Highpowered and programmable Power supply
IT6500 Series Programming Guide

Model: IT6512/IT6513/IT6512A/IT6513A/IT6502D

Version: 2.2

Notices

Manual Part Number

IT6500C-402248

Revision

2nd Edition: MAR 12, 2020

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CAUTION

A CAUTION sign denotes a hazard. It calls attention to an operating procedure or practice that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

WARNING

A WARNING sign denotes a hazard. It calls attention to an operating procedure or practice that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.

NOTE

A NOTE sign denotes important hint. It calls attention to tips or supplementary information that is essential for users to refer to.

Quality Certification and Assurance

We certify that IT6500 series power supply meets all the published specifications at time of shipment from the factory.

Warranty

ITECH warrants that the product will be free from defects in material and workmanship under normal use for a period of one (1) year from the date of delivery (except those described in the Limitation of Warranty below).

For warranty service or repair, the product must be returned to a service center designated by ITECH.

- The product returned to ITECH for warranty service must be shipped PREPAID. And ITECH will pay for return of the product to customer.
- If the product is returned to ITECH for warranty service from overseas, all the freights, duties and other taxes shall be on the account of customer.

Limitation of Warranty

This Warranty will be rendered invalid if the product is:

- Damaged resulting from customer-wired circuits or customer-supplied parts or accessories;
- Modified or repaired by customer without authorization;
- Damaged resulting from customer-wired circuits or use in an environment not designated by us;
- The product model or serial number is altered, deleted, removed or made illegible by customer;
- Damaged as a result of accidents, including but not limited to lightning, moisture, fire, improper use or negligence.

Safety Symbols

	Direct current		ON (power)
	Alternating current		OFF (power)
	Both direct and alternating current		Power-on state
	Chassis (earth ground) symbol.		Power-off state
	Earth (ground) terminal		Reference terminal
	Caution		Positive terminal
	Warning (refer to this manual for specific Warning or Caution information)		Negative terminal
	A chassis terminal	-	-

Safety Precautions

The following safety precautions must be observed during all phases of operation of this instrument. Failure to comply with these precautions or specific warnings elsewhere in this manual will constitute a default under safety standards of design, manufacture and intended use of the instrument. ITECH assumes no liability for the customer's failure to comply with these precautions.

WARNING

- **Do not use the instrument if it is damaged. Before operation, check the casing to see whether it cracks. Do not operate the instrument in the presence of inflammable gasses, vapors or dusts.**
- **The power supply is provided with a power line during delivery and should be connected to junction box. Before operation, be sure that the power supply is well grounded. Make sure to use the power cord supplied by ITECH.**
- **Check all marks on the instrument before connecting the instrument to power supply.**
- **Use electric wires of appropriate load. All loading wires should be capable of bearing maximum short-circuit of instrument without overheating. If there are multiple loads, each pair of the load power cord must be carry out the full rated short-circuit output current of the power securely.**
- **Ensure the voltage fluctuation of mains supply is less than 10% of the working voltage range in order to reduce risks of fire and electric shock.**
- **Do not install alternative parts on the instrument or perform any unauthorized modification.**
- **Do not use the instrument if the detachable cover is removed or loosen.**
- **To prevent the possibility of accidental injuries, be sure to use the power adapter supplied by the manufacturer only.**
- **We do not accept responsibility for any direct or indirect financial damage or loss of profit that might occur when using the instrument.**
- **This instrument is used for industrial purposes. Do not apply this product to IT power supply system.**
- **Never use the instrument with a life-support system or any other equipment subject to safety requirements.**

CAUTION

- **Failure to use the instrument as directed by the manufacturer may render its protective features void.**
- **Always clean the casing with a dry cloth. Do not clean the internals.**
- **Make sure the vent hole is always unblocked.**

Environmental Conditions

The instrument is designed for indoor use and an area with low condensation. The table below shows the general environmental requirements for the instrument.

Environmental Conditions	Requirements
Operating temperature	0°C to 40°C
Operating humidity	20%-80% (non-condensation)

Storage temperature	-10°C to 70 °C
Altitude	Operating up to 2,000 meters
Installation category	II
Pollution degree	Pollution degree 2

Note

To make accurate measurements, allow the instrument to warm up for 30 min.

Regulatory Markings

CE	The CE mark indicates that the product complies with all the relevant European legal directives. The specific year (if any) affixed refers to the year when the design was approved.
	The instrument complies with the WEEE Directive (2002/96/EC) marking requirement. This affix product label indicates that you must not discard the electrical/electronic product in domestic household waste.
	This symbol indicates the time period during which no hazardous or toxic substances are expected to leak or deteriorate during normal use. The expected useful life of the product is 10 years. The product can be used safely during the 10-year Environment Friendly Use Period (EFUP). Upon expiration of the EFUP, the product must be immediately recycled.

Waste Electrical and Electronic Equiment (WEEE) Directive

2002/96/EC Waste Electrical and Electronic Equipment (WEEE) Directive

This product complies with the WEEE Directive (2002/96/EC) marking requirement. This affix product label indicates that you must not discard the electrical/electronic product in domestic household waste.

Product Category

With reference to the equipment classifications described in the Annex 1 of the WEEE Directive, this instrument is classified as a “ Monitoring and Control Instrument “.

To return this unwanted instrument, contact your nearest ITECH office.

Compliance Information

Complies with the essential requirements of the following applicable European Directives, and carries the CE marking accordingly:

- Electromagnetic Compatibility (EMC) Directive 2014/30/EU
- Low-Voltage Directive (Safety) 2014/35/EU

Conforms with the following product standards:

EMC Standard

IEC 61326-1:2012/ EN 61326-1:2013 [1][2][3]

Reference Standards

CISPR 11:2009+A1:2010/ EN 55011:2009+A1:2010 (Group 1, Class A)
IEC 61000-4-2:2008/ EN 61000-4-2:2009
IEC 61000-4-3:2006+A1:2007+A2:2010/ EN 61000-4-3:2006+A1:2008+A2:2010
IEC 61000-4-4:2004+A1:2010/ EN 61000-4-4:2004+A1:2010
IEC 61000-4-5:2005/ EN 61000-4-5:2006
IEC 61000-4-6:2008/ EN 61000-4-6:2009
IEC 61000-4-11:2004/ EN 61000-4-11:2004

1. The product is intended for use in non-residential/non-domestic environments. Use of the product in residential/domestic environments may cause electromagnetic interference.
2. Connection of the instrument to a test object may produce radiations beyond the specified limit.
3. Use high-performance shielded interface cable to ensure conformity with the EMC standards listed above.

Safety Standard

IEC 61010-1:2010/ EN 61010-1:2010

Content

Chapter1 SCPI Command Introduction

1.1 Overview

SCPI is short for Standard Commands for Programmable Instruments which defines a communication method of bus controller and instrument. It is based on ASCII and supply for testing and measuring instruments. SCPI command is based on hierarchical architecture which also known as tree system. In this system, Relevant Command is returned to a common node or root, so that a subsystem is formed.

A part of OUTPut subsystem is listed below:

OUTPut:

SYNC {OFF|0|ON|1}

SYNC:

MODE {NORMal|CARRier}

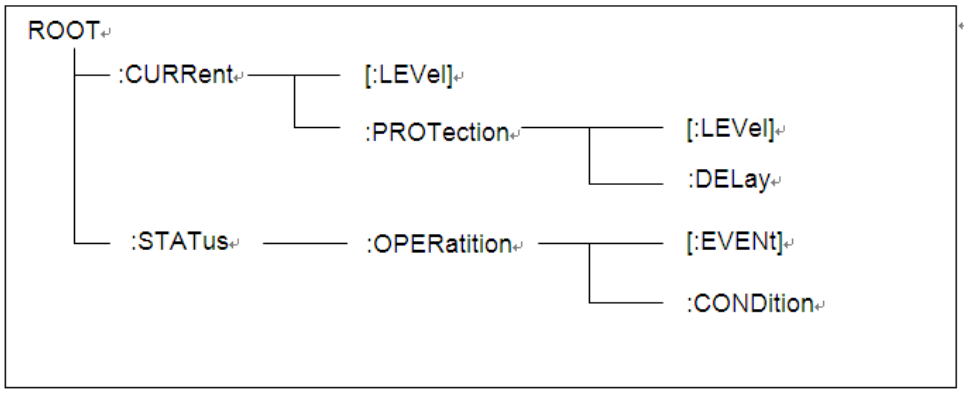
POLarity {NORMal|INVerted}

OUTPut is the root class keyword, SYNC is the second keyword, MODE and POLarity are the third keyword. Colon(:) is used for separating the command keyword and the next level keyword.

1.2 Command Type of SCPI

SCPI has two types of commands, common and subsystem.

- Common commands generally are not related to specific operation but to controlling overall instrument functions, such as reset, status, and synchronization. All common commands consist of a three-letter mnemonic preceded by an asterisk: *RST *IDN? *SRE 8.
- Subsystem commands perform specific instrument functions. They are organized into an inverted tree structure with the "root" at the top. The following figure shows a portion of a subsystem command tree, from which you access the commands located along the various paths.



Multiple commands in a message

Multiple SCPI commands can be combined and sent as a single message with one message terminator. There are two important

considerations when sending several commands within a single message:

- Use a semicolon to separate commands within a message.
- Head paths influence how the instrument interprets commands.

We consider the head path as a string which will be inserted in front of every command of a message. As for the first command of a message, the head path is a null string; for each subsequent command, the head path is a string which is defined to form the current command until and including the head of the last colon separator. A message with two combined commands: CURR:LEV 3;PROT:STAT OFF

The example indicates the effect of semicolon and explains the concept of head path. Since the head path is defined to be "CURR" after "curr: lev 3", the head of the second command, "curr", is deleted and the instrument explains the second command as: CURR:PROT:STAT OFF

If "curr" is explicitly included in the second command, it is semantically wrong. Since combining it with the head path will become "CURR:CURR:PROT:STAT OFF", resulting in wrong command.

Movement in the subsystem

In order to combine commands from different subsystems, you need to be able to reset the header path to a null string within a message. You do this by beginning the command with a colon (:), which discards any previous header path. For example, you could clear the output protection and check the status of the Operation Condition register in one message by using a root specifier as follows:

PROTection:CLEAr;:STATus:OPERation:CONDition?

The following message shows how to combine commands from different subsystems as well as within the same subsystem:

POWer:LEVel 200;PROTection 28; :CURRent:LEVel 3;PROTection:STATe ON

Note the use of the optional header LEVel to maintain the correct path within the voltage and current subsystems, and the use of the root specifier to move between subsystems.

Including Common Commands

You can combine common commands with subsystem commands in the same message. Treat the common command as a message unit by separating it with a semicolon (the message unit separator). Common commands do not affect the header path; you may insert them anywhere in the message.

VOLTage:TRIGgered 17.5;:INITialize;*TRG

OUTPut OFF;*RCL 2;OUTPut ONIT872X-3X SCPI Communication protocol 17

Case sensitivity

Common commands and SCPI commands are not case sensitive. You can use upper or lower, for example:

*RST = *rst

:DATA? = :data?

:SYSTem:PRESet = :system:preset

Long-form and short-form versions

A SCPI command word can be sent in its long-form or short-form version. However, the short-form version is indicated by upper case characters. Examples:

:SYSTem:PRESet long-form

:SYST:PRES short form

:SYSTem:PRES long-form and short-form combination

Note that each command word must be in long-form or short-form, and not something in between.

For example, :SYSTe:PRESe is illegal and will generate an error. The command will not be executed.

Query

Observe the following precautions with queries:

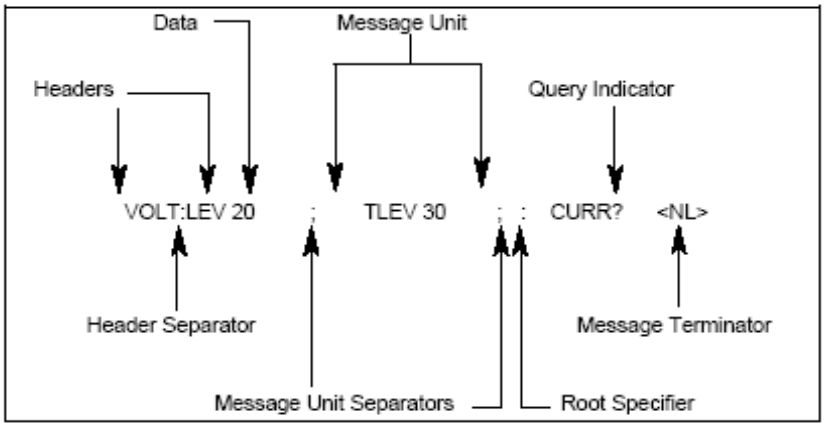
- Set up the proper number of variables for the returned data. For example, if you are reading back a measurement array, you must dimension the array according to the number of measurements that you have placed in the measurement buffer.
- Read back all the results of a query before sending another command to the instrument. Otherwise a Query Interrupted error will occur and the unreturned data will be lost.

1.3 Message Typeof SCPI

There are two types of SCPI messages, program and response.

- program message: A program message consists of one or more properly formatted SCPI commands sent from the controller to the instrument. The message, which may be sent at any time, requests the instrument to perform some action.
- response message: A response message consists of data in a specific SCPI format sent from the instrument to the controller. The instrument sends the message only when commanded by a program message called a "query."

The next figure illustrates SCPI message structure:



The Message Unit

The simplest SCPI command is a single message unit consisting of a command header (or keyword) followed by a message terminator. The message unit may include a parameter after the header. The parameter can be numeric or a string.

ABORt<NL>

VOLTage 20<NL>

Headers

Headers, also referred to as keywords, are instructions recognized by the instrument. Headers may be either in the long form or the short form. In the long form, the header is completely spelled out, such as VOLTAGE, STATUS and DELAY. In the short form, the header has only the first three or four letters, such as VOLT, STAT and DEL.

Query Indicator

Following a header with a question mark turns it into a query (VOLTage?, VOLTage:PROTection?). If a query contains a parameter, place the query indicator at the end of the last header(VOLTage:PROTection?MAX).

Message Unit Separator

When two or more message units are combined into a compound message, separate the units with a semicolon (STATus:OPERation?;QUEStionable?).

Root Specifier

When it precedes the first header of a message unit, the colon becomes the root specifier.

Message Terminator

A terminator informs SCPI that it has reached the end of a message. Three permitted message terminators are:

- newline (<NL>),decimal 10 or hexadecimal 0X0A in ASCII.
- end or identify (<END>)
- both of the above (<NL><END>).

In the examples of this guide, there is an assumed message terminator at the

end of each message.

Command execution rules

- Commands execute in the order that they are presented in the program message.
- An invalid command generates an error and, of course, is not executed.
- Valid commands that precede an invalid command in a multiple command program message are executed.
- Valid commands that follow an invalid command in a multiple command program message are ignored.

1.4 Response Data Type

Character strings returned by query statements may take either of the following forms, depending on the length of the returned string:

- **<CRD>:** Character Response Data. Permits the return of character strings.
- **<AARD>:** Arbitrary ASCII Response Data. Permits the return of undelimited 7-bit ASCII. This data type has an implied message terminator.
- **<SRD>:** String Response Data. Returns string parameters enclosed in double quotes.
- **<Block>**: arbitrary block data.

Response messages

A response message is the message sent by the instrument to the computer in response to a query command.

Sending a response message

After sending a query command, the response message is placed in the Output Queue. When the instrument is then addressed to talk, the response message is sent from the Output Queue to the computer.

Multiple response messages

If you send more than one query command in the same program message, the multiple response messages for all the queries is sent to the computer when the instrument is addressed to talk. The responses are sent in the order that the query commands were sent and are separated by semicolons (;). Items within the same query are separated by commas (,). The following example shows the response message for a program message that contains four single item query commands:

0; 1; 1; 0

Response message terminator (RMT)

Each response is terminated with an LF (line feed) and EOI (end or identify). The following example shows how a multiple response message is terminated:

0; 1; 1; 0; <RMT>

Message exchange protocol

Two rules summarize the message exchange protocol:

Rule 1.You must always tell the IT6500 Series what to send to the computer.

The following two steps must always be performed to send information from the instrument other computer:

1. Send the appropriate query command(s) in a program message.

2. Address the IT6500 Series to talk.

Rule 2.The complete response message must be received by the computer before another program message can be sent to the IT6500 Series.

1.5 Command Format

Formats for command display are as follows:

[SOURce[1|2]:]VOLTage:UNIT {VPP|VRMS|DBM}

[SOURce[1|2]:]FREQuency:CENTer
{<frequency>|MINimum|MAXimum|DEFault}

Based on the command syntax, most commands (and certain Parameter) are expressed in both upper and lower cases. Upper case refers to abbreviation of commands. Shorter program line may send commands in abbreviated format. Long-format commands may be sent to ensure better program readability.

For example, both formats of VOLT and VOLTAGE are acceptable in the above syntax statements. Upper or lower case may be used. Therefore, formats of VOLTAGE, volt and Volt are all acceptable. Other formats (such as VOL and VOLTAG) are invalid and will cause errors.

- Parameter options with given command strings are included in the brace ({ }). The brace is not sent along with command strings.
- Vertical stripes (|) separate several parameter options with given command strings. For example, {VPP|VRMS|DBM} indicates that you may assign "APP", "VRMS" or "DBM" in the above commands. Vertical stripes are not sent along with command strings.
- Angle brackets (< >) in the second example indicates that a value must be assigned to the parameter in the brace. For example, the parameter in the angle bracket is <frequency> in the above syntax statements. Angle brackets are not sent along with command strings. You must assign a value (such as "FREQ:CENT 1000") to the parameter, unless you select other options displayed in the syntax (such as "FREQ:CENT MIN").
- Some syntax elements (such as nodes and Parameter) are included in square brackets ([ ]). It indicates that these elements can be selected and omitted. Angle brackets are not sent along with command strings. If no value is assigned to the optional Parameter, the instrument will select a default value. In the above examples, "SOURce[1|2]" indicates that you may refer to source channel 1 by "SOURce" or "SOURce1" or "SOUR1" or "SOUR". In addition, since the whole SOURce node is optional (in the square bracket), you can refer to the channel 1 by omitting the whole SOURce node. It is because the channel 1 is the default channel for SOURce language node. On the other hand, if you want to refer to channel 2, "SOURce2" or "SOUR2" must be used in the program line.

Colon (:)

It is used to separate key words of a command with the key words in next level. As shown below:

APPL:SIN 455E3,1.15,0.0

In this example, APPLy command assigns a sine wave with frequency of 455

KHz, amplitude of 1.15 V and DC offset of 0.0 V.

Semicolon (;)

It is used to separate several commands in the same subsystem and can also minimize typing. For example, to send the following command string:

TRIG:SOUR EXT; COUNT 10

has the same effect as sending the following two commands:

TRIG:SOUR EXT
TRIG:COUNT 10

Question mark (?)

You can insert question marks into a command to query current values of most Parameter. For example, the following commands will trigger to set the count as 10:

TRIG:COUN 10

Then, you may query count value by sending the following command:

TRIG:COUN?

You may also query the allowable minimum or maximum count as follows:

TRIG:COUN?MIN
TRIG:COUN?MAX

Comma (,)

If a command requires several Parameter, then a comma must be used to separate adjacent Parameter.

Space

You must use blank characters, [TAB] or [Space] to separate Parameter with key words of commands.

Generic commands (*)

The IEEE-488.2 standard defines a set of common commands that perform functions such as reset, self-test, and status operations. Generic commands always start with a asterisk (*) and occupy 3 character sizes, including one or more Parameter. Key words of a command and the first parameter are separated by a space. Semicolon (;) can separate several commands as follows:

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

Command terminator

Command strings sent to the instrument must end with a <Newline> (<NL>) character. IEEE-488 EOI (End or Identify) information can be used as <NL> character to replace termination command string of <NL> character. It is acceptable to place one <NL> after a <Enter>. Termination of command string always resets current SCPI command path to root level.

NOTE

As for every SCPI message with one query sent to the instrument, the instrument will use a <NL> or newline sign (EOI) to terminate response of return. For example, if "DISP:TEXT?" is sent, <NL> will be placed after the returned data string to terminate response. If an SCPI message includes several queries separated by semicolon (such as "DISP?;DISP:TEXT?"), <NL> will terminate response returned after response to the last query. In all cases, the program must read <NL> in response before another command is sent to the instrument, otherwise errors will be caused.

1.6 Data Type

SCPI language defines several data types used for program message and response messages.

- Numerical parameter

Commands requiring numerical parameter support the notations of all common decimal notations, including optional signs, decimal points, scientific notation, etc. Special values of numerical parameter are also acceptable, such as MIN, MAX and DEF. In addition, suffixes for engineering units can also be sent together with numerical Parameter (including M, k, m or u). If the command accepts only some specific values, the instrument will automatically round the input parameter to acceptable values. The following commands require numerical Parameter of frequency value:

[SOURce[1|2]:]FREQuency:CENTer {<Frequency>|MINimum|MAXimum}

- <NR1>: represents an integer value, such as 273;
- <NR2>: represents a real number in floating-point format, such as 0.273;
- <NR3>: represents a real number in scientific notation, such as 2.73E+2;
- <Nrf>:The extensible form includes <NR1>, <NR2> and <NR3>;
- <Nrf+>: The extensible decimal form includes <NRf> and MIN MAX DEF, MIN and MAX represent the minimum and maximum finite number. DEF is the default of the parameter.

- Discrete parameter

Discrete Parameter are used for settings with limited number of programming values (such as IMMediate, EXTernal or BUS). They can use short and long format like key words of commands. They may be expressed in both upper and lower case. The query response always returns uppercase Parameter in short format. The following commands require discrete Parameter in voltage unit:

[SOURce[1|2]:]VOLTage:UNIT {VPP|VRMS|DBM}

- Boolean parameter

Boolean Parameter refer to true or false binary conditions. In case of false conditions, the instrument will accept "OFF" or "0". In case of true conditions, the instrument will accept "ON" or "1". In query of Boolean settings, the instrument will always return "0" or "1". Boolean Parameter are required by the following commands:

DISPlay {OFF|0|ON|1}

- ASCII string Parameter

String Parameter may actually include all ASCII character sets. Character

strings must start and end with paired quotation marks; and single quotation marks or double quotation marks are both allowed. Quotation mark separators may also act as one part of a string, they can be typed twice without any character added between them. String parameter is used in the following command:

DISPlay:TEXT <quoted string>

For example, the following commands display message of "WAITING..." (without quotation marks) on the front panel of the instrument.

DISP:TEXT "WAITING..."

Single quotation marks may also be used to display the same message.

DISP:TEXT 'WAITING...'

- <CPD>: character program data;
- <SPD>: string program data. String parameters enclosed in single or double quotes.

1.7 Communication Interface

IT6500 have four standard communication interfaces: RS232, USB, RS485, and LAN. The customer can choose any one according to his demands.

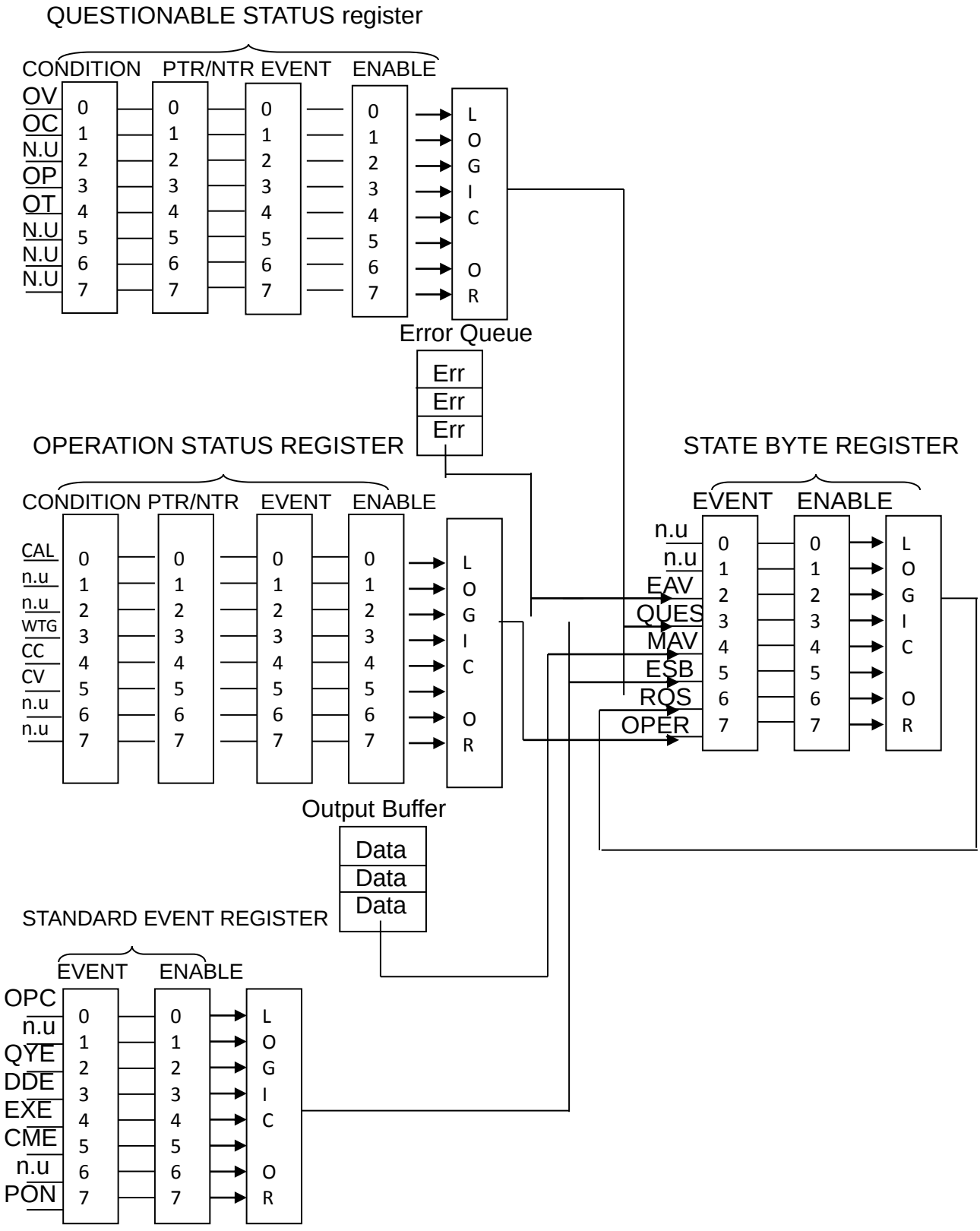
Please refer to user manual for detailed introductions of the remote interface connections.

Chapter2 SCPI Status Register

You can get the current status of the power supply by reading the operation status registers. The power supply records the different status of the instrument through the four status register group, the four status register group are: status byte register, standard event register, query status register and operation status register. Status byte register records the information of the other status register.

BIT	Signal	Meaning
		Operation status register
0	CAL	The power supply is calculating the new calibration parameter.
3	WTG	The power supply is waiting for trigger.
4	CC	The power supply is in constant current status.
5	CV	The power supply is in constant voltage status.
		Query status register
0	OV	Over voltage
1	OC	Over current
3	OP	Over power
4	OT	Over temperature
		Standard event register
0	OPC	Operation completed. All the parallel operations are completed.
2		
3	QYE	Query error. Output buffer data lost.
4	DDE	Instrument memory data loss or self test error
5	EXE	Execute error. Command parameter over flow or the operation condition is not consistent
7		
	CME	Command error. There is syntax or semantic error in the command received.
	PON	Power on bit, this bit is set to 1 after power on
		Status byte register
2	EAV	Error buffer available
3	QUES	This bit is set to 1 when any one status of enabled query status register changes.
4		
5	MAV	Output buffer available
6	ESB	Bit ESB is set to 1 when the status of a enabled standard event status
7		
	RQS	register changes
	OPER	If the status of enabled operation register changes, then this bit is set to1.

he following chart is the Status register Structure of the power supply:



Chapter3 SCPI Command Description

STATus:QUEStionable[:EVENt]?

This command can be used to read the value in query event register. After executing this command, the query event register will be cleared.

Query syntax

STATus:QUEStionable[:EVENt]?

Arguments

None

Returns

<NR2>

Related Command

STATus:QUEStionable:ENABle

definition of Query status register is as follow:

bit	15	14	13	12	11	10	9	8
info	no use	no use	no use	no use	no use	no use	no use	no use
bit	7	6	5	4	3	2	1	0
info	no use	no use	no use	OT	OP	no use	OC	OV
value				16	8		2	1

STATus:QUEStionable:CONDition?

This command is used to read the value of query condition register and gets the status of power supply. When the parameter of questionable condition register changes, the bit corresponding in questionable event register is 1.

Query syntax

STATus:QUEStionable:CONDition?

Arguments

None

Returns

<NR2>

STATus:QUEStionable:ENABle

This command can set the parameter of operation event enable register. Setting parameter can determine which bit value of question event register is 1 and the bit will cause QUES of status byte register to be 1.

Command syntax

STATus:QUEStionable:ENABle <NR2>

Arguments

0~255

Example

STATus:QUEStionable:ENABle 128

Query syntax

STATus:QUEStionable:ENABle?

Returns

<NR2>

STATus:QUEStionable:NTRansition

This command is used to edit the negative transition trigger register of query event.

Command syntax

STATus:QUEStionable:NTRansition <NR1>

Arguments

0~255

Example

STATus:QUEStionable:NTRansition 128

Query syntax

STATus:QUEStionable:NTRansition?

STATus:QUEStionable:PTRansition

This command is used to edit the positive transition trigger register of query event.

Command syntax

STATus:QUEStionable:PTRansition <NR1>

Arguments

0~255

Example

STATus:QUEStionable:PTRansition 128

Query syntax

STATus:QUEStionable:PTRansition?

STATus:OPERation[:EVENt]?

This command can read the parameter from operation event register. After executing this order, operation event register is reset.

Query syntax

STATus:OPERation [:EVENt]?

Arguments

None

Returns

<NR1>

Related Command

STATus:OPERation:ENABle

STATus:OPERation:CONDition?

This command can read the parameter from the operation condition register. When the parameter of operation condition register changes, the bit corresponding in operation event register is 1.

Query syntax

STATus:OPERation:CONDition?

Arguments

None

Returns

<NR1>

STATus:OPERation:ENABle

This command can set the parameter of operation event enable register. Setting parameter can determine which bit value of operation event register is 1 and the bit will cause OPER of status byte register to be 1.

Command syntax

STATus:OPERation:ENABle <NR1>

Arguments

0~255

Example

STATus:OPERation:ENABle 128

Query syntax

STATus:OPERation:ENABle?

Returns

<NR1>

STATus:OPERation:NTRansition

This command is used to edit the negative transition trigger register of operation event.

Command syntax

STATus:OPERation:NTRansition <NR1>

Arguments

0~255

Example

STATus:OPERation:NTRansition 128

Query syntax

STATus:OPERation:NTRansition?

STATus:OPERation:PTRansition

This command is used to edit the positive transition trigger register of operation event.

Command syntax

STATus:OPERation:PTRansition <NR1>

Arguments

0~255

Example

STATus:OPERation:PTRansition 128

Query syntax

STATus:OPERation:PTRansition?

SYSTem:ERRor?

This command is used to read the error information.

(101) Too many numeric suffices

(110) No input command

(114) Invalid Numeric suffix

(116) Invalid value

(117) Invalid dimensions

(120) Parameter overflowed

(130) Wrong units for parameter

(140) Wrong type of parameter

(150) Wrong number of parameter

(160) Unmatched quotation mark

(165) Unmatched bracket

(170) Invalid command

(180) No entry in list

(190) Too many dimensions

(191) Too many char

(-200) Execution error

(-221) Settings conflict

(-222) Data out of range

(-223) Too much data

(-224) Illegal parameter value

(-225) Out of memory

(-230) Data Corrupt or Stale

(-270) Macro error

(-310) System error

(-350) Too many errors

(-400) Query error

(-410) Query INTERRUPTED

(-420) Query UNTERMINATED

(-430) Query DEADLOCKED"},

(-440) Query UNTERMINATED

(0) No error

(1) Module Initialization Lost"

(2) Mainframe Initialization Lost

(3) Module Calibration Lost

(4) Eeprom failure

(5) RST checksum failed

(10) RAM selftest failed
(40) Flash write failed
(41) Flash erase failed"
(213) RS-232 buffer overrun
(216) RS-232 receiver framing
(217) RS-232 receiver parity
(218) RS-232 receiver overrun
(220) Front panel uart overrun
(221) Front panel uart framing
(222) Front panel uart parity"},
(223) Front panel buffer overrun
(224) Front panel timeout"},
(225) Front Crc Check error
(226) Front Cmd Error
(401) CAL switch prevents
(402) CAL password is incorrect
(403) CAL not enabled
(404) readback cal are incorrect
(405) programming cal are incorrect
(406) Incorrect sequence of cal
(600) FETCH of data was not acquired
(601) Measurement overrange

Command syntax

SYST:ERR?

Arguments

None

Returns

〈NR1〉,〈SRD〉

SYSTem:VERSion?

This command is used to query the current SCPI version. The returned parameter is a string like “YYYY.V “, in which the YYYY is the year of that version, V is the software version of that year.

Command syntax

SYST:VERS?

Arguments

None

Returns

<NRf>

SYSTem:REMote

This command is used to switch to the remote control mode (PC control).

Command syntax

SYSTem:REMote

Arguments

None

SYSTem:LOCal

This command is used to switch the instrument to local control mode (control from panel).

Command syntax

SYST:LOCal

Arguments

None

SYSTem:RWLock

This command is transmit through RS232 interface, the same function as **SYSTem:REMote**, but the difference is: this command can lock " LOCAL " button as well. When this command is executed, the "Local " button can't switch to local control mode.

Command syntax

SYSTem:RWLock

Arguments

None

SYSTem:POSetup

This command is used to set the power on status of power supply.

Command syntax

SYSTem:POSetup RST|SAV0

Arguments

RST|SAV0

Returns

None

Query syntax

SYSTem:POSetup?

SYSTem:CLEar

This command is used to clear error information.

Command syntax

SYSTem:CLEar

Arguments

None

Returns

None

SYSTem:BEEPer

This command is used to turn on/turn off the beeper, when the arguments is set to 1/ON, the beeper is enabled and press keyboard will beeper, otherwise, it is mute.

Command syntax

SYSTem:BEEPer

Command syntax

SYSTem:BEEPer <bool>

Arguments

0|1|ON|OFF

Returns

None

Query syntax

SYSTem:BEEPer?

SYSTem:COMMunicate:GPIB:RDEVice:ADDRess

This command is used to set the address of GPIB interface.

Command syntax

SYSTem:COMMunicate:GPIB:RDEVice:ADDRess <NR1>

Arguments

0-31

Query syntax

SYSTem:COMMunicate:GPIB:RDEVice:ADDRess?

Returns

<NR1>

SYSTem:INTerface

This command is used to select the communication interface.

Command syntax

SYSTem:INTerface <GPIB|USB|RS232 |RS485>

Arguments

None

ADDRess

This command is used to set the slave machine's address when communicating through RS485 interface.If the value is 0,then all slave machines will deal with commands coming from main machine.If the it is a nonzero value,then only the power supply with the same address with main machine's could deal with main machine's commands.

Command syntax

ADDRess <NR1>

Arguments

0-31

Chapter4 Display Related Command

DISPlay[:WINDow][:STATe]

This command is used to turn on or turn off the VFD display board.When display board is in off mode,then the output values will not be shown on the VFD screen.

Command syntax

DISPlay[:WINDow][:STATe] <bool>

Arguments

0|1|ON|OFF

Example

DISPlay 1

Query syntax

DISPlay[:WINDow][:STATe]?

Returns

0|1

DISPlay[:WINDow]:TEXT[:DATA]

This command is used to display one message on the VFD display board.

Command syntax

DISPlay[:WINDow]:TEXT[:DTAT]<NR1><,text with quotation >

Arguments

The first parameter represents the display position (0~47). The second parameter is the characters to be displayed.

Example

DISP:TEXT 1, "HELL0"

Query syntax

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

DISPlay[:WINDow]:TEXT:CLEar

This command is used to clear all information on the front panel.

Command syntax

DISPlay[:WINDow]:TEXT:CLEar

Chapter5 Trigger Commands

TRIGger[:IMMediate]

This command is used to create a trigger signal. It will give a trigger signal in BUS trigger source mode. The function is the same as command *TRG.

Command syntax

TRIGger[:IMMediate]

Arguments

None

Related Command

*TRG TRIG:SOURce

TRIGger:SOURce

This command is used to select the trigger source. Power supply could receive trigger signal directly from front panel by pressing “Trigger” button or receive BUS trigger signal.

Command syntax

TRIG:SOURce <mode>

Arguments

MANUAL |BUS

Query syntax

TRIGger:SOURce?

Returns

MANUAL |BUS

Chapter6 Output Command

[SOURce:]OUTPut[:STATe]

This command is used to control the output state of power supply.

Command syntax

[SOURce:]OUTPut [:STATe] <bool>

Arguments

0|1|ON|OFF

Query syntax

[SOURce:]OUTPut[:STATe]?

Returns

0|1

[SOURce:]RISe[:LEVel]

This command is used to set the voltage rising time of power supply.

Command syntax

[SOURce:]RISe[:LEVel] <NRf>

Unit

s/m/ms

Arguments

0~999

Query syntax

[SOURce:]RISe[:LEVel]?

Returns

0~999

[SOURce:]FALL[:LEVel]

This command is used to set the voltage falling time of power supply.

Command syntax

[SOURce:] FALL [:LEVel] <NRf>

Unit

s/m/ms

Arguments

0~999

Query syntax

[SOURce:] FALL [:LEVel]?

Returns

0~999

[SOURce:]CURRent[:LEVel][:IMMediate][:AMPLitude]

This command is used to set the output current value.

Command syntax

[SOURce:]CURRent[:LEVel][:IMMediate][:AMPLitude] <NRf>

Arguments

MIN TO MAX|MIN|MAX|DEF

Unit

A mA uA

Query syntax

[SOURce:]CURRent[:LEVel][:IMMediate][:AMPLitude]?

Arguments

None

Returns

<NRf>

[SOURce:]CURRent[:LEVel]:TRIGgered[:AMPLitude]{< current level >| MINimum |MAXimum}

This command is used to set a current value to be triggered. Different from general current value, this value will be effective until it receives a trigger signal. Sending CURRent command will not impact this command's current setting value. Sending inquiry command will return the original setting value.

Command syntax

[SOURce:]CURRent[:LEVel]:TRIGgered[:AMPLitude] <NRf>

Arguments

MIN TO MAX|MIN|MAX|DEF

Unit

A

Query syntax

[SOURce:]CURRent[:LEVel]:TRIGgered[:AMPLitude]?

Returns

<NRf>

[SOURce:]CURRent:PROTection[:LEVel]

This command is used to set current value for over current protection. When the OCP occurs, the command CURR:PROT:CLE can be sent to clear the over current protection state.

Command syntax

[SOURce:]CURRent:PROTection[:LEVel]

Arguments

MIN - MAX

Unit

A

Query syntax

[SOURce:]CURRent:PROTection[:LEVel]?

Returns

<NR2>

[SOURce:]CURRent:PROTection:STATe

This command is used to set over current protection state.

Command syntax

[SOURce:]CURRent:PROTection:STATe

Arguments

0|1|OFF|ON

Query syntax

[SOURce:]CURRent:PROTection:STATe?

Returns

0|1

[SOURce:]VOLTage[:LEVel][:IMMediate][:AMPLitude]

This command is used to set the output voltage value.

Command syntax

[SOURce:]VOLTage[:LEVel][:IMMediate][:AMPLitude] <NRf>

Arguments

MIN TO MAX|MIN|MAX|DEF

Unit

V mV uV

Query syntax

[SOURce:]VOLTage[:LEVel][:IMMediate][:AMPLitude]?

Arguments

None

Returns

<NRf>

[SOURce:]VOLTage[:LEVel]:TRIGgered[:AMPLitude]{< voltage level > |MINimum | MAXimum}

This command is used to set a voltage value to be triggered. Different from general voltage value, this value will be effective until it receives a trigger signal. Sending VOLTage command will not impact this command's voltage setting value. Sending inquiry command will return the original setting value.

Command syntax

[SOURce:]VOLTage[:LEVel]:TRIGgered[:AMPLitude] <NRf>

Arguments

MIN TO MAX|MIN|MAX|DEF

Unit

V mV uV

Query syntax

[SOURce:]VOLTage[:LEVel]:TRIGgered[:AMPLitude]?

Returns

<NRf>

[SOURce:]VOLTage:PROTection[:LEVel]

This command is used to set voltage value of OVP.

Command syntax

[SOURce:] VOLTage:PROTection[:LEVel] <NRf>

Arguments

MIN TO MAX|MIN|MAX|DEF

Unit

V mV uV

Query syntax

[SOURce:] VOLTage:PROTection[:LEVel]?

Arguments

None

Returns

<NRf>

[SOURce:]VOLTage:PROTection:DELay

This command is used to set delay time for over voltage protection.

Command syntax

[SOURce:]VOLTage:PROTection:DELay<NRf>

Arguments

0.001~0.6

Unit

s

Query syntax

[SOURce:]VOLTage:PROTection:DELay?

Arguments

0.001~0.6

Returns

<NRf>

[SOURce:]VOLTage:PROTection:STATe

This command is used to set over voltage protection state.

Command syntax

[SOURce:]VOLTage:PROTection:STATe<bool>

Arguments

0|1|ON|OFF

Query syntax

[SOURce:]VOLTage:PROTection:STATe?

Arguments

None

Returns

0|1

[SOURce:]PROTection:TRIGgered?

This command is used to query the execution status of overvoltage protection. return "1" indicates that the overvoltage protection circuit has been triggered and the OVP status has not been cleared, and return "0" indicates that the OVP circuit has not been triggered.

Command syntax

[SOURce:]PROTection:TRIGgered?

Returns

0|1

[SOURce:]PROTection:CLEar

This command is used to clear the OVP state. Before sending this command, please increase the upper limitation of OVP or you can also reduce the output voltage.

Command syntax

[SOURce:]PROTection:CLEar

Returns

None

[SOURce:]VOLTage:LIMit[:LEVel]<voltage>

This command is used to set the lower limitation of output voltage

Command syntax

[SOURce:]VOLTage:LIMit[:LEVel] <NRf>

Arguments

MIN TO MAX|MIN|MAX|DEF

Unit

V mV uV

Query syntax

[SOURce:]VOLTage:LIMit[:LEVel]?

Returns

<NRf>

[SOURce:]VOLTage:RANGe<voltage>

This command is used to set the upper limitation of output voltage

Command syntax

[SOURce:]VOLTage:RANGe <NRf>

Arguments

MIN TO MAX|MIN|MAX|DEF

Unit

V mV uV

Query syntax

[SOURce:]VOLTage:RANGe?

Returns

<NRf>

Chapter7 Composite Control Command

[SOURce:]APPLy {<voltage>|MIN|MAX} [,{<current>|MIN|MAX}]

This command has combined two kinds of commands----VOLTage and CURRent. As long as the setting value is within the range of max current and max voltage, then the output voltage and current will execute according to the present setting value. APPLy command will only be effective when the setting values are within the range of upper limitation.If not, an execution error will occur. MIN and MAX can also be used as special parameters. Min will enable the output voltage and current to be 0.Max will enable the output voltage and current to be the upper limitation value.

Command syntax

[SOURce:]APPLy <NRf>,<NRf>

Arguments

MIN~MAX

Unit

V, A

Query syntax

[SOURce:]**APPLy?**

Returns

<NRf>,<NRf>

Chapter8 Input Measuring Commands

MEASure[:SCALar]:VOLTage[:DC]?

This command is used to enquire the actual output voltage.

Command syntax

MEASure[:SCALar]:VOLTage[:DC]?

Arguments

None

Returns

〈NRf〉

Unit

V

Example

MEAS:VOLT?

FETch:VOLTage?

This command is used to read the voltage to be handled in the sample cache. After sending the command and let the instrument dialogue, the readings will be sent to the computer. This command does not affect the instrument settings. This command does not trigger a measurement operation, requires only the latest available reading. Before reading the new, the command returns are old readings.

Command syntax

FETch:VOLTage?

Returns

<NRf>

Unit

V

MEASure[:SCALar]:CURRent[:DC]?

This command is used to enquire the latest DC current value.

Command syntax

MEASure[:SCALar]:CURRent[:DC]?

Arguments

None

Returns

〈NRf〉

Unit

A

例子

MEAS:CURR?

FETch:CURRent?

This command is used to read the current which is to be handled in the sample cache. After sending the command and let the instrument dialogue, the readings will be sent to the computer. This command does not affect the instrument settings. This command does not trigger a measurement operation, requires only the latest available reading. Before reading the new, the command returns are old readings.

Command syntax

FETch:CURRent?

Returns

<NRf>

MEASure[:SCALar]:POWer[:DC]?

This command is used to enquire the actual output power.

Command syntax

MEASure[:SCALar]:POWer[:DC]?

Arguments

None

Returns

〈NRf〉

Unit

W

例子

MEAS:POWer?

FETch:POWer?

This command is used to fetch the power value in buffer.

Command syntax

FETch:POWer?

Returns

<NRf>

SENSe:AVERage:COUNt

This command is used to set the number of measuring filtering.

Command syntax

SENSe:AVERage:COUNt<NR1>

Arguments

0-15

Query syntax

SENSe:AVERage:COUNt?

Returns

0-15

Chapter9 Other Commands

LOAD[:STATe]

This command is used to turn on/turn off the internal load function of power supply.

Command syntax

LOAD[:STATe] <off|on|0|1>

Arguments

<off|on|0|1>

Query syntax

LOAD[:STATe]?

Returns

<0|1>

on/1 indicates turn on, and off/0 indicates off.

Chapter10 List Operation Commands (IT6512 /6513)

List operation commands are specialized function for model IT6512/6513.

LIST:STATe

This command is used to set the state of list mode. 0 indicates list mode is off, and 1 indicates list mode is on.

Command syntax

LIST:STATe<0|1|ON|OFF>

Query syntax

LIST:STATe?

Returns

0|1

LIST:RECall

This command is used to recall a list file.

Command syntax

LIST:RECall<NR1>

Arguments

1~10

Query syntax

LIST:RECall?

Returns

1~10

LIST:EDIT

This command is used to select list file which has been edited.

Command syntax

LIST:EDIT<NR1>

Arguments

1~10

Query syntax

LIST:EDIT?

Returns

1~10

LIST:POWer

This command is used to edit the power of list file.

Command syntax

LIST:POWer<NRf>

Arguments

MIN~MAX

Query syntax

LIST:POWer?

Returns

MIN~MAX

LIST:REPeat

This command is used to edit the running times of list file.

Command syntax

LIST:REPeat <NR2>

Arguments

1~65535

Query syntax

LIST:REPeat?

Returns

1~65535

LIST:LINK:SEQuence

This command is used to edit the list sequence to be linked.

Command syntax

LIST:LINK:SEQuence <NR2>

Arguments

0~65535

Query syntax

LIST:LINK:SEQuence?

Returns

0~65535

LIST:SEQuence:REPeat<NR1><,NR1>

This command is used to edit the running count of sequence which is linked to the List file.

Command syntax

LIST:SEQuence:REPeat<NR1><,NR1>

Arguments

Parameter1 represents the sequence number of 1-10, parameter2 corresponds to the running count of sequence(1~65535) .

Query syntax

LIST:SEQuence:REPeat? <NR2>

Returns

0~65535

LIST:SAVe

This command is used to save the list file in a nonvolatile memory.

Command syntax

LIST:SAVe

Arguments

None

Chapter11 Sequence Operation Command (IT6512 /IT6513)

Sequence operation commands are specialized function for model IT6512/6513.

SEQuence:EDIT

This command is used to select the list sequence to be edited.

Command syntax

SEQuence:EDIT<NR1>

Arguments

1~10

Query syntax

SEQuence:EDIT?

Returns

1~10

SEQuence:STEP:ACTive

This command is used to select the steps to be activated of sequence.

Command syntax

SEQuence:STEP:ACTive<NR2>

Arguments

0~1023

Query syntax

SEQuence:STEP:ACTive?

Returns

0~1023

SEQuence:VOLTage

This command is used to edit the voltage of specified step of the sequence.

Command syntax

SEQuence:VOLTage<NR1><,NRf>

Unit

V

Arguments

Parameter1 represents the number of step to be edited.Parameter2 is the voltage (MIN~MAX).

Query syntax

SEQuence:VOLTage? <NR1>

Returns

MIN~MAX

SEQuence:CURRent

This command is used to edit the current of specified step of a sequence file.

Command syntax

SEQuence:CURRent<NR1><,NRf>

Arguments

Parameter1 represents the number of step to be edited.Parameter2 is the current (MIN~MAX).

Query syntax

SEQuence:CURRent? <NR1>

Returns

MIN~MAX

SEQuence:WIDTh

This command is used to edit the width of specified step of the sequence file .

Command syntax

SEQuence:WIDTh <NR1><,NRf>

Arguments

Parameter1 represents the number of steps to be edited (1-10). Parameter2 is the time width (1ms~24h).

Unit

s

Query syntax

SEQuence:WIDTh? <NR1>

Returns

0.001~86400

SEQuence:SLOPe

This command is used to edit the slope of a specified step of the sequence file, this command is only effective for IT6512-L/IT6513-L.

Command syntax

SEQuence:SLOPe <NR1><,NRf>

Arguments

Parameter1 represents the number of steps to be edited (1-10). Parameter2 is the time width (1ms~24h).

Unit

s

Query syntax

SEQuence:SLOPe? <NR1>

Returns

0.001~86400

SEQuence:SAVe

This command is used to save the sequence file.

Command syntax

SEQuence:SAVe

Arguments

None

Chapter12 IEEE-488 Commands

This chapter introduced often-used IEEE-488 commands.

*CLS

This command clears the following registers:

- Standard event register
- Query event register
- Status byte register

Command syntax

*CLS

Arguments

None

*ESE

This command can set the parameter of standard event enable register. Setting parameter can determine which bit of standard event register is 1 and the byte will enable ESB of status byte register is 1.

Command syntax

*ESE <NR1>

Arguments

0～255

Default set

Refer to *PSC command

Example

*ESE 128

Query syntax

*ESE?

Returns

<NR1>

Related Command

*ESR? *PSC *STB?

The bit definition of the standard event enabled register:

Bit Position	7	6	5	4	3	2	1	0
Bit name	PON	not used	CME	EXE	DDE	QYE	not used	OPC
Bit weight	128		32	16	8	4		1

PON Power-on

CME Command error

EXE Execution error

DDE Device-dependent error

QYE Query error

OPC Operation complete

*ESE?

This command is used to read the standard event register.

Query syntax

***ESE**?

Arguments

None

Returns

<NR1>

*ESR?

This command can read the value of standard event status register. After executing this command, standard event status register is reset. Bit definition of standard event status register is as the same as the standard event status enable register.

Query syntax

*ESR?

Arguments

None

Returns

<NR1>

Related Command

*CLS *ESE *ESE? *OPC

*IDN?

This command can read information about power supply. The returns parameter contains 4 segments divided by comma.

Query syntax

*IDN?

Arguments

None

Returns

<AARD> segment description

Example

ITECH, 6512A, 00000000000004, V1.01-V1.00

*OPC

When all commands before this command are executed, bit OPC in standard event register will be set to 1.

Command syntax

*OPC

Arguments

None

Query syntax

*OPC?

Returns

<NR1>

*RST

This command reset the power supply to default settings.

Command syntax

*RST

Arguments

None

*SRE <NR1>

This command can set the parameter of state byte enable register. Setting parameter can determine which byte value of state byte register is 1 and the byte will set RQS of state byte register to 1. Bit definition of state byte enable register is as the same as the state byte register.

Command syntax

*SRE <NRf>

Arguments

0～255

Default set

Reference to *PSC

Example

*SRE 128

Query syntax

*SRE?

Returns

<NR1>

Related Command

*ESE *ESR? *STB?

*STB?

This command can read the data from status byte register.

Query syntax

*STB?

Arguments

None

Returns

<NR1>

Related Command

*CLS *ESE *ESR

*TRG

When power supply trigger source is a command from via BUS, this command will give a trigger signal. And its function is the same as "**TRIGger"** command.

Query syntax

*TRG

Arguments

None

Returns

None

*PSC

This command is used to control whether the power supply will generate a service request when power on again.

- 1 OR ON: When the power supply power on, status byte enable register, operater event enable register, query event enable register and standard event enable register will be cleared.
- 0 OR OFF: When the power supply power on, The value of status byte enable register, operater event enable register, query event enable register and standard event enable register will be stored in the none-volatile storage, which will be recalled when power on.

Command Syntax

*PSC <bool>

Parameters

0|1|ON|OFF

Query Syntax

*PSC?

Returned Parameters

0|1

*SAV

This command can save the current setups of power supply to specified memory. These setups contains current setups, voltage setups, max voltage set, min voltage set, OVP set, OVP timer, OPP set, voltage rise and fall time, analog interface and series and parallel set.

The memory can divided into 10 groups, each contains 0~9 setups. So IT6512 can save 100 Setups in all.

Command syntax

*SAV<NRf>

Arguments

0~9

Example

*SAV 9

*RCL:

This command can recall the setups you saved before from the specified memory.

Command syntax

***RCL<NRf>**

Arguments

0～9

Example

*RCL 8

*TST?

This command is used to query the self-test by the instrument. 0 indicates that self-test succeeds; other Arguments indicate self-test fails. In addition, in case of failure, an error information will be generated to describe failure reason.

Command syntax

*TST?

Arguments

None

Returns

<NR1>

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