rgcBuf);

            //2) Set the frequency of channel A to 16.78GHz
```

```
            viPrintf(vi, "SENS1:FREQ    %lfGHz\n", 16.78);

            //3) Firstly query the frequency of channel A, and save it into rgdFreq[1]
            viPrintf(vi, "SENS1:FREQ?\n");
            viScanf(vi, "%t", rgcBuf);          //incorporate the query result into the array
            ShowMsg(rgcBuf);

            sscanf(rgcBuf, "%lf", &rgdFreq[1]);
            sprintf(rgcBuf, "The Frequency of Channel A is: %lg\n", rgdFreq[1]);
            ShowMsg(rgcBuf);

            //4) Restore the frequency of channel A
            viPrintf(vi, "SENS1:FREQ    %lg\n", rgdFreq[0]);

            viClose(vi); //turn off the device
        }
        viClose(defaultRM); //close the default task
    }
}
```

5 Error Description

This chapter will show you how to find out problems and accept after-sales service. and the error message of the microwave power meter will be explained.

5.1 Error information

The microwave power meter adopts two methods to record measurement errors: Error information queue displayed on the front panel and SCPI (remote control mode) error information queue, and these two kinds of error information queue will be saved separately for management.

5.1.1 Local error information

1) Error information viewing

Use the interface operation method:

If any error information is displayed in the lower right corner of the instrument during use, it indicates that the operation of the software or hardware of the instrument is defective. You can roughly determine type of the fault according to the error code, and take corresponding troubleshooting measures.

The error display area of the instrument can only display one piece error information at one time. As the instrument may have a number of problems at the same time, all error information can be seen by executing the following operations:

Step 1. Press the [System] and then press the [Error List]. The error list window will pop up.

*Step***2.** The prompt information is displayed in the window.

Step 3. Use the mouse to browse the error messages and close the dialog.

Step 4. Select the Clear Error List button to clear the history error messages.

2) Description of error messages

If errors are detected during measurement by the microwave power meter, the warning or error information (error abbreviation + detailed description of error) will be displayed on the right side of the status indication area, and the error level will be marked with different colors of the status bar:

Table5.1 Identification of Error Level of Status Indication Area with Different Colors

Color	Error Level	Error Description
Red	Severe error	It means the severe error during the measurement. When such error occurs, the instrument can't normally work.
Red	Error	It means the error during the measurement, for example, failure to complete the measurement normally due to data loss or incorrect setting.
Black	Normal	No error information is displayed.

5.1.2 Remote control error information

1) Format and description of error information

Under the remote control mode, the error information will be recorded in the error/event queue of the status reporting system. The error information can be queried with the command "SYSTem:ERRor?", and the format is as follows:

5.1 Error information

“<Error Code>, "<Error Information in the Error Queue>; <Detailed Description of Error Information>”

Example:

“-110, "Data out of Range; Inputted Parameter out of Lower Bound.”

The remote control error information includes two types:

- The information of the negative error code defined in SCPI standard will not be described in details here.
- The specific description of the instrument characteristics positive error code is as shown in the following table:

Table5.2 Description of the Instrument Characteristics Error Information

Error Code	Error Description
-101	Invalid character Invalid character: There is invalid character in the program mnemonic (command or parameter). For example: AVER:COUN !6
-102	Syntax error Syntax error: The program mnemonic syntax is invalid. For example: DISPlay:ACT, CH1
-108	Parameter not allowed Parameter not allowed: The command has too many parameters, or no parameter follows the parameter command. For example: TRAC:AUT ON
-109	Missing parameter Missing parameter: The command has too few parameters. For example: AVER
-112	Program mnemonic too long Program mnemonic too long: A single segment in a command has more than 12 characters. For example: OUTPutROSCillatorStatus ON
-113	Undefined header Undefined header: The microwave power meter receives an unrecognized command. Possible reasons: Incorrect spelling or incorrect abbreviation of the command. For example: CALI:AUTO
-121	Invalid character in number Invalid character in number: There is an invalid character in the numeric data. For example: SENS:CORR:GAIN2 #12
-123	Exponent too large Exponent too large: The exponent of the numeric data is larger than 32,000. For example: SENS:CORR:GAIN2 1E32001
-124	Too many digits Too many digits: The magnitude of the numeric data is more than 255 bits, excluding the prefixed 0.
-128	Numeric data not allowed Numeric data not allowed: The command which can't receive the numeric data receives a value.
-131	Invalid suffix

	Invalid suffix: The suffix of the numeric data is incorrect. For example: FREQ 10GZ
-134	Suffix too long Suffix too long: The suffix is longer than 12 characters. For example: FREQ 10GHHHHHHHHHHHHHHHHHZ
-138	Suffix not allowed Suffix not allowed: The numeric data can't be followed by a suffix. For example: SENS:CORR:GAIN2 12HZ
-148	Character data not allowed Character data not allowed: Check if a quotation mark shall be added. For example: MEM:CLE Status_1 Correct: MEM:CLE "Status_1"
-151	Invalid string data Invalid string data: Check if the single or double quotation marks of the string are matched. For example: MEM:CLE “Status1
-158	String data not allowed String data not allowed: Check if the parameter type is valid. For example: OUTP:ROSC "ON"
-161	Invalid block data Invalid block data: Check it according to section 7.7.6 of the IEEE 488.2.
-168	Block data not allowed Block data not allowed: The valid data block is detected, but it is not supported by the command. For example: OUTP:ROSC #15FETC?
-178	Expression data not allowed Expression data not allowed: The valid expression is detected, but it is not allowed in the microwave power meter. For example: SENS:CORR:GAIN2 (1+3)
-211	Trigger ignored Trigger ignored: The TRIG:IMM, *TRG commands are received when the microwave power meter is not in the waiting for trigger status.
-213	Init ignored Init ignored: The measurement initialization command is received when the microwave power meter has been initialized. For example: INIT:CONT ON INIT
-214	Trigger deadlock Trigger deadlock
-220	Parameter error; Frequency list must be in ascending order. Parameter error; Frequency list must be in ascending order.
-221	Settings conflict Settings conflict: Many causes will lead to a conflict, such as setting trigger delay during statistical measurement.
-222	Data out of range Data out of range: The numeric data is not within the valid range. For example: AVER:COUN 100000

5.1 Error information

-224	Illegal parameter value Illegal parameter value: A discrete parameter is received, but it is invalid for this command.
-226	Lists not same length Lists not same length
-230	Data corrupt or stale; Please calibrate Data corrupt or stale; Please calibrate
-231	Data questionable; CAL ERROR Data questionable; CAL ERROR: The calibration of the microwave power meter fails. The most possible cause is that no sensor is connected to the output end of the calibrator during calibration. Data questionable; CAL ERROR Ch1 Data questionable; CAL ERROR Ch1: The calibration of the microwave power meter fails. The most possible cause is that no sensor is connected to the output end of the calibrator during calibration. Data questionable，CAL ERROR Ch2 Data questionable; CAL ERROR Ch2: The calibration of the microwave power meter fails. The most possible cause is that no sensor is connected to the output end of the calibrator during calibration. Data questionable; Input Overload Data questionable; Input Overload: The power input exceeds the upper power limit of the sensor of channel A. Data questionable; Input Overload Ch1 Data questionable; Input Overload: The power input exceeds the upper power limit of the sensor of channel A. Data questionable，Input Overload Ch2 Data questionable; Input Overload: The power input exceeds the upper power limit of the sensor of channel B. Data questionable; Lower window log error Data questionable; Lower window log error: In case of the difference measurement, the measurement result is 0 and the unit displayed is logarithm. Data questionable; Upper window log error Data questionable; Upper window log error: In case of the difference measurement, the measurement result is 0 and the unit displayed is logarithm. Data questionable，ZERO ERROR Data questionable; ZERO ERROR: The zero of the microwave power meter fails. The most possible cause is that the power signal is inputted during zero. Data questionable，ZERO ERROR Ch1 Data questionable; ZERO ERROR Ch1: The zero of the microwave power meter fails. The most possible cause is that the power signal is inputted during zero. Data questionable，ZERO ERROR Ch2 Data questionable; ZERO ERROR Ch2: The zero of the microwave power meter fails. The most possible cause is that the power signal is inputted during zero.
-241	Hardware missing Hardware missing: The microwave power meter fails to execute the command, and the cause is that no sensor is connected or the sensor type is unmatched.
-310	System error; Sensor EEPROM Read Failed - critical data not found or unreadable System error; Sensor EEPROM Read Failed - critical data not found or unreadable System error; Sensor EEPROM Read Failed - unknown EEPROM table format

	System error; Sensor EEPROM Read Failed - unknown EEPROM table format.
-321	Out of memory Out of memory
-330	Self-test Failed; Self-test Failed
-350	Queue overflow Queue overflow: After the error queue is full, the subsequent errors will not be recorded.
-410	Query INTERRUPTED Query INTERRUPTED: A command shall send data to the output buffer area, but the buffer area has already included the data sent by the previous command (the previous data will not be overwritten). The output buffer area will be cleared when the machine is powered off or when *RST command is received. For details, please refer to section 6.3.2.3 of IEEE488.2.
-420	Query UNTERMINATED Query UNTERMINATED: The microwave power meter is set to speak (namely, send data to the interface bus), but no command to send data to the output buffer area is received. For details, please refer to section 6.3.2.2 of IEEE488.2. For example, try to read data from a remote interface after executing CONFigure command (it will not generate data).
-430	Query DEADLOCKED Query DEADLOCKED: The output buffer area can't contain the command to generate too much data, and the output buffer area is full. The command continues but data is lost. For details, please refer to section 6.3.1.7 of IEEE488.2.
-440	Query UNTERMINATED after indefinite response Query UNTERMINATED after indefinite response: Some combined queries may generate illegal response information. If the query command of an indefinite response (any block response with indefinite length or any ASCII response data) is not the last query command, the instrument will report the query error, and it will send the response any more after the query command. For details, please refer to section 6.5.7.5of IEEE488.2.

2) Error information type

Error events correspond to only one type of error information. The types of error information are classified and described below:

- Query error **(–499 to –400):** It means that the message exchange protocol error described in IEEE 488.2, Chapter 6 is detected by the output queue control of the instrument. In this case, the query error bit (bit 2) of the event status register will be set (for details, see IEEE 488.2, 6.5). In this case, the data can't be successfully read from the output queue.
- **Instrument characteristics error (-399 to –300, 201 to 703, and 800 to 810):** It means that the instrument operation fails, which may be caused by abnormal hardware or firmware status. Such error code is often used for the instrument self-test. In this case, the instrument characteristics error bit (bit 3) of the event status register will be set.
- **Execution error (-299 to –200):** It means that errors are detected during measurement. In this case, the execution error bit (bit 4) of the event status register will be set.
- **Command error (-199 to –100):** It means the syntax error detected during the instrument command parse, which is caused by wrong command format generally. In this case, the command error bit (bit 5) of the event status register will be set.

5.2 Repair method

5.2 Repair method

5.2.1 Contact us

If 2438 series of microwave power meter has any fault, firstly observe and save the error information, and then analyze possible causes and eliminate and solve the problems according to methods described in section "7.2 Fault diagnosis and troubleshooting" in the User Manual. If the fault is not solved, please contact our service center according to the following contact information and provide the collected error information, and we will help you solve the problem as soon as possible.

Contact information:

Tel: **+86-0532-86896691**

Website: www.ceyear.com

E-mail: sales@ceyear.com

Postal code: **266555**

Address: No.98, Xiangjiang Road, Qingdao City, China

5.2.2 Packaging and delivery

When your microwave power meter incurs a problem that is difficult to solve, please contact us by phone or fax. If it is confirmed that the microwave power meter needs to be repaired, please pack it with the original packaging material and packing box as per the following steps:

1) Please include a detailed explanation of the problem that you've encountered when using the microwave meter along with the apparatus in the packaging box.
2) Pack the microwave power meter in its original packing material to reduce possible damage.
3) Place the pads at the corners of outer packing box and then put the instrument into the packing box.
4) Seal the packing box with tapes, and reinforce it with nylon tape;
5) Mark "Fragile! No Touch! Handle with Care!" indicated.
6) Please arrange the consignment as required for the precise instrument.
7) Keep copies of all the shipping documents.

Attention

When packaging the microwave power meter, please pay attention to the following items.

Packaging of the microwave power meter with other materials may damage it. It is forbidden to use polystyrene beads as the packaging material because they can't fully protect the instrument and may damage the instrument after being sucked into the instrument fan by the static electricity.

NOTE

Packaging and transport of the instrument

When transporting or handling the instrument (for example, damage during shipment), you shall strictly observe the precautions described in "3.1.1.1 Unpacking" of the user's manual.

Appendixes

Appendix A Lookup Table of the SCPI by Subsystem

Attached Table 1 Lookup Table of the SCPI by Subsystem Classification

Command	Operation	Brief introduction to functions
*CLS	Setting only	Clear the instrument status data structures
*DDT		Query or set the operation of response to the *TRG common command of the power meter
*ESE		Query or set the standard event status enable register
*ESR?	Query only	Query the value of the standard event status register
*IDN?	Query only	Query identification string of the power meter
*OPC		When all pending operations are completed, set the operation end bit in the standard event status register
*RCL	Setting only	Recall the status in the specified save recall register
*RST	Setting only	Reset the power meter
*SAV	Setting only	Save the instrument status in the specified register
*SRE		Query or set the service request register
*STB?	Query only	Query the status byte
*TRG	Setting only	Trigger all channels to be triggered
*TST?	Query only	Execute self-test
*WAI	Setting only	Keep the power meter in a waiting status
:ABORt[1]|2	Setting only	Stop measurement of corresponding channel of the power meter
:CALCulate[1]|2|3|4:FEED[1]|2		Query or set the measurement mode displayed in the window
:CALCulate[2]|2-4:GAIN[:MAGNitude]		Query or set the display offset value of the specified window
:CALCulate[1]|2|3|4:GAIN:Status		Query or set the display offset switch state
:CALCulate[1]|2|3|4:LIMit:CLEar:AUTO		Control the time to reset the limit FCO (failure count)
:CALCulate[1]|2|3|4:LIMit:CLEar[:IMMediate]	Setting only	Reset FCO (failure count) of the specified window
:CALCulate[1]|2|3|4:LIMit:FAIL?	Query only	Query if the specified window is out of the limit
:CALCulate[1]|2|3|4:LIMit:FCOunt?	Query only	Query the limit detection failure count (FCO) of the specified window
:CALCulate[1]|2|3|4:LIMit:LOWer[:DATA]		Query or set the lower measurement limit of the specified window
:CALCulate[1]|2|3|4:LIMit:Status		Query or set the measurement limit detection switch of the specified window

Appendix A Lookup Table of the SCPI by Subsystem

:CALCulate[1]|2|3|4:LIMit:UPPer[:DATA]		Query or set the upper measurement limit of the specified window
:CALCulate[1]|2|3|4:MATH[:EXPRession]		Query or set the specified measurement expression of the specified window
:CALCulate[1]|2|3|4:MATH[:EXPRession]:CATalogue?	Query only	List all measurement expressions
:CALCulate[1]|2|3|4:RELative[:MAGNitude]:AUTO		Set the reference value for relative measurement
:CALCulate[1]|2|3|4:RELative[:MAGNitude]:VALue?	Query only	Query the reference value for relative measurement
:CALCulate[1]|2|3|4:RELative:Status		Query or set the relative measurement switch state
:CALibration[1]|2[:ALL]	Setting only	Zero and calibrate power meter
:CALibration[1]|2:AUTO	Setting only	Calibrate the specified channel of the power meter
:CALibration[1]|2:RCALibration		Set the “Must Cal” switch of the channel
:CALibration[1]|2:ZERO:AUTO		Zero the power meter
:CONFigure[1]|2|3|4[:SCALar][:POWer][:AC]		Query or set the power measurement mode of the specified window
:CONFigure[1]|2|3|4[:SCALar][:POWer][:AC]:DIFFerence	Setting only	Set the power measurement mode of the specified window to the difference measurement, and disable relative measurement
:CONFigure[1]|2|3|4[:SCALar][:POWer][:AC]:DIFFerence:RELative	Setting only	Set the power measurement mode of the specified window to the difference measurement, and enable relative measurement
:CONFigure[1]|2|3|4[:SCALar][:POWer][:AC]:RATio	Setting only	Set the power measurement mode of the specified window to the ratio measurement, and enable relative measurement
:CONFigure[1]|2|3|4[:SCALar][:POWer][:AC]:RATio:RELative	Setting only	Set the power measurement mode of the specified window to the ratio measurement, and enable relative measurement
:CONFigure[1]|2|3|4[:SCALar][:POWer][:AC]:RELative	Setting only	Set the absolute power measurement mode of the specified window, and enable relative measurement
:DISPlay:IMAGe:TEST		Bitmap test
:DISPlay:SCReen:FORMat		Query or set the display mode
:DISPlay[:WINDow[1]|2]:FORMat		Query or set the display mode of the specified window
:DISPlay[:WINDow[1]|2][:NUMeric[1]|2]:RESolution		Query or set the display resolution of the specified measurement of the specified window
:DISPlay[:WINDow[1]|2]:SELect[1]|2		Query or set the specified measurement of the specified window
:DISPlay[:WINDow[1]|2]:Status		Enable or disable the display in the specified window

:DISPlay[:WINDow[1]|2]:TRACe:FEED		Query or set the channel input of the trace display window
:FETCh[1]|2:ARRay:AMEasure:POWer?	Query only	Query the automatic measurement power value of the given channel
:FETCh[1]|2:ARRay:AMEasure:TIME?	Query only	Query the automatic measurement time value of the given channel
:FETCh[1]|2:DROop?	Query only	Query the pulse droop measurement value of the given channel
:FETCh[1]|2|3|4[:SCALar][:POWer][:AC]?	Query only	Set the specified window to the absolute power measurement, disable relative measurement, and return the measurement value
:FETCh[1]|2|3|4[:SCALar][:POWer][:AC]:DIFFerence?	Query only	Set the specified window to the difference power measurement, disable relative measurement, and return the measurement value
:FETCh[1]|2|3|4[:SCALar][:POWer][:AC]:DIFFerence:RELative?	Query only	Set the specified window to the difference power measurement, enable relative measurement, and return the measurement value
:FETCh[1]|2|3|4[:SCALar][:POWer][:AC]:RATio?	Query only	Set the power measurement mode of the specified window to the ratio measurement, disable relative measurement, and return the measurement value
:FETCh[1]|2|3|4[:SCALar][:POWer][:AC]:RATio:RELative?	Query only	Set the power measurement mode of the specified window to the ratio measurement, enable relative measurement, and return the measurement value
:FETCh[1]|2|3|4[:SCALar][:POWer][:AC]:RELative?	Query only	Set the specified window to the absolute power measurement, enable relative measurement, and return the measurement value
:FORMat[:READings]:BORDer		Query or set the transmission order of binary data
:FORMat[:READings][:DATA]		Query or set the data transmission format
:INITiate[1]|2:CONTinuous		Query or set the trigger status of the specified channel
:INITiate:CONTinuous:ALL		Query or set the trigger status of all the channels
:INITiate:CONTinuous:SEQuence[1]|2		Query or set the trigger status of the specified channel
:INITiate[1]|2[:IMMediate]	Setting only	Set the specified channel to the waiting for trigger status
:INITiate[:IMMediate]:ALL	Setting only	Set all the channels to the waiting for trigger status
:INITiate[:IMMediate]:SEQuence[1]|2	Setting only	Set the specified channel to the waiting for trigger status
:MEASure[1]|2|3|4[:SCALar][:POWer][:AC]?	Query only	Set the specified window to the absolute power measurement, disable relative

Appendix A Lookup Table of the SCPI by Subsystem

		measurement, and return the measurement value
:MEASure[1]|2|3|4[:SCALar][:POWer][:AC]:DIFFerence?	Query only	Set the specified window to the difference power measurement, disable relative measurement, and return the measurement value
:MEASure[1]|2|3|4[:SCALar][:POWer][:AC]:DIFFerence:RELative?	Query only	Set the specified window to the difference power measurement, enable relative measurement, and return the measurement value
:MEASure[1]|2|3|4[:SCALar][:POWer][:AC]:RATio?	Query only	Set the power measurement mode of the specified window to the ratio measurement, disable relative measurement, and return the measurement value
:MEASure[1]|2|3|4[:SCALar][:POWer][:AC]:RATio:RELative?	Query only	Set the power measurement mode of the specified window to the ratio measurement, enable relative measurement, and return the measurement value
:MEASure[1]|2|3|4[:SCALar][:POWer][:AC]:RELative?	Query only	Set the specified window to the absolute power measurement, enable relative measurement, and return the measurement value
:MEMory:CATalog[:ALL]?	Query only	List the user configuration in the power meter, including save recall configuration and FDO table
:MEMory:CATalog:Status?	Query only	List the save recall configuration in the power meter
:MEMory:CATalog:TABLe?	Query only	List FDO table in the power meter
:MEMory:CLEar[:NAME]	Setting only	It is used to reset FDO table and save recall table specified in the power
:MEMory:CLEar:TABLe[1]|2|3|4|5|6|7|8|9|10	Setting only	Clear the specified FDO table
:MEMory:FREE[:ALL]?	Query only	Query the total number of unused bytes and the number of used bytes in the user configuration space
:MEMory:FREE:Status?	Query only	Query the total number of unused bytes and the number of used bytes in the save recall space
:MEMory:FREE:TABLe?	Query only	Query the total number of unused bytes and the number of used bytes in FDO table space
:MEMory:NStatuss?	Query only	Query number of the save recall status, and 10 will be returned always
:MEMory:Status:CATalog?	Query only	List name of all the save recall status
:MEMory:TABLe[1]|2|3|4|5|6|7|8|9|10:DEFine		Query or set name of the specified FDO table
:MEMory:TABLe[1]|2|3|4|5|6|7|8|9|10:FREQuency		Query or set the frequency list of the specified FDO table
:MEMory:TABLe[1]|2|3|4|5|6|7|8|9|10:FREQuency:POINts?	Query only	Query number of the frequency point of the specified FDO table

:MEMory:TABLe[1]|2|3|4|5|6|7|8|9|10:GAIN[:MAGNitude]		Query or set the amplitude gain list of the specified FDO table
:MEMory:TABLe[1]|2|3|4|5|6|7|8|9|10:GAIN[:MAGNitude]:POINts?	Query only	Query number of the amplitude gain point of the specified FDO table
:MEMory:TABLe:MOVE	Setting only	Rename the specified FDO table
:MEMory:TABLe:SELect		Query or set the current FDO table
:OUTPut:LEVel:POWer		Query or set the power level of the calibrator
:OUTPut:RECorder[1]|2:FEED		Query or set measurement input of the recorder
:OUTPut:RECorder[1]|2:LIMit:LOWer		Query or set the lower limit power of the recorder
:OUTPut:RECorder[1]|2:LIMit:UPPer		Query or set the upper limit power of the recorder
:OUTPut:RECorder[1]|2:Status		Query or set the output switch state of the recorder
:OUTPut:ROSCillator:LEVel		Query or set the power level of the calibrator
:OUTPut:ROSCillator[:Status]		Query or set the output status of the calibrator
:PSTatistic:CCDF:COUNt		Query or set the total number of statistical terminations
:PSTatistic[1]|2:CCDF:DATA?	Query only	Query the statistical probability list of the power meter
:PSTatistic[1]|2:CCDF:DATA:MAX		Query or set the maximum value of X axis of the statistical trace
:PSTatistic:CCDF:DECades		Query or set the “Decimal Number” of statistical longitudinal axis
:PSTatistic[1]|2:CCDF:END:ACTion		Query or set the statistical termination
:PSTatistic:CCDF:GAUSsian:MARKer[1]|2[:SET]	Setting only	Set the mark to Gaussian probability curve
:PSTatistic:CCDF:GAUSsian[:Status]		Query or set the display status of Gaussian probability curve
:PSTatistic:CCDF:MARKer[1]|2:DATA?	Query only	Query the power and probability of the mark in the statistical trace
:PSTatistic:CCDF:MARKer:DELTa?	Query only	Query two power differences and probability differences (M2-M1)
:PSTatistic:CCDF:MARKer[1]|2:X		Query or set the horizontal position of the mark
:PSTatistic:CCDF:MARKer[1]|2:Y		Query or set the vertical position of the mark
:PSTatistic[1]|2:CCDF:POWer?	Query only	Query the power of the given probability point
:PSTatistic[1]|2:CCDF:PROBability?	Query only	Query the probability of the given power point
:PSTatistic:CCDF:REFerence:DATA?	Query only	Query the reference statistical probability list of the power meter
:PSTatistic:CCDF:REFerence:MARKer[1]|2[:SET]	Setting only	Set the mark to the reference statistics curve
:PSTatistic:CCDF:REFerence:POWer:AVERage?	Query only	Query the average power of the reference statistics curve

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:PSTatistic:CCDF:REFerence:POWer:PEAK?	Query only	Query the peak power of the channel statistics curve
:PSTatistic:CCDF:REFerence:POWer:PTAVerage?	Query only	Query the peak-to-average ratio of the reference statistics curve
:PSTatistic:CCDF:REFerence[:Status]		Query or set the display status of the reference statistics curve
:PSTatistic[1]|2:CCDF:STORe:REFerence		During setting: Save the statistics curve of the specified channel to the reference statistics curve; During query: Query if the reference curve exists
:PSTatistic[1]|2:CCDF:TABLe?	Query only	Query the statistical list, including the average power, average power probability, power under 6 probabilities, peak-to-average ratio and sampling times
:PSTatistic[1]|2:CCDF:TIME		Query or set the statistical termination time
:PSTatistic[1]|2:CCDF:TRACe:MARKer[1]|2[:SET]	Setting only	Set the mark to the channel statistics curve
:PSTatistic[1]|2:CCDF:TRACe:POWer:AVERage?	Query only	Query the average power of the channel statistics curve
:PSTatistic[1]|2:CCDF:TRACe:POWer:PEAK?	Query only	Query the peak power of the channel statistics curve
:PSTatistic[1]|2:CCDF:TRACe:POWer:PTAVerage?	Query only	Query the peak-to-average ratio of the channel statistics curve
:PSTatistic[1]|2:CCDF:TRACe[:Status]		Query or set the display status of the channel statistics curve
:PSTatistic:CCDF:Y:MAX		Query or set the “Maximum Probability Value” of the statistics display
:READ[1]|2|3|4[:SCALar][:POWer][:AC]?	Query only	Set the specified window to the absolute power measurement, disable relative measurement, and return the measurement value
:READ[1]|2|3|4[:SCALar][:POWer][:AC]:DIFFerence?	Query only	Set the specified window to the difference power measurement, disable relative measurement, and return the measurement value
:READ[1]|2|3|4[:SCALar][:POWer][:AC]:DIFFerence:RELative?	Query only	Set the specified window to the difference power measurement, enable relative measurement, and return the measurement value
:READ[1]|2|3|4[:SCALar][:POWer][:AC]:RATio?	Query only	Set the power measurement mode of the specified window to the ratio measurement, disable relative measurement, and return the measurement value
:READ[1]|2|3|4[:SCALar][:POWer][:AC]:RATio:RELative?	Query only	Set the power measurement mode of the specified window to the ratio measurement, enable relative measurement, and return the measurement value
:READ[1]|2|3|4[:SCALar][:POWer][:AC]:	Query only	Set the specified window to the absolute

RELative?		power measurement, enable relative measurement, and return the measurement value
[:SENSe[1]|2]:ADJunct[:Status]		Query or set the accessory compensation switch of the high power sensor
[:SENSe[1]|2]:AVERage[1]|2:COUNt		Query or set the average counts of the channel
[:SENSe[1]|2]:AVERage:COUNt:AUTO		Query or set the automatic average status of the channel
[:SENSe[1]|2]:AVERage:SDETect		Query or set the step detection status of the channel
[:SENSe[1]|2]:AVERage[1][:Status]		Query or set the average switch state of the channel
[:SENSe[1]|2]:CORRection:CSET2[:SELect]		Select FDO table
[:SENSe[1]|2]:CORRection:CSET2:Status		Query or set the enable status of FDO table
[:SENSe[1]|2]:CORRection:FDOFfset[:INPut][:MAGNitude]?	Query only	Query the FDO factor of the specified channel
[:SENSe[1]|2]:CORRection:GAIN[1]|2|3|4[:INPut][:MAGNitude]		Query or set the offset of the channel
[:SENSe[1]|2]:CORRection:GAIN[1]|2|3|4[:INPut]:Status		Query or set the offset enable status of the channel
[:SENSe[1]|2]:FREQuency[:CW|FIXed]		Query or set the frequency of the channel
[:SENSe[1]|2]:POWer:AC:RANGe		Query or set the range of the sensor
[:SENSe[1]|2]:POWer:AC:RANGe:AUTO		Query or set the automatic range switch state of the sensor
[:SENSe[1]|2]:PULSe:DISTal		Query and set the Distal Line of the pulse measurement
[:SENSe[1]|2]:PULSe:MESial		Query and set the Mesial Line of the pulse measurement
[:SENSe[1]|2]:PULSe:PROXimal		Query and set the proximal line of the pulse measurement
[:SENSe[1]|2]:PULSe:UNIT		Query the pulse definition setting unit
[:SENSe[1]|2]:ROSCillator:SOURce		Query or select the internal calibrator
[:SENSe[1]|2]:SWEep[1]|2|3|4:AUTO		Query or set the automatic gate status of the specified gate
[:SENSe[1]|2]:SWEep[1]|2|3|4:AUTO:REFernce[1]|2		Query or set the reference ratio of the specified gate
[:SENSe[1]|2]:SWEep[1]|2|3|4:OFFSet:TIME		Query or set the start time of the specified gate
[:SENSe[1]|2]:SWEep[1]|2|3|4:TIME		Query or set the time length of the specified gate
[:SENSe[1]|2]:TRACe:AUTOscale	Setting only	Set the specified channel automatically
[:SENSe[1]|2]:TRACe:LIMit:LOWer		Query or set the lower power limit of the trace display of the channel

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[:SENSe[1]|2]:TRACe:LIMit:UPPer		Query or set the upper power limit of the trace display of the channel
[:SENSe[1]|2]:TRACe:OFFSet:TIME		Query or set the horizontal start time of the trace of the channel
[:SENSe[1]|2]:TRACe:TIME		Query or set the time length of the trace of the channel
[:SENSe[1]|2]:TRACe:UNIT		Query or set the unit of the trace of the channel
[:SENSe[1]|2]:TRACe:X:SCALe:PDIV		Query or set the horizontal scale of the specified channel
[:SENSe[1]|2]:TRACe:Y:CENTer		Query or set the vertical center of the trace of the specified channel
[:SENSe[1]|2]:TRACe:Y:SCALe:PDIV		Query or set the vertical scale of the trace of the specified channel
:SERVice:LANGuage		Query or set the language selection
:SERVice:SECure:ERASe	Setting only	Erase the user storage information of the power meter
:SERVice:SENSor[1]|2:CDATe?	Query only	Query the sensor calibration date
:SERVice:SENSor[1]|2:CPLace?	Query only	Query the sensor calibration location
:SERVice:SENSor[1]|2:FREQuency:MAXimum?	Query only	Query the maximum frequency of the sensor of the specified channel
:SERVice:SENSor[1]|2:FREQuency:MINimum?	Query only	Query the minimum frequency of the sensor of the specified channel
:SERVice:SENSor[1]|2:SNUMber?	Query only	Query the serial number of the sensor of the specified channel
:SERVice:SENSor[1]|2:TYPE?	Query only	Query the type of the sensor of the specified channel
:SERVice:SNUMber		Query or set the serial number of the power meter
:Status:DEVice:CONDition?	Query only	Query the value in the device status condition register
:Status:DEVice:ENABle		Query or set the device status event enable register
:Status:DEVice[:EVENt]?	Query only	Query the device event register
:Status:DEVice:NTRansition		Query or set the device negative transition filter
:Status:DEVice:PTRansition		Query or set the device positive transition filter
:Status:OPERation:CALibrating[:SUMMary]:CONDition?	Query only	Query the value in the calibration status condition register
:Status:OPERation:CALibrating[:SUMMary]:ENABle		Query or set the calibration operation event enable register
:Status:OPERation:CALibrating[:SUMMary][:EVENt]?	Query only	Query the calibration operation event register
:Status:OPERation:CALibrating[:SUMMary]:NTRansition		Query or set the calibration negative transition filter
:Status:OPERation:CALibrating[:SUMM		Query or set the calibration positive transition

ary]:PTRansition		filter
:Status:OPERation:CONDition?	Query only	Query the value in the operation status condition register
:Status:OPERation:ENABle		Query or set the operation status event enable register
:Status:OPERation[:EVENt]?	Query only	Query the operation status event register
:Status:OPERation:LLFail[:SUMMary]:CONDition?	Query only	Query the value in the lower limit detection operation status condition register
:Status:OPERation:LLFail[:SUMMary]:ENABle		Query or set the lower limit detection operation event enable register
:Status:OPERation:LLFail[:SUMMary][:EVENt]?	Query only	Query the lower limit detection operation event register
:Status:OPERation:LLFail[:SUMMary]:NTRansition		Query or set the lower detection operation negative transition filter
:Status:OPERation:LLFail[:SUMMary]:PTRansition		Query or set the lower detection operation positive transition filter
:Status:OPERation:NTRansition		Query or set the operation status negative transition filter
:Status:OPERation:PTRansition		Query or set the operation status positive transition filter
:Status:OPERation:SENSe[:SUMMary]:CONDition?	Query only	Query the value in the sense operation status condition register
:Status:OPERation:SENSe[:SUMMary]:ENABle		Query or set the sense operation event enable register
:Status:OPERation:SENSe[:SUMMary][:EVENt]?	Query only	Query the sense operation event register
:Status:OPERation:SENSe[:SUMMary]:NTRansition		Query or set the sense operation negative transition filter
:Status:OPERation:SENSe[:SUMMary]:PTRansition		Query or set the sense operation positive transition filter
:Status:OPERation:TRIGger[:SUMMary]:CONDition?	Query only	Query the value in the trigger operation status condition register
:Status:OPERation:TRIGger[:SUMMary]:ENABle		Query or set the trigger operation event enable register
:Status:OPERation:TRIGger[:SUMMary][:EVENt]?	Query only	Query the trigger operation event register
:Status:OPERation:TRIGger[:SUMMary]:NTRansition		Query or set the trigger operation negative transition filter
:Status:OPERation:TRIGger[:SUMMary]:PTRansition		Query or set the trigger operation positive transition filter
:Status:OPERation:ULFail[:SUMMary]:CONDition?	Query only	Query the value in the upper limit detection operation status condition register
:Status:OPERation:ULFail[:SUMMary]:ENABle		Query or set the upper limit detection operation event enable register
:Status:OPERation:ULFail[:SUMMary][:EVENt]?	Query only	Query the upper limit detection operation event register
:Status:OPERation:ULFail[:SUMMary]:		Query or set the upper detection operation

NTRansition		negative transition filter
:Status:OPERation:ULFail[:SUMMary]:PTRansition		Query or set the upper detection operation positive transition filter
:Status:PRESet	Setting only	Preset some status registers
:Status:QUEStionable:CALibration[:SUMMary]:CONDition?	Query only	Query the value in the calibration questionable status condition register
:Status:QUEStionable:CALibration[:SUMMary]:ENABle		Query or set the calibration questionable event enable register
:Status:QUEStionable:CALibration[:SUMMary][:EVENt]?	Query only	Query the calibration operation event register
:Status:QUEStionable:CALibration[:SUMMary]:NTRansition		Query or set the calibration questionable negative transition filter
:Status:QUEStionable:CALibration[:SUMMary]:PTRansition		Query or set the calibration questionable positive transition filter
:Status:QUEStionable:CONDition?	Query only	Query the value in the questionable status condition register
:Status:QUEStionable:ENABle		Query or set the questionable status event enable register
:Status:QUEStionable[:EVENt]?	Query only	Query the questionable status event register
:Status:QUEStionable:NTRansition		Query or set the questionable status negative transition filter
:Status:QUEStionable:POWer[:SUMMary]:CONDition?	Query only	Query the value in the power questionable status condition register
:Status:QUEStionable:POWer[:SUMMary]:ENABle		Query or set the power questionable event enable register
:Status:QUEStionable:POWer[:SUMMary][:EVENt]?	Query only	Query the power questionable event register
:Status:QUEStionable:POWer[:SUMMary]:NTRansition		Query or set the power questionable negative transition filter
:Status:QUEStionable:POWer[:SUMMary]:PTRansition		Query or set the power questionable positive transition filter
:Status:QUEStionable:PTRansition		Query or set the questionable status positive transition filter
:SYSTem:BEEPer[:Status]		Query or set the switch state of the beeper
:SYSTem:COMMunicate:GPIB[:SELF]:ADDRess		Query or set GPIB address
:SYSTem:COMMunicate:LAN:ADDRess		Query or set IP address
:SYSTem:COMMunicate:LAN:CURRent:ADDRess?	Query only	Query IP address
:SYSTem:COMMunicate:LAN:CURRent:DGATeway?	Query only	Query gateway
:SYSTem:COMMunicate:LAN:CURRent:SMASk?	Query only	Query the sub-network mask
:SYSTem:COMMunicate:LAN:DGATeway		Query or set the gateway

:SYSTem:COMMunicate:LAN:MAC?	Query only	Query MAC address of LAN
:SYSTem:COMMunicate:LAN:RESTart	Setting only	Restart the network
:SYSTem:COMMunicate:LAN:SMASk		Query or set the sub-network mask
:SYSTem:COMMunicate:TCPip:CONTrol?	Query only	Obtain the SOCKET port number, and return 5,000 in this case
:SYSTem:DATE		Query or set the date (year, month, day)
:SYSTem:DISPlay:BMP?	Query only	Return image of the power meter in BMP format
:SYSTem:ERRor:CODE?	Query only	Return the error code of the power meter from its error queue
:SYSTem:ERRor[:NEXT]?	Query only	Return the error code and error information of the power meter from its error queue
:SYSTem:HELP:HEADers?	Query only	Query the command list supported by the power meter
:SYSTem:KEY		Remote key input
:SYSTem:LOCal	Setting only	This command can unlock the front panel keyboard and allow controlling the power meter with the front panel keyboard
:SYSTem:PRESet	Setting only	Reset the power meter to the status specified by the parameter
:SYSTem:REMote	Setting only	Lock other keys except the “Local” key
:SYSTem:RWLock	Setting only	The locking includes all keys of “Local” key
:SYSTem:TIME		Query or set the time (hour, minute, second)
:SYSTem:VERSion?	Query only	Query SCPI version number of the power meter
:TRACe[1]|2[:DATA]?	Query only	Query the pulse measurement trace data of the specified channel
:TRACe[1]|2:DEFine:DURation:REFerence		Query or set the reference value for calculating the pulse duration (namely the pulse width)
:TRACe[1]|2:DEFine:TRANsition:REFerence		Query or set the reference value for calculating the pulse transition duration (rising time or falling time)
:TRACe[1]|2:MEASurement:INSTant:REFerence?	Query only	Query the time when the trace intersects with a given reference value
:TRACe[1]|2:MEASurement:PULSe:DCYCle?	Query only	Query the pulse duty cycle
:TRACe[1]|2:MEASurement:PULSe:DURation?	Query only	Query the pulse duration (namely the pulse width)
:TRACe[1]|2:MEASurement:PULSe:PERiod?	Query only	Query the pulse period
:TRACe[1]|2:MEASurement:PULSe:SEParation?	Query only	Query the pulse interval time
:TRACe[1]|2:MEASurement:REFerence?	Query only	Query the power of the given reference value
:TRACe[1]|2:MEASurement:TRANsition	Query only	Query the pulse negative transition duration

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:NEGative:DURation?		(namely falling time)
:TRACe[1]|2:MEASurement:TRANsition :NEGative:OCCurence?	Query only	Query the pulse negative transition (namely falling) moment
:TRACe[1]|2:MEASurement:TRANsition :POSitive:DURation?	Query only	Query the pulse positive transition duration (namely rising time)
:TRACe[1]|2:MEASurement:TRANsition :POSitive:OCCurence?	Query only	Query the pulse positive transition (namely rising) moment
:TRACe[1]|2:UNIT		Query or set the trace unit of the given channel
:TRIGger[1]|2[:IMMediate]	Setting only	Set the specified channel to the waiting for trigger status
:TRIGger:MODE		Query or set the trigger mode of the microwave power meter.
:TRIGger:POSition		Query or set the position of the trigger event on the screen
:TRIGger[:SEQuence[1]|2]:DELay		Query or set the trigger delay
:TRIGger[:SEQuence[1]|2]:HOLDoff		Query or set the trigger holdoff
:TRIGger[:SEQuence[1]|2]:IMMediate	Setting only	Set the specified channel to the waiting for trigger status
:TRIGger[:SEQuence]:LEVel		Query or set the trigger level
:TRIGger[:SEQuence]:LEVel:AUTO		Query or set the automatic trigger level status
:TRIGger[:SEQuence]:SLOPe		Query or set the trigger slope
:TRIGger[:SEQuence[1]|2]:SOURce		Query or set the trigger source
:TRIGger[1]|2:SOURce		Query or set the trigger source
:UNIT[1]|2|3|4:POWer		Query or set the power unit of the window
:UNIT[1]|2|3|4:POWer:RATio		Query or set the ratio measurement power unit of the window