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Programmer's Reference

Agilent Technologies

Notices

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This chapter introduces the remote programming basics of the U3606A. The SCPI programming commands provide the means to control this instrument remotely via a PC.

NOTE During remote programming, various SCPI commands are stringed together in a single programming module. As the programming module executes each SCPI command sequentially, a 1 millisecond interval between each subsequent SCPI command is recommended to allow the U3606A Multimeter | DC Power Supply sufficient command processing time.

Introduction to the SCPI Language

SCPI, also known as the Standard Commands for Programmable Instruments, is an ASCII-based instrument command language designed for test and measurement instruments. SCPI commands define how you communicate with an instrument from a bus controller.

They are based on a hierarchical structure, similar to the file systems used by many bus controllers. This hierarchical structure is also known as a tree system. In this system, associated commands are grouped together under a common node or root, thus forming subsystems. You must specify the complete path to execute the individual lower-level commands. A portion of the SOURce subsystem is shown below to illustrate the tree system.

```
SOURce
    :VOLTage
        :LIMit <value>
        :LIMit?
SOURce
    :CURRent
        :RANGe <value>
```

SOURce is the root keyword of the command, VOLTage and CURRent are second-level keywords, and LIMit and RANGe are third-level keywords. A colon (:) separates a command keyword from a lower-level keyword.

Mnemonic forms

Each keyword has both a long and a short form. A standard notation is used to differentiate the short–form keyword from the long–form keyword. The long form of the keyword is shown, with the short–form portion shown in uppercase characters, and the rest of the keyword shown in lowercase characters. For example, the short form of SOURce is SOUR.

For shorter program lines, you can send the abbreviated form. For better program readability, you can send the long form. For example, in the above syntax statement, SOURce and SOUR are both acceptable forms. You can use a mixture of upper-case and lower-case letters. Therefore, SOURCE, sour, and Sour are all acceptable forms. Other forms, such as SOU and sourc, are not valid and will generate an error.

SCPI Conventions and Data Formats

Throughout this document, the following conventions and formats are used in the SCPI command examples. The examples are presented in the following manner:

Example

This programming snippet illustrates how several commands are used together to instruct the U3606A to make a single DC voltage measurement.

→ CONF 10, 0.0001	*A right directional arrow (→) indicates a command that is sent to the instrument.* *The abbreviated form of the command is favored over the long form for shorter program lines. See "Mnemonic forms" on page 2 for more information.* Optional keywords are omitted in the command syntax. See "Square brackets" on page 8 for more information.
→ TRIG:SOUR BUS	
→ INIT	*The particular command or query in question is highlighted in the programming snippet.* *This example illustrates how the "INIT" command is used within a larger programming module.*
→ *TRG	*Commands beginning with an "*" indicate an IEEE-488.2 common command. See "Using "*" commands" on page 7 for more information.*
→ FETC?	*A command ending with a "?" indicates a query that is sent to the instrument. See "Using "?" commands" on page 6 for more information.*
← 9.985308E+00	*A left directional arrow (←) indicates a return message from the instrument.*

Command separators

Using a colon

A colon (:) is used to separate a command keyword from a lower-level keyword. When a colon is inserted between two command mnemonics, the colon moves the path down one level in the present path (for the specified root-level command) of the command tree. You must separate command mnemonics from each other using a colon as shown below:

→ `MEM:STAT:REC:AUTO ON`

An error is generated if you do not use the colon in your command string.

→ `MEM STAT REC AUTO ON`

→ `SYST:ERR?`

Typical response:

← `-113,"Undefined header"`

When a colon is the first character of a command keyword, it indicates that the next command mnemonic is a root-level command.

→ `:CALC:FUNC NULL`

This indicates that the `CALC` command mnemonic is a root-level command. However, you can omit the leading colon if the command is the first of a new program line.

→ `CALC:FUNC NULL`

Using a semicolon

Use a semicolon (;) to separate two commands within the same command string. For example, sending the following command string:

→ :SOUR:VOLT:RANG 5;:SOUR:VOLT:LIM 8

is the same as sending the following two commands.

→ SOUR:VOLT:RANG 5

→ SOUR:VOLT:LIM 8

The semicolon does not change the present path specified. For example, the following two statements are equivalent.

→ :SOUR:VOLT:RANG 5;:SOUR:VOLT:LIM 8

→ :SOUR:VOLT:RANG 5;LIM 8

Note that in the first statement, the first colon is optional but the fourth is compulsory.

Using a comma

If a command requires more than one parameter, you must separate adjacent parameters using a comma (,).

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

The angle brackets are not sent with the command string. See "Syntax conventions" on page 8 for more information.

→ CONF:AC 10, 0.001

Using whitespace

You must use whitespace characters, [tab], or [space] to separate a parameter from a command keyword. Whitespace characters are generally ignored only in parameter lists. You may omit the whitespace characters only in parameter lists.

For example, sending the following command:

→ `CONF:AC 10,0.01`

is the same as sending this command:

→ `CONF:AC 10, 0.01`

However, an error is generated if you do not use a whitespace character to separate a parameter from a command keyword in your command string.

→ `CONF:AC10,0.01`

→ `SYST:ERR?`

Typical response:

← `-113,"Undefined header"`

Using "?" commands

The bus controller may send commands at any time, but a SCPI-equipped instrument may only send responses when specifically instructed to do so. Only query commands (commands that end with a "?") will instruct the instrument to send a response message. Queries return either measured values or internal instrument settings.

For example, the following command sets the U3606A to measure AC current within a range of 100 mA.

→ `CONF:CURR:AC 0.1`

You can then query the present measurement configuration by sending:

→ `CONF?`

Typical response:

← `CURR:AC +1.000000E-01,+1000000E-05`

NOTE

If you send two query commands without reading the response from the first, then attempt to read the second response, you may receive some data from the first response followed by the complete second response. To avoid this, do not send a query command without reading the response. When you cannot avoid this situation, send a device clear before sending the second query command. See "Using device clear" on page 11 for more information.

Using "*" commands

Commands starting with a "*" are called common commands. They are required to perform the identical function for all instruments that are compliant with the IEEE-488.2 interface standard. Common commands always begin with an asterisk (*), are three characters in length, and may include one or more parameters. The "*" commands are used to control reset, self-test, and status operations in the U3606A.

→ `*RST; *CLS`

See Chapter 15, "IEEE-488.2 Common Commands," starting on page 319 for a complete list of all common commands supported.

Syntax conventions

The following SCPI conventions are used throughout this document.

Braces

Braces "{ }" enclose the parameter choices for a given command string. For example, the syntax statement below shows that you have to chose a function (either NULL, DB, DBM, AVERage, LIMit, or HOLD) for the calculate operation.

```
CALCulate:FUNCtion {NULL|DB|DBM|AVERage|LIMit|HOLD}
```

The braces are not sent with the command string. A vertical bar "|" separates multiple parameter choices for a given command string.

```
→ CALC:FUNC AVER
```

Triangle brackets

Triangle brackets "< >" indicate that you must specify a value for the enclosed parameter. For example, the syntax statement below shows the <value> parameter enclosed in triangle brackets:

```
[SOURce:]VOLTage[:LEVel][:IMMediate][:AMPLitude] <value>
```

The brackets are not sent with the command string. You must specify a value for the parameter:

```
→ VOLT 10
```

Square brackets

Some commands and parameters are enclosed in square brackets "[ ]". This indicates that the command or parameter is optional and can be omitted. For example, the syntax statement below shows that the STATe second-level keyword is optional and can be omitted.

```
OUTPut[:STATe] {0|1|OFF|ON}
```

The brackets are not sent with the command string.

```
→ OUTP ON
```

For parameters enclosed in square brackets, if you do not specify a value for the optional parameter, the instrument chooses a default value.

Data types and formats

The SCPI language defines different data formats for use in program messages and response messages. Instruments are flexible listeners and can accept commands and parameters in various formats. However, SCPI-equipped instruments are precise talkers. This means that SCPI-equipped instruments always respond to a particular query in a predefined, rigid format.

Numeric

Parameters that accepts all commonly used decimal representations of numbers including optional signs, and decimal points, scientific notations (3e2 = 3×10^2, 5.43e–3 = 5.43×10^{-3}, or 10e6 = 10×10^6), and engineering notations (M, k, m, μ, n) Special values for numeric parameters such as `AUTO`, `MIN`, `MAX`, and `DEF` are also accepted. If only specific numeric values are accepted, the instrument will automatically round the input numeric parameters. As an example, the following command requires a numeric parameter for the amplitude value:

```
[SOURce:]VOLTage[:LEVel][:IMMediate][:AMPLitude] <value>
```

Discrete

Parameters (used in program settings) that have a limited number of values such as `IMMediate` and `BUS`. Some of these parameters have a short form and a long form just like command keywords. You can mix upper-case and lower-case letters. Query responses will always return the abbreviated form in all upper-case letters. As an example, the following command require a discrete parameter for the trigger source.

```
TRIGger:SOURce {IMMediate|BUS}
```

Boolean

Parameters that represent a single binary condition that is either true or false. For a false condition, the U3606A will accept `OFF` or `0`. For a true condition, the U3606A will accept `ON` or `1`. When you query a boolean setting, the U3606A will always return `0` or `1`. As an example, the following command require a boolean parameter for the instrument output state:

```
OUTPut[:STATe] {0|OFF|1|ON}
```

String

Parameters can contain virtually any set of ASCII characters. A string must begin and end with matching quotes; either with a single quote or a double quote. You can include the quote delimiter as part of the string by typing it twice without any characters in–between.

```
CALibration:STRing “<string>”
```

Input message terminators

Program messages sent to a SCPI-equipped instrument must terminate with a <newline> character. The IEEE.488 EOI (end or identify) signal is interpreted as a <newline> character and may also be used to terminate a message in place of the <newline> character. A <carriage return> followed by a <newline> is also accepted. Many programming languages allow you to specify a message terminator character or EOI state to be automatically sent with each bus transaction. Message termination always sets the current path back to the root-level.

Using device clear

Device clear is an IEEE-488 low-level bus message that you can use to return the instrument to a responsive state (for example, during a lengthy query).

Different programming languages and IEEE-488 interface cards provide access to this capability through their own unique commands. The status registers, the error queue, and all configuration states are left unchanged when a device clear message is received.

Device clear performs the following actions:

1. If a measurement is running, it is aborted.
2. The instrument returns to the trigger “idle” state.
3. The instrument's input and output buffers are cleared.
4. The instrument is prepared to accept a new command string.

An overlapped command, if any, will be terminated with no “Operation Complete” indication.

NOTE It is recommended that you allow for a two-second wait following a device clear to enable the instrument to process the clear operation.

SCPI Status System

The status system records various instrument conditions and states in several register groups. Each register group is made up of several low-level registers called the Condition register, Event register, and Enable register which control the action of specific bits within the register group.

- A Condition register continuously monitors the state of the instrument. The bits in the condition register are updated in real-time and the bits are not latched or buffered. This is a read-only register and the bits are not cleared when you read the register.
- An Event register latches the various events from the changes in the condition register. There is no buffering in this register; while an event bit is set, subsequent events corresponding to that bit are ignored. This is a read-only register. Once a bit is set, it remains set until cleared by a query or clear status (`*CLS`) command.
- An Enable register defines which bits in the event register will be reported to the Status Byte register group. You can write to or read from an enable register.

The relationship between various registers in the U3606A SCPI status system is shown in Figure 1-1.

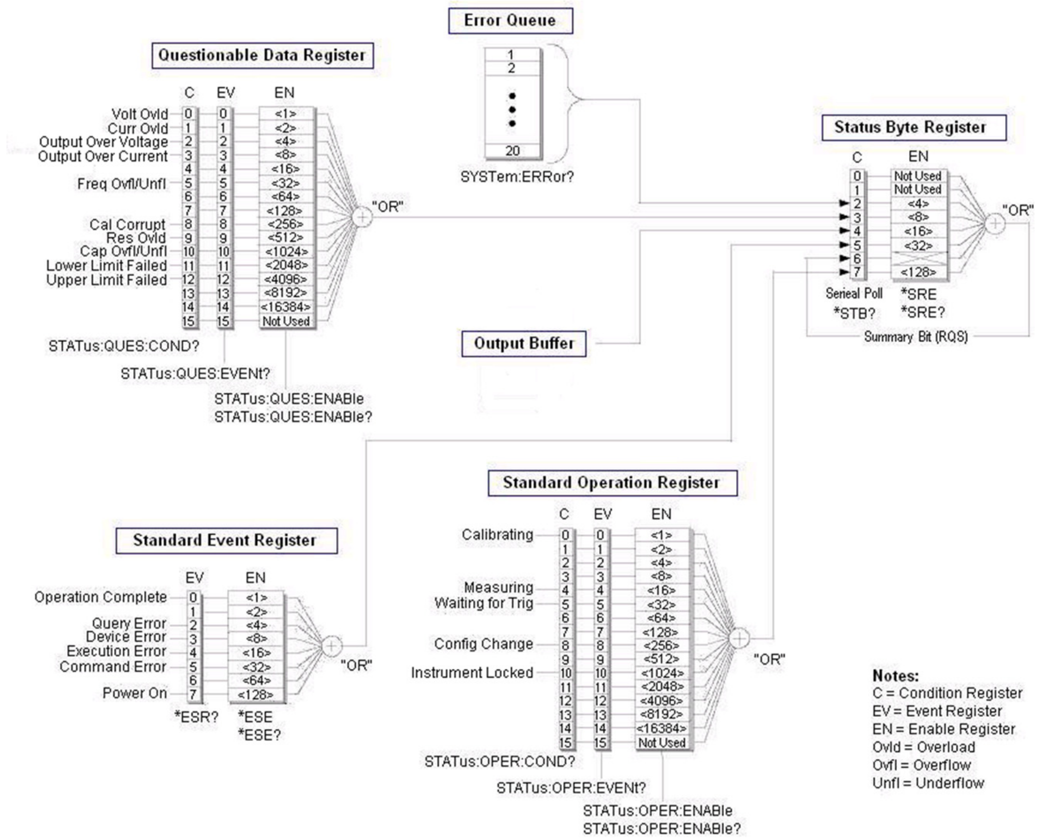

Figure 1-1 Status system diagram

Standard Event register

The Standard Event register group reports the following types of instrument events: power-on detected, command syntax errors, command execution errors, device errors (self-test or calibration), or query errors. All of these conditions can be reported in the Standard Event summary bit through the enable register. To set the enable register mask, key in a decimal value to the register using the event status enable (`*ESE`) command.

Bit definitions: Standard Event register

Bit number	Decimal value	Definition
0 Operation complete	1	All commands prior to and including `*OPC` have been executed.
1 Not used	Not used	"0" is returned.
2 Query error	4	A query error occurred (an error in the –400 range has been generated).
3 Device error	8	A self-test, calibration, or other device-specific error has occurred (an error in the -300 range or any positive error has been generated).
4 Execution error	16	An execution error occurred.
5 Command error	32	A command syntax error occurred.
6 Not used	Not used	"0" is returned.
7 Power-on	128	Power has been turned off and on since the last time the event register was read or cleared.

The event register in the Standard Event is cleared when:

- you execute the clear status (`*CLS`) command, or
- you read the event register using the event status register (`*ESR?`) command.

The Standard Event enable register is cleared when you send the `*ESE 0` command.

NOTE When a command, execution, device, or query error have occurred, a related error message will be generated. For a complete listing of all error messages, refer to Chapter 16, "List of Error Messages," starting on page 337.

Status Byte register

The Status Byte register group reports the conditions from the other status registers. Clearing an event register from one of the other registers will clear the corresponding bits in the Status Byte condition register. Data that is waiting in the U3606A output buffer is immediately reported on the “Message Available” bit (bit 4).

Bit definitions: Status Byte register

Bit number	Decimal value	Definition
0 Not used	Not used	“0” is returned.
1 Not used	Not used	“0” is returned.
2 Error queue	4	One or more errors have been stored in the Error Queue. Use the `SYSTem:ERRor?` query to read and delete errors.
3 Questionable Data summary	8	One or more bits are set in the Questionable Data register. Bits must be enabled using the `STATus:QUEStionable:ENABle` command.
4 Message available	16	Data is available in the instrument output buffer.
5 Standard Event summary	32	One or more bits are set in the Standard Event register. Bits must be enabled using the `*ESE` command.
6 Master Status summary	64	One or more bits are set in the Status Byte Register and may generate a Request for Service (RQS). Bits must be enabled using the `*SRE` command.
7 Not used	Not used	“0” is returned.

The Status Byte condition register will be cleared when:

- you execute the clear status (`*CLS`) command, or
- you read the event register from one of the other register groups. (Only the corresponding bits are cleared in the condition register.)

The Status Byte enable register is cleared when you execute the `*SRE 0` command.

NOTE Refer to Chapter 15, “IEEE-488.2 Common Commands,” starting on page 319 for more details of the common commands mentioned above.

Operation Status register

The operation status group monitors conditions which are a part of the operation of the U3606A as a whole.

Bit definitions: Standard Operation register

Bit number	Decimal value	Definition
0 Calibration in progress	1	Instrument is performing a calibration.
1 Not used	Not used	"0" is returned.
2 Not used	Not used	"0" is returned.
3 Not used	Not used	"0" is returned.
4 Measuring	16	Instrument is initiated, and is making, or about to make a measurement.
5 Waiting for trigger	32	Instrument is waiting for a trigger.
6 Not used	Not used	"0" is returned.
7 Not used	Not used	"0" is returned.
8 Configuration change	256	Instrument configuration has been changed, either from the front panel or from the remote interface.
9 Not used	Not used	"0" is returned.
10 Instrument locked	1024	If a remote interface has a lock, this bit will be set. When a remote interface releases the lock, this bit will be cleared.
11 Not used	Not used	"0" is returned.
12 Not used	Not used	"0" is returned.
13 Not used	Not used	"0" is returned.
14 Not used	Not used	"0" is returned.
15 Not used	Not used	"0" is returned.

NOTE Refer to Chapter 11, "STATus Subsystem," starting on page 283 for more details of the Operation Status register.

Questionable Status register

The questionable status register provides information about the quality of the U3606A measurement results. Any or all of these conditions can be reported in the questionable data summary bit through the enable register. You must write a value using the STATus:QUEStionable:ENABle command to set the enable register mask.

Bit definitions: Questionable Data register

Bit number	Decimal value	Definition
0 Voltage overload	1	Range overload on DC or AC voltage.
1 Current overload	2	Range overload on DC or AC current.
2 Output over voltage	4	Voltage output over protection limit.
3 Output over current	8	Current output over protection limit.
4 Not used	Not used	Instrument is initiated, and is making, or about to make a measurement.
5 Frequency overload/underflow	32	Range overload or underflow on frequency.
6 Not used	Not used	“0” is returned.
7 Not used	Not used	“0” is returned.
8 Calibration corrupt	256	At least one calibration constant is corrupt.
9 Resistance overload	512	Range overload on resistance.
10 Capacitance overload/underflow	1024	Range overload or underflow on capacitance.
11 Lower limit failed	2048	Reading is less than lower limit in limit test.
12 Upper limit failed	4096	Reading is greater than upper limit in limit test.
13 Not used	Not used	“0” is returned.
14 Not used	Not used	“0” is returned.
15 Not used	Not used	“0” is returned.

NOTE

Refer to Chapter 11, “STATus Subsystem,” starting on page 283 for more details of the Questionable Status register.

2
CALCulate Subsystem

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This chapter describes the CALCulate commands used to program the U3606A over a remote interface. The U3606A is capable of performing several mathematical, statistical, and limit calculation functions using the CALCulate commands.

CALCulate:FUNCtion

Syntax

`CALCulate:FUNCtion {AVERage|DB|DBM|HOLD|LIMit|NULL}`

This command selects the calculation function to be used.

- `AVERage`: Returns the mathematical average of all readings taken since averaging was enabled. Use `CALCulate:AVERage:AVERage?`, `CALCulate:AVERage:MAXimum?`, `CALCulate:AVERage:MINimum?`, `CALCulate:AVERage:COUNt?`, and `CALCulate:AVERage:PRESent?` to return the average, maximum, minimum, count, and last reading taken respectively, since averaging was enabled.
- `DB`: When enabled, the dB operation computes the dBm value for the next reading, stores the dBm result into the dB Ref register and immediately produces the following calculation. The first computed reading is always precisely 00.000 dB.

  Result = $10 \times \text{Log}_{10}$ [Reading^2 / R_{REF} / 0.001 W] – dB Ref

  Set a reference value in the dB reference register of the instrument with the `CALCulate:DB:REFerence` command.
- `DBM` equation: Result = $10 \times \text{Log}_{10}$ [Reading^2 / R_{REF} / 0.001 W]

  Set the reference resistance (R_{REF}) with the `CALCulate:DBM:REFerence` command.
- `HOLD`: The reading hold feature allows you to capture and hold a stable reading (refer to the *U3606A User's and Service Guide* for details).

  Set the variation and threshold values with the `CALCulate:HOLD:VARiation` and `CALCulate:HOLD:THReshold` commands.
- `LIMit`: Compares each reading against upper and lower limits. Limit failures are posted in the Questionable Status register.

  Set the upper and lower limits with `CALCulate:LIMit:UPPer` and `CALCulate:LIMit:LOWer`, respectively. Check for limit failures with the `STATus:QUEStionable[:EVENt]?` command.
- `NULL` equation: Result = Reading – Offset

  Set the Offset using the `CALCulate:NULL:OFFSet` command

`CALCulate:FUNCtion?`

This query returns a string value that represents the currently selected calculation function: AVER, DB, DBM, HOLD, LIM, or NULL

Parameter

Item	Type	Description	Default value
function	Discrete	AVERage|DB|DBM|HOLD|LIMit|NULL	NULL

Remarks

- The CALCulate subsystem must be enabled using the CALCulate:STATe command.
- All calculation functions are not allowed for diode and continuity tests.
- All calculation functions can be combined with each other with the exception of the following restrictions:
  - If DB and DBM are selected, all previously set calculation functions will be disabled.
  - If LIMit is selected, previously set AVERage and HOLD functions will be disabled.
  - If AVERage is selected, previously set LIMit and HOLD functions will be disabled.
  - If HOLD is selected, previously set LIMit and AVERage functions will be disabled.
  - If NULL is selected, previously set DBM and DB functions will be disabled.
- The instrument clears the calculation function selection, reverting to the default after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Example

→ CALC:STAT ON	*This command sets the calculation state to ON.*
→ CALC:FUNC DBM	*This command sets the function to be calculated to DBM.*
→ CALC:DBM:REF 300	*This command sets the dBm reference resistance to 300 ohms.*
→ CALC:FUNC?	*This query returns the currently selected calculation function.*
← DBM	

See also

"CALCulate[:STATe]" on page 23

"STATus:QUEStionable[:EVENt]?" on page 292

"SYSTem:PRESet" on page 301

"*RST" on page 328

CALCulate[:STATe]

Syntax

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

This command turns the CALCulate subsystem, and thus the selected calculation function, on or off.

`CALCulate[:STATe]?`

This query returns a boolean value that represents the current calculation state: `0` or `1`

Parameter

Item	Type	Range of values	Default value
state	Boolean	0|1|OFF|ON	0

Remarks

- This is an adjunct command to the `CALCulate:FUNCtion` command. The calculation function to be used is selected using the `CALCulate:FUNCtion` command.
- The `CALCulate:STATe` is set to `OFF` when the measurement function is changed.
- When the `CALCulate:STATe ON` command is sent, the math registers for null, averaging, and dB reference value are cleared. This also occurs when the `CALCulate:FUNCtion` command is sent with the `CALCulate:STATe` previously set to `ON`. The dBm reference resistance value is not cleared in either case.
- The instrument resets the calculation state to off after a Factory Reset (`*RST` command), an Instrument Preset (`SYSTem:PRESet` command), or a function change.

Example

→ `CALC ON`	*This command sets the calculation state to ON.*
→ `CALC?`	*This query returns the current calculation state.*
← `1`	

See also

"CALCulate:FUNCtion" on page 20

"SYSTem:PRESet" on page 301

"*RST" on page 328

CALCulate:AVERage:AVERage?

Syntax

`CALCulate:AVERage:AVERage?`

This query returns a numeric value that represents the mathematical average (mean) of all readings taken since averaging was enabled.

Remarks

- This command returns the average of the readings taken, or "`0`" if there is no data is available.
- The instrument clears the stored average data when averaging is enabled, when the `CALCulate:FUNCtion` command is sent while `CALCulate:STATe` is set to `ON`, after a power-on cycle, after a Factory Reset (`*RST` command), an Instrument Preset (`SYSTem:PRESet` command), or after a function change.

Example

→ `CALC:AVER:AVER?`	*This query returns the average of the readings taken.*
← `+1.007850E+01`	

See also

"CALCulate:FUNCtion" on page 20

"CALCulate[:STATe]" on page 23

"SYSTem:PRESet" on page 301

"SYSTem:SMOoth[:STATe]" on page 303

"*RST" on page 328

CALCulate:AVERage:COUNt?

Syntax

`CALCulate:AVERage:COUNt?`

This query returns a numeric value that represent the number of readings taken since averaging was enabled.

Remarks

- This command returns the count since averaging was enabled, or "0" if there is no data is available.
- The instrument clears the stored average data when averaging is enabled, when the `CALCulate:FUNCtion` command is sent while `CALCulate:STATe` is set to `ON`, after a power-on cycle, after a Factory Reset (`*RST` command), an Instrument Preset (`SYSTem:PRESet` command), or after a function change.

Example

→ `CALC:AVER:COUN?`	*This query returns the number of readings taken since averaging was enabled.*

← `+1.345000E+03`

See also

"CALCulate:FUNCtion" on page 20

"CALCulate[:STATe]" on page 23

"SYSTem:PRESet" on page 301

"*RST" on page 328

CALCulate:AVERage:MAXimum?

Syntax

`CALCulate:AVERage:MAXimum?`

This query returns a numeric value that represents the highest value recorded since averaging was enabled.

Remarks

- This command returns the maximum value found, or “`0`” if there is no data is available.
- The instrument clears the stored average data when averaging is enabled, when the `CALCulate:FUNCtion` command is sent while `CALCulate:STATe` is set to `ON`, after a power-on cycle, after a Factory Reset (`*RST` command), an Instrument Preset (`SYSTem:PRESet` command), or after a function change.

Example

→ `CALC:AVER:MAX?`	*This query returns the maximum value found.*
← `+1.007900E+01`	

See also

“CALCulate:FUNCtion” on page 20

“CALCulate[:STATe]” on page 23

“SYSTem:PRESet” on page 301

“*RST” on page 328

CALCulate:AVERage:MINimum?

Syntax

`CALCulate:AVERage:MINimum?`

This query returns a numeric value that represents the lowest value recorded since averaging was enabled.

Remarks

- This command returns the minimum value found, or “0” if there is no data is available.
- The instrument clears the stored average data when averaging is enabled, when the `CALCulate:FUNCtion` command is sent while `CALCulate:STATe` is set to `ON`, after a power-on cycle, after a Factory Reset (`*RST` command), an Instrument Preset (`SYSTem:PRESet` command), or after a function change.

Example

→ `CALC:AVER:MIN?`	*This query returns the minimum value found.*
← `+1.007150E+01`	

See also

“CALCulate:FUNCtion” on page 20

“CALCulate[:STATe]” on page 23

“SYSTem:PRESet” on page 301

“*RST” on page 328

CALCulate:AVERage:PRESent?

Syntax

`CALCulate:AVERage:PRESent?`

This query returns a numeric value that represents the last value recorded since averaging was enabled.

Remarks

- This command returns the present reading taken, or "`0`" if there is no data is available.
- The instrument clears the stored average data when averaging is enabled, when the `CALCulate:FUNCtion` command is sent while `CALCulate:STATe` is set to `ON`, after a power-on cycle, after a Factory Reset (`*RST` command), an Instrument Preset (`SYSTem:PRESet` command), or after a function change.

Example

→ `CALC:AVER:PRES?`	*This query returns the last recorded value.*
← `+1.007870E+01`	

See also

"CALCulate:FUNCtion" on page 20

"CALCulate[:STATe]" on page 23

"SYSTem:PRESet" on page 301

"*RST" on page 328

CALCulate:DB:REFerence

Syntax

`CALCulate:DB:REFerence <value>`

This command stores a reference value in the dB reference register of the instrument, which is used for the dB function in the `CALCulate:FUNCtion` command.

NOTE You must select the dB math function (`CALCulate:FUNCtion DB`) and turn on math operations (`CALCulate:STATe ON`) before writing to the dB reference register.

`CALCulate:DB:REFerence?`

This query returns a numeric value that represents the dB reference value.

Parameter

Item	Type	Range of values	Default value
value	Numeric	–120 dBm to 120 dBm	0 dBm

Remarks

The instrument clears the dB reference value to the default after a Factory Reset (`*RST` command), an Instrument Preset (`SYSTem:PRESet` command), or after a math or measurement function change.

Example

→ CALC:DB:REF -10.0	*This command sets the dB reference value to –10.0 dBm.*
→ CALC:DB:REF?	*This query returns the dB reference value.*
← -1.000000E+01	

See also

"CALCulate:FUNCtion" on page 20

"CALCulate[:STATe]" on page 23

"SYSTem:PRESet" on page 301

"*RST" on page 328

CALCulate:DBM:REFerence

Syntax

`CALCulate:DBM:REFerence <value>`

This command selects the dBm reference resistance. This reference value affects both the dBm and dB functions in the `CALCulate:FUNCtion` command.

`CALCulate:DBM:REFerence?`

This query returns a numeric value that represents the dBm reference resistance.

Parameter

Item	Type	Range of values	Default value
value	Numeric[1]	1 ohm to 9999 ohms	600 ohms

[1] Integers only. All decimal parts are truncated. For example, 60.7 ohms is truncated to 60 ohms.

Remarks

- The dBm reference resistance does not reset when calculation functions are enabled by the `CALCulate[:STATe]` command, nor when the `CALCulate:FUNCtion` command is sent with `CALCulate:STATe` set to `ON`.
- The dBm reference resistance value is stored in the nonvolatile memory. It is not affected by a power-on cycle, Factory Reset (`*RST` command), Instrument Preset (`SYSTem:PRESet` command), or function change.

Example

→ `CALC:DBM:REF 300`	*This command sets the dBm reference resistance to 300 ohms.*
→ `CALC:DBM:REF?`	*This query returns the dBm reference resistance.*
← `+3.000000E+02`	

See also

"CALCulate:FUNCtion" on page 20

"CALCulate[:STATe]" on page 23

"SYSTem:PRESet" on page 301

"*RST" on page 328

CALCulate:HOLD:VARiation

Syntax

`CALCulate:HOLD:VARiation <value>`

This command sets the variation of the hold function. When the variation is set to `0`, data hold is enabled. Otherwise, refresh hold is enabled.

`CALCulate:HOLD:VARiation?`

This command returns a numeric value that represents the variation of the hold function.

Parameter

Item	Type	Range of values	Default value
value	Numeric	0% to 100%	10%

Remarks

- The hold variation does not reset when calculation functions are enabled by the `CALCulate[:STATe]` command, nor when the `CALCulate:FUNCtion` command is sent with `CALCulate:STATe` set to `ON`.
- The hold variation value is stored in the nonvolatile memory. It is not affected by a power-on cycle, Factory Reset (`*RST` command), Instrument Preset (`SYSTem:PRESet` command), or function change.

Example

→ `CALC:HOLD:VAR 5`	*This command sets the hold variation to 5%.*
→ `CALC:HOLD:VAR?`	*This query returns the hold variation.*
← `+5.000000E+00`	

See also

"CALCulate:FUNCtion" on page 20

"CALCulate[:STATe]" on page 23

"CALCulate:HOLD:THReshold" on page 36

"SYSTem:PRESet" on page 301

"*RST" on page 328

CALCulate:HOLD:THReshold

Syntax

`CALCulate:HOLD:THReshold <value>`

This command sets the threshold of the hold function.

`CALCulate:HOLD:THReshold?`

This query returns a numeric value that represents the threshold of the hold function.

Parameter

Item	Type	Range of values	Default value
value	Numeric	0.1% to 9.9%	0.5%

Remarks

- The hold threshold does not reset when calculation functions are enabled by the `CALCulate[:STATe]` command, nor when the `CALCulate:FUNCtion` command is sent with `CALCulate:STATe` set to `ON`.
- The hold threshold value is stored in the nonvolatile memory. It is not affected by a power-on cycle, Factory Reset (`*RST` command), Instrument Preset (`SYSTem:PRESet` command), or function change.

Example

→ `CALC:HOLD:THR 1`	*This command sets the hold threshold to 1%.*
→ `CALC:HOLD:THR?`	*This query returns the hold threshold.*
← `+1.000000E+00`	

See also

"CALCulate:FUNCtion" on page 20

"CALCulate[:STATe]" on page 23

"CALCulate:HOLD:VARiation" on page 34

"SYSTem:PRESet" on page 301

"*RST" on page 328

CALCulate:LIMit:LOWer

Syntax

`CALCulate:LIMit:LOWer <value>`

This command sets the lower limit for the present measurement function (used in limit testing).

`CALCulate:LIMit:LOWer?`

This query returns a numeric value that represents the lower limit.

NOTE You must select the limit math function (`CALCulate:FUNCtion LIMit`) and turn on math operations (`CALCulate:STATe ON`) before you set a limit value.

Parameter

Item	Type	Range of values	Default value
value	Numeric	Dependant on measurement function selected. • VOLT:DC|AC|ACDC|DCAC: –1200 V to 1200 V • CURR:DC|AC|ACDC|DCAC: –12 A to 12 A • RES: –120e6 ohms to 120e6 ohms • LRES: –12 ohms to 12 ohms • CAP: –12e–3 F to 12e–3 F • FREQ: –1.99999e6 Hz to 1.99999e6 Hz • PWID: –1999.99e–3 s to 1999.99e–3 s • DCYC: –100% to 100%	0

Remarks

- You can assign a lower limit, an upper limit, or both. The lower limit must always be less than or equal to the upper limit, even if you are using only one of the limits.
- Limit crossing: If a reading is less than the specified lower limit, bit 11 (Lower limit failed) is set in the Questionable Data register, which results in an SRQ if enabled. You can use the `STATus:QUEStionable[:EVENt]?` command to read the event register. See Chapter 11, "STATus Subsystem," starting on page 283 for further information.
- Every measuring function has its own lower/upper limit registers. The values are stored in the nonvolatile memory. It is not affected by a power-on cycle, Factory Reset (`*RST` command), Instrument Preset (`SYSTem:PRESet` command), or function change.

Example

→ `CALC:LIM:LOW -0.25`	*This command sets the lower limit to –0.25.*
→ `CALC:LIM:LOW?`	*This query returns the lower limit setting.*
← `-2.500000E-01`	

See also

"CALCulate:FUNCtion" on page 20

"CALCulate[:STATe]" on page 23

"CALCulate:LIMit:UPPer" on page 40

"STATus:QUEStionable[:EVENt]?" on page 292

"SYSTem:PRESet" on page 301

"*RST" on page 328

CALCulate:LIMit:UPPer

Syntax

```
CALCulate:LIMit:UPPer <value>
```

This command sets the upper limit for the present measurement function (used in limit testing).

```
CALCulate:LIMit:UPPer?
```

This query returns a numeric value that represents the upper limit.

NOTE You must select the limit math function (`CALCulate:FUNCtion LIMit`) and turn on math operations (`CALCulate:STATe ON`) before you set a limit value.

Parameter

Item	Type	Range of values	Default value
value	Numeric	Dependant on measurement function selected. • VOLT:DC|AC|ACDC|DCAC: –1200 V to 1200 V • CURR:DC|AC|ACDC|DCAC: –12 A to 12 A • RES: –120e6 ohms to 120e6 ohms • LRES: –12 ohms to 12 ohms • CAP: –12e–3 F to 12e–3 F • FREQ: –1.99999e6 Hz to 1.99999e6 Hz • PWID: –1999.99e–3 to 1999.99e–3 • DCYC: –100 to 100	0

Remarks

- You can assign a lower limit, an upper limit, or both. The lower limit must always be less than or equal to the upper limit, even if you are using only one of the limits.
- Limit crossing: If a reading is less than the specified lower limit, bit 12 (Upper limit failed) is set in the Questionable Data register, which results in an SRQ if enabled. You can use the `STATus:QUEStionable[:EVENt]?` command to read the event register. See Chapter 11, "STATus Subsystem," starting on page 283 for further information.
- Every measuring function has its own lower/upper limit registers. The values are stored in the nonvolatile memory. It is not affected by a power-on cycle, Factory Reset (`*RST` command), Instrument Preset (`SYSTem:PRESet` command), or function change.

Example

→ `CALC:LIM:LOW 10.25`	*This command sets the upper limit to 10.25.*
→ `CALC:LIM:LOW?`	*This query returns the upper limit setting.*
← `-2.500000E-01`	

See also

"CALCulate:FUNCtion" on page 20

"CALCulate[:STATe]" on page 23

"CALCulate:LIMit:LOWer" on page 38

"STATus:QUEStionable[:EVENt]?" on page 292

"SYSTem:PRESet" on page 301

"*RST" on page 328

CALCulate:NULL:OFFSet

Syntax

```
CALCulate:NULL:OFFSet <value>
```

This command stores an offset value in the Null register of the instrument.

```
CALCulate:NULL:OFFSet?
```

This query returns a numeric value that represents the offset value of the Null calculation.

NOTE You must select the null math function (`CALCulate:FUNCtion NULL`) and turn on math operations (`CALCulate:STATe ON`) before you set an offset value.

Parameter

Item	Type	Range of values	Default value
value	Numeric	Dependant on measurement function selected. • VOLT:DC|AC|ACDC|DCAC: –1200 V to 1200 V • CURR:DC|AC|ACDC|DCAC: –12 A to 12 A • RES: –120e6 ohms to 120e6 ohms • LRES: –12 ohms to 12 ohms • CAP: –12e–3 F to 12e–3 F • FREQ: –1.99999e6 Hz to 1.99999e6 Hz • PWID: –1999.99e–3 s to 1999.99e–3 s • DCYC: –100% to 100%	0

Remarks

The null offset value will reset after a power-on cycle, Factory Reset (`*RST` command), Instrument Preset (`SYSTem:PRESet` command), or function change.

Example

→ CALC:NULL:OFFS 2.25	*This command sets the null value to 2.25.*
→ CALC:NULL:OFFS?	*This query returns the null value.*
← 2.250000E+00	

See also

"CALCulate:FUNCtion" on page 20

"CALCulate[:STATe]" on page 23

"SYSTem:PRESet" on page 301

"*RST" on page 328

3
CALibration Subsystem

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This chapter describes the CALibration commands used to program the U3606A over a remote interface. The CALibration commands are used to calibrate the U3606A.

CAUTION

For a more detailed discussion of the calibration procedures, see the U3606A User's and Service Guide. Please refer to the U3606A User's and Service Guide before attempting to calibrate the instrument. Improper use of the CALibration commands can adversely affect the accuracy and reliability of the instrument. A recommended sequence of calibration commands is described in "Remote Calibration Procedures" on page 56.

CALibration[:ALL]?

Syntax

`CALibration[:ALL]?`

This query performs a calibration of the multimeter using the specified calibration value (`CALibration:VALue` command) and returns a boolean value that represents the calibration status: "`+0`" (calibration passed) or "`+1`" (calibration failed).

NOTE Before you can calibrate the instrument, you must unsecure it by entering the correct security code. See "CALibration:SECure:CODE" on page 48 for more information on unsecuring the instrument for calibration.

Remarks

- If a calibration fails, "`+1`" is returned and an error is stored in the error queue. For a complete listing of the error messages related to calibration failures, see Chapter 16, "List of Error Messages," starting on page 337.
- This command increments the calibration count on the U3606A (see `CALibration:COUNt?` command).

Example

→ `CAL?`	*This command performs a calibration and returns a pass/fail indication.*
← `+0`	

See also

"CALibration:SECure:CODE" on page 48

"CALibration:VALue" on page 53

CALibration:COUNt?

Syntax

`CALibration:COUNt?`

This query returns a numeric value that represents the calibration count indicating how many calibrations have been performed in the instrument. Note that your instrument was calibrated before it left the factory. When you receive your instrument, be sure to read the count to determine the initial values.

Remarks

- The calibration counts increment up to a maximum of 32767 after which they roll over to “0”. Since the value increments by one for each calibration point, a complete calibration may increase the value by many counts.
- The calibration count is incremented by the `CALibration[:ALL]?` command. You can read the calibration count whether the instrument is secured or unsecured.
- The calibration count is stored in nonvolatile memory, and does not change when power has been off or after a Factory Reset (`*RST` command).

Example

→ `CAL:COUN?`	*This command returns the calibration count.*
← `+739`	

See also

“CALibration[:ALL]?” on page 46

“CALibration:SECure:CODE” on page 48

CALibration:SECure:CODE

Syntax

```
CALibration:SECure:CODE <new_code>
```

This command allows you to enter a new security code to prevent accidental or unauthorized calibrations. The specified code is used to unsecure calibration memory. To change the security code, you must first unsecure calibration memory using the old security code, and then enter a new code.

Parameter

Item	Type	Range of values	Default value
new_code	String	A string of up to 12 characters.[1]	ATU3606A

[1] You do not have to use all 12 characters but the first character must always be a letter (A to Z). The remaining 11 characters can be letters (A to Z) or numbers (0 to 9). Blank spaces are not allowed.

Remarks

- The security code is set to ATU3606A when the instrument is shipped from the factory.
- If you forget your security code, you can override the security feature. See the *U3606A User's and Service Guide* for more information.
- See the *U3606A User's and Service Guide* for more information on how to unlock the instrument from the front panel.
- The security code is stored in nonvolatile memory, and does not change when power has been off or after a Factory Reset (`*RST` command).

Example

→ `CAL:SEC:CODE ABC1234`	*This command sets a new calibration security code (the calibration memory must be unsecured first).*

See also

"CALibration:SECure:STATe" on page 49

CALibration:SECure:STATe

Syntax

`CALibration:SECure:STATe <mode>, <code>`

This command unsecures or secures the instrument for calibration. To unsecure the instrument, you must provide a security code to prevent accidental or unauthorized calibrations of the instrument. Before you can calibrate the instrument, you must unsecure it by entering the correct security code.

`CALibration:SECure:STATe?`

This query returns a boolean value that represents the current calibration security setting: `0` or `1`

Parameters

Item	Type	Range of values	Default value
mode	Boolean	0|1|OFF|ON	0
code	String	A string of up to 12 characters.[1] This parameter is required to disable security, but is optional to enable security (but must be correct if provided).	ATU3606A

[1] You do not have to use all 12 characters but the first character must always be a letter (A to Z). The remaining 11 characters can be letters, numbers (0 to 9), or the underscore character ("_"). Blank spaces are not allowed.

Remarks

- When you first receive your instrument, it is secured. The security code is set to ATU3606A when the instrument is shipped from the factory.
- Once you enter a security code, that code must be used for both front-panel and remote-interface calibration. For example, if you secure the instrument from the front panel, you must use that same code to unsecure it from the remote interface.
- Unsecuring the instrument using this command enables the instrument to be calibrated. To calibrate the U3606A, use the `CALibration:VALue` and `CALibration[:ALL]?` commands.

- The calibration security setting is stored in nonvolatile memory, and does not change when power has been off or after a Factory Reset (*RST command).

Example

→ CAL:SEC:STAT OFF, ATU3606A	*This command unsecures the instrument using the factory default security code.*
→ CAL:SEC:STAT?	*This query returns the current calibration security setting.*
← 0	

See also

"CALibration:SECure:CODE" on page 48

CALibration:STRing

Syntax

`CALibration:STRing "<string>"`

This command allows you to store one message in calibration memory. For example, you can store such information as the date when the last calibration was performed, the date when the next calibration is due, the instrument's serial number, or even the name and phone number of the person to contact for a new calibration.

`CALibration:STRing?`

This query returns an ASCII string value enclosed in double quotes. If no calibration message has been specified, an empty quoted string ("") is returned.

Parameter

Item	Type	Range of values	Default value
string	String	A string of up to 40 characters enclosed in quotes[1]	-

[1] You can use letters (A to Z), numbers (0 to 9), and special characters like "@", "%", "*", and so on.

Remarks

- You can record a calibration message only from the remote interface and only when the instrument is unsecured (`CALibration:SECure:STATe OFF` command). You can read the message from the remote interface only. You can read the calibration message whether the instrument is secured or unsecured.
- Storing a calibration message will overwrite any message previously stored in memory.
- The calibration message is stored in nonvolatile calibration memory, and does not change when power has been off or after a Factory Reset (`*RST` command).

Example

→ `CAL:STR "CAL: 27 Nov 2009"`	*This command stores a message in the calibration memory.*
→ `CAL:STR?`	*This query returns the message currently stored in calibration memory (the quotes are also returned).*
← `"CAL: 27 Nov 2009"`	

See also

"CALibration:SECure:CODE" on page 48

CALibration:VALue

Syntax

```
CALibration:VALue <value>
```

This command specifies the value of the known calibration signal as outlined in the calibration procedures in the *U3606A User's and Service Guide*.

```
CALibration:VALue?
```

This query returns a numeric value that represents the calibration value.

Parameter

Item	Type	Range of values	Default value
value	Numeric	Desired calibration signal in the units specified by the present measurement function.	-

Remarks

Refer to the *U3606A User's and Service Guide* for detailed procedures, including how to connect a calibration source, recommended equipment, the specified calibration points, and so forth.

Example

→ `CONF:VOLT:DC`	*This command configures the instrument for DC voltage measurements.*
→ `CAL:VAL 10`	*This command sets calibration value to +10 volts for DC voltage measurements.*
→ `CAL:VAL?`	*This query returns the present calibration value.*
← `+1.000000E+01`	

See also

"CALibration[:ALL]?" on page 46

CALibration:LEVel

`CALibration:LEVel {MINimum|MAXimum|LOAD}`

This command selects the minimum or maximum calibration point as outlined in the calibration procedures in the *U3606A User's and Service Guide*.

Parameter

Item	Type	Range of values	Default value
level	Discrete	MINimum|MAXimum|LOAD	-

Remarks

Refer to the *U3606A User's and Service Guide* for detailed procedures, including how to set up the output calibration connections, the specified calibration points, how to initiate the calibration of the output voltage or current, and so forth.

Example

→ `SOUR:VOLT:RANG 8`	*This command sets the current output range to S2 (8 V/3 A).*
→ `CAL:LEV MAX`	*This command sets calibration point to 8 V.*

Remote Calibration Procedures

The CALibration commands are used to calibrate the U3606A. Please note that the use of these commands requires a detailed knowledge of the appropriate calibration procedures, which are described in the *U3606A User's and Service Guide*. Please refer to that guide before attempting to calibrate the instrument. Improper use of the CALibration commands can adversely affect the accuracy and reliability of the instrument.

During calibration the following instrument behavior is expected:

- The display "CALib" in the lower secondary display starts flashing to indicate that the calibration is in progress.
- Successful completion of the adjustment is indicated by a short beep and the primary display briefly showing "PASS".
- An adjustment failure is indicated by a long beep, the primary display showing "FAiL" and a calibration error number appearing in the upper secondary display. Correct the problem and repeat this procedure.

The adjustment data is stored only when all the calibration items for the measurement selected is completed. For example, to store the adjustment data for DC voltage measurements, you will need to complete the following calibration items: Short, 100 mV, 1 V, –1 V, 10 V, 100 V, and 1000 V.

Before performing and adjustments, first you will need to unsecure the instrument for calibration.

Calibration steps	Remote commands
1 Enter the calibration mode.	→ `CAL:SEC:STAT OFF, ATU3606A`
2 Optional step: Change the default security code after unsecuring the instrument for calibration (be sure to write down the new code).	→ `CAL:SEC:CODE <new code>`
3 Perform the zero and gain adjustments for the front input terminals. See page 57.	
4 Perform the output adjustments for the front and rear output terminals. See page 75.	

Zero offset adjustments

Each time you perform a zero offset adjustment, the instrument stores a new set of offset correction constants for measurement functions and ranges. The instrument will sequence through all required functions and ranges automatically and store new zero offset calibration constants.

CAUTION Never turn off the instrument during zero offset adjustment. This may cause ALL calibration memory to be lost.

Be sure to allow the instrument to warm up and stabilize for 2 hours before performing the adjustments. Follow the steps outlined below. Review the “Test Considerations” described in the *U3606A User’s and Service Guide* before beginning this test.

Calibration step	Remote command
Zero offset adjustment — DC voltage (short)	
1 Select the DC voltage measurement. Connect a shorting plug between the **V** (red) and **LO** (black) input terminals.	→ `CONF:VOLT:DC`
2 Calibrate the zero point for DC voltage measurements.	→ `CAL:VAL 0`
3 Start the calibration.	→ `CAL?`
Zero offset adjustment — 2-wire resistance (short)	
4 Select the 2-wire resistance measurement. Leave the shorting plug between the Ω (red) and **LO** (black) input terminals connected.	→ `CONF:RES`
5 Calibrate the zero point for 2-wire resistance measurements.	→ `CAL:VAL 0`
6 Start the calibration.	→ `CAL?`

Calibration step	Remote command
Zero offset adjustment — 2-wire resistance (open)	
7 Remove the shorting plug from the input terminals (all terminals open). Select the 2-wire resistance measurement, 100 MΩ range.	→ `CONF:RES 100M`
8 Calibrate the open point for 2-wire resistance measurements.	→ `CAL:VAL 9.9E+37`
9 Start the calibration.	→ `CAL?`
Zero offset adjustment — DC current (open)	
10 Select the DC current measurement. Leave the input terminals open.	→ `CONF:CURR`
11 Calibrate the open point for DC current measurements.	→ `CAL:VAL 9.9E+37`
12 Start the calibration.	→ `CAL?`
Zero offset adjustment — Capacitance (open)	
13 Select the capacitance measurement. Leave the input terminals open.	→ `CONF:CAP`
14 Calibrate the open point for capacitance measurements.	→ `CAL:VAL 9.9E+37`
15 Start the calibration.	→ `CAL?`

Gain adjustments

The instrument calculates and stores gain corrections for each input value. The gain constant is computed from the calibration value entered for the calibration command and from measurements made automatically during the adjustment procedure.

Most measuring functions and ranges have gain adjustment procedures. The 100 MΩ range does not have gain calibration procedures.

Adjustments for each function should be performed ONLY in the order shown.

Gain adjustment considerations

- The zero offset adjustment procedure must have been recently performed prior to beginning any gain adjustment procedures.
- Be sure to allow the instrument to warm up and stabilize for 2 hours before performing the adjustments.
- Consider the thermal effects as you are connecting test leads to the calibrator and instrument. It is recommended to wait 1 minute before starting the calibration after connecting the test leads.

CAUTION Never turn off the instrument during a gain adjustment. This may cause the calibration memory for the present function to be lost.

DC voltage gain adjustment procedure

Follow the steps outlined below. Review the "Test Considerations" described in the *U3606A User's and Service Guide* and the "Gain adjustment considerations" on page 59 before beginning this test.

Calibration step	Remote command
DC voltage gain adjustment — Short	
1 Select the DC voltage measurement. Connect a shorting plug between the **V** (red) and **LO** (black) input terminals.	→ `CONF:VOLT:DC`
2 Calibrate the zero point for DC voltage measurements.	→ `CAL:VAL 0`
3 Start the calibration.	→ `CAL?`

NOTE If the zero offset adjustment procedure has been recently performed prior to the DC voltage gain calibration procedure, the adjustment item "Short" can be omitted.

Calibration step	Remote command
DC voltage gain adjustment — 100 mV	
4 Select the 100 mV range. Remove the shorting plug from the input terminals. Input 100 mV DC voltage to the **V** (red) and **LO** (black) input terminals.	→ `CONF:VOLT:DC 0.1`
5 Calibrate the 100 mV point for DC voltage measurements.	→ `CAL:VAL 0.1`
6 Start the calibration.	→ `CAL?`
DC voltage gain adjustment — ±1 V	
7 Select the 1 V range. Input 1 V DC voltage to the **V** (red) and **LO** (black) input terminals.	→ `CONF:VOLT:DC 1`
8 Calibrate the 1 V point for DC voltage measurements.	→ `CAL:VAL 1`
9 Start the calibration.	→ `CAL?`

Calibration step	Remote command
10 Calibrate the –1 V point for DC voltage measurements.	→ `CAL:VAL -1`
11 Start the calibration.	→ `CAL?`
DC voltage gain adjustment — 10 V	
12 Select the 10 V range. Input 10 V DC voltage to the **V** (red) and **LO** (black) input terminals.	→ `CONF:VOLT:DC 10`
13 Calibrate the 10 V point for DC voltage measurements.	→ `CAL:VAL 10`
14 Start the calibration.	→ `CAL?`
DC voltage gain adjustment — 100 V	
15 Select the 100 V range. Input 100 V DC voltage to the **V** (red) and **LO** (black) input terminals.	→ `CONF:VOLT:DC 100`
16 Calibrate the 100 V point for DC voltage measurements.	→ `CAL:VAL 100`
17 Start the calibration.	→ `CAL?`
DC voltage gain adjustment — 1000 V	
18 Select the 1000 V range. Input 1000 V DC voltage to the **V** (red) and **LO** (black) input terminals.	→ `CONF:VOLT:DC 1000`
19 Calibrate the 1000 V point for DC voltage measurements.	→ `CAL:VAL 1000`
20 Start the calibration.	→ `CAL?`

AC voltage gain adjustment procedure

Follow the steps outlined below. Review the “Test Considerations” described in the *U3606A User’s and Service Guide* and the “Gain adjustment considerations” on page 59 before beginning this test.

Calibration step	Remote command
AC voltage gain adjustment — 10 mV	
1 Select the AC voltage measurement, 10 mV range. Input 10 mV, 1 kHz AC voltage to the **V** (red) and **LO** (black) input terminals.	→ `CONF:VOLT:AC 0.01`
2 Calibrate the 10 mV point for AC voltage measurements.	→ `CAL:VAL 0.01`
3 Start the calibration.	→ `CAL?`
AC voltage gain adjustment — 100 mV	
4 Select the 100 mV range. Input 100 mV, 1 kHz AC voltage to the **V** (red) and **LO** (black) input terminals.	→ `CONF:VOLT:AC 0.1`
5 Calibrate the 100 mV point for AC voltage measurements.	→ `CAL:VAL 0.1`
6 Start the calibration.	→ `CAL?`
AC voltage gain adjustment — 1 V	
7 Select the 1 V range. Input 1 V, 1 kHz AC voltage to the **V** (red) and **LO** (black) input terminals.	→ `CONF:VOLT:AC 1`
8 Calibrate the 1 V point for AC voltage measurements.	→ `CAL:VAL 1`
9 Start the calibration.	→ `CAL?`

Calibration step	Remote command
AC voltage gain adjustment — 10 V	
10 Select the 10 V range. Input 10 V, 1 kHz AC voltage to the **V** (red) and **LO** (black) input terminals.	→ `CONF:VOLT:AC 10`
11 Calibrate the 10 V point for AC voltage measurements.	→ `CAL:VAL 10`
12 Start the calibration.	→ `CAL?`
AC voltage gain adjustment — 100 V	
13 Select the 100 V range. Input 100 V, 1 kHz AC voltage to the **V** (red) and **LO** (black) input terminals.	→ `CONF:VOLT:AC 100`
14 Calibrate the 100 V point for AC voltage measurements.	→ `CAL:VAL 100`
15 Start the calibration.	→ `CAL?`
AC voltage gain adjustment — 750 V	
16 Select the 750 V range. Input 750 V, 1 kHz AC voltage to the **V** (red) and **LO** (black) input terminals.	→ `CONF:VOLT:AC 750`
17 Calibrate the 750 V point for AC voltage measurements.	→ `CAL:VAL 750`
18 Start the calibration.	→ `CAL?`

Frequency gain adjustment procedure

Follow the steps outlined below. Review the “Test Considerations” described in the *U3606A User’s and Service Guide* and the “Gain adjustment considerations” on page 59 before beginning this test.

Calibration step	Remote command
Frequency gain adjustment — 1 kHz	
1 Select the AC voltage measurement, 1 V range.	→ `CONF:VOLT:AC 1`
2 Select the frequency measurement. Input 1 V, 1 kHz AC voltage to the **V** (red) and **LO** (black) input terminals.	→ `CONF:FREQ`
3 Calibrate the 1 kHz point for frequency measurements.	→ `CAL:VAL 1000`
4 Start the calibration.	→ `CAL?`

Resistance gain adjustment procedures

Follow the steps outlined below. Review the “Test Considerations” described in the *U3606A User’s and Service Guide* and the “Gain adjustment considerations” on page 59 before beginning this test.

Calibration step	Remote command
Resistance gain adjustment — Short	
1 Select the 2-wire resistance measurement. Connect a shorting plug between the Ω (red) and **LO** (black) input terminals.	→ `CONF:RES`
2 Calibrate the zero point for 2-wire resistance measurements.	→ `CAL:VAL 0`
3 Start the calibration.	→ `CAL?`
Resistance gain adjustment — Open	
4 Remove the shorting plug from the input terminals (all terminals open). Select the 100 MΩ range.	→ `CONF:RES 100M`
5 Calibrate the open point for 2-wire resistance measurements.	→ `CAL:VAL 9.9E+37`
6 Start the calibration.	→ `CAL?`

NOTE If the zero offset adjustment procedure has been recently performed prior to the resistance gain calibration procedure, the adjustment item “Short” and “Open” can be omitted.

Calibration step	Remote command
Resistance gain adjustment — 10 MΩ	
7 Select the 10 MΩ range. Input 10 MΩ resistance to the Ω (red) and **LO** (black) input terminals.	→ `CONF:RES 10M`
8 Calibrate the 10 MΩ point for 2-wire resistance measurements.	→ `CAL:VAL 10M`
9 Start the calibration.	→ `CAL?`

Calibration step	Remote command
Resistance gain adjustment — 1 MΩ	
10 Select the 1 MΩ range. Input 1 MΩ resistance to the Ω (red) and **LO** (black) input terminals.	→ `CONF:RES 1M`
11 Calibrate the 1 MΩ point for 2-wire resistance measurements.	→ `CAL:VAL 1M`
12 Start the calibration.	→ `CAL?`
Resistance gain adjustment — 100 kΩ	
13 Select the 100 kΩ range. Input 100 kΩ resistance to the Ω (red) and **LO** (black) input terminals.	→ `CONF:RES 100k`
14 Calibrate the 100 kΩ point for 2-wire resistance measurements.	→ `CAL:VAL 100k`
15 Start the calibration.	→ `CAL?`
Resistance gain adjustment — 10 kΩ	
16 Select the 10 kΩ range. Input 10 kΩ resistance to the Ω (red) and **LO** (black) input terminals.	→ `CONF:RES 10k`
17 Calibrate the 10 kΩ point for 2-wire resistance measurements.	→ `CAL:VAL 10k`
18 Start the calibration.	→ `CAL?`
Resistance gain adjustment — 1000 Ω	
19 Select the 1000 Ω range. Input 1000 Ω resistance to the Ω (red) and **LO** (black) input terminals.	→ `CONF:RES 1000`
20 Calibrate the 1000 Ω point for 2-wire resistance measurements.	→ `CAL:VAL 1000`
21 Start the calibration.	→ `CAL?`

Calibration step	Remote command
Resistance gain adjustment — 100 Ω	
22 Select the 100 Ω range. Input 100 Ω resistance to the Ω (red) and **LO** (black) input terminals.	→ `CONF:RES 100`
23 Calibrate the 100 Ω point for 2-wire resistance measurements.	→ `CAL:VAL 100`
24 Start the calibration.	→ `CAL?`

DC current gain adjustment procedure

Follow the steps outlined below. Review the “Test Considerations” described in the *U3606A User’s and Service Guide* and the “Gain adjustment considerations” on page 59 before beginning this test.

Calibration step	Remote command
DC current gain adjustment — Open	
1 Remove all connections from the input terminals (all terminals open). Select the DC current measurement.	→ `CONF:CURR:DC`
2 Calibrate the open point for DC current measurements.	→ `CAL:VAL 9.9E+37`
3 Start the calibration.	→ `CAL?`

NOTE If the zero offset adjustment procedure has been recently performed prior to the current gain calibration procedure, the adjustment item “Open” can be omitted.

Calibration step	Remote command
DC current gain adjustment — 10 mA	
4 Select the 10 mA range. Input 10 mA DC current to the **I** (red) and **LO** (black) input terminals.	→ `CONF:CURR:DC 0.01`
5 Calibrate the 10 mA point for DC current measurements.	→ `CAL:VAL 0.01`
6 Start the calibration.	→ `CAL?`
DC current gain adjustment — 100 mA	
7 Select the 100 mA range. Input 100 mA DC current to the **I** (red) and **LO** (black) input terminals.	→ `CONF:CURR:DC 0.1`
8 Calibrate the 100 mA point for DC current measurements.	→ `CAL:VAL 0.1`
9 Start the calibration.	→ `CAL?`

Calibration step	Remote command
DC current gain adjustment — 1 A	
10 Select the 1 A range. Input 1 A DC current to the **I** (red) and **LO** (black) input terminals.	→ `CONF:CURR:DC 1`
11 Calibrate the 1 A point for DC current measurements.	→ `CAL:VAL 1`
12 Start the calibration.	→ `CAL?`

AC current gain adjustment procedure

Follow the steps outlined below. Review the “Test Considerations” described in the *U3606A User’s and Service Guide* and the “Gain adjustment considerations” on page 59 before beginning this test.

Calibration steps	Remote commands
AC current gain adjustment — 1 mA	
1 Select the AC current measurement, 1 mA range. Input 1 mA, 1 kHz AC current to the **I** (red) and **LO** (black) input terminals.	→ `CONF:CURR:AC 0.001`
2 Calibrate the 1 mA point for AC current measurements.	→ `CAL:VAL 0.001`
3 Start the calibration.	→ `CAL?`
AC current gain adjustment — 10 mA	
4 Select the 10 mA range. Input 10 mA, 1 kHz AC current to the **I** (red) and **LO** (black) input terminals.	→ `CONF:CURR:AC 0.01`
5 Calibrate the 10 mA point for AC current measurements.	→ `CAL:VAL 0.01`
6 Start the calibration.	→ `CAL?`
AC current gain adjustment — 100 mA	
7 Select the 100 mA range. Input 100 mA, 1 kHz AC current to the **I** (red) and **LO** (black) input terminals.	→ `CONF:CURR:AC 0.1`
8 Calibrate the 100 mA point for AC current measurements.	→ `CAL:VAL 0.1`
9 Start the calibration.	→ `CAL?`

Calibration steps	Remote commands
AC current gain adjustment — 1 A	
10 Select the 1 A range. Input 1 A, 1 kHz AC current to the **I** (red) and **LO** (black) input terminals.	→ `CONF:CURR:AC 1`
11 Calibrate the 1 A point for AC current measurements.	→ `CAL:VAL 1`
12 Start the calibration.	→ `CAL?`

Capacitance gain adjustment procedure

Follow the steps outlined below. Review the "Test Considerations" described in the *U3606A User's and Service Guide* and the "Gain adjustment considerations" on page 59 before beginning this test.

Calibration steps	Remote commands
Capacitance gain adjustment — Open	
1 Remove all connections from the input terminals (all terminals open). Select the capacitance measurement.	→ `CONF:CAP`
2 Calibrate the open point for capacitance measurements.	→ `CAL:VAL 9.9E+37`
3 Start the calibration.	→ `CAL?`

NOTE If the zero offset adjustment procedure has been recently performed prior to the capacitance gain calibration procedure, the adjustment item "Open" can be omitted.

Calibration steps	Remote commands
Capacitance gain adjustment — 0.4 nF	
4 Select the 1 nF range. Input 0.4 nF to the -|((red) and **LO** (black) input terminals.	→ `CONF:CAP 1n`
5 Calibrate the 0.4 nF point for capacitance measurements.	→ `CONF:VAL 0.4E-9`
6 Start the calibration.	→ `CAL?`
Capacitance gain adjustment — 1 nF	
7 Input 1 nF to the -|((red) and **LO** (black) input terminals.	
8 Calibrate the 1nF point for capacitance measurements.	→ `CONF:VAL 1E-9`
9 Start the calibration.	→ `CAL?`

Calibration steps	Remote commands
Capacitance gain adjustment — 10 nF	
10 Select the 10 nF range. Input 10 nF to the (red) and **LO** (black) input terminals.	→ `CONF:CAP 10n`
11 Calibrate the 10 nF point for capacitance measurements.	→ `CONF:VAL 1E-8`
12 Start the calibration.	→ `CAL?`
Capacitance gain adjustment — 100 nF	
13 Select the 100 nF range. Input 100 nF to the (red) and **LO** (black) input terminals.	→ `CONF:CAP 100n`
14 Calibrate the 100 nF point for capacitance measurements.	→ `CONF:VAL 1E-7`
15 Start the calibration.	→ `CAL?`
Capacitance gain adjustment — 1 µF	
16 Select the 1 µF range. Input 1 µF to the (red) and **LO** (black) input terminals.	→ `CONF:CAP 1u`
17 Calibrate the 1 µF point for capacitance measurements.	→ `CONF:VAL 1E-6`
18 Start the calibration.	→ `CAL?`
Capacitance gain adjustment — 10 µF	
19 Select the 10 µF range. Input 10 µF to the (red) and **LO** (black) input terminals.	→ `CONF:CAP 10u`
20 Calibrate the 10 µF point for capacitance measurements.	→ `CONF:VAL 1E-5`
21 Start the calibration.	→ `CAL?`
Capacitance gain adjustment — 100 µF	
22 Select the 100 µF range. Input 100 µF to the (red) and **LO** (black) input terminals.	→ `CONF:CAP 100u`
23 Calibrate the 100 µF point for capacitance measurements.	→ `CONF:VAL 1E-4`
24 Start the calibration.	→ `CAL?`

Calibration steps	Remote commands
Capacitance gain adjustment — 1 mF	
25 Select the 1 mF range. Input 1 mF to the ⊣⊢ (red) and **LO** (black) input terminals.	→ `CONF:CAP 1m`
26 Calibrate the 1 mF point for capacitance measurements.	→ `CONF:VAL 1E-3`
27 Start the calibration.	→ `CAL?`
Capacitance gain adjustment — 10 mF	
28 Select the 10 mF range. Input 10 mF to the ⊣⊢ (red) and **LO** (black) input terminals.	→ `CONF:CAP 10m`
29 Calibrate the 10 mF point for capacitance measurements.	→ `CONF:VAL 1E-2`
30 Start the calibration.	→ `CAL?`

Output adjustments

The instrument calculates and stores output corrections for each output level. The U3606A implements a closed loop output calibration procedure to its inherent dual function ability as a digital multimeter and a DC power supply. The output constant is computed from the calibration level set for the calibration command and from measurements made automatically during the adjustment procedure.

Calibration steps	Remote commands
1 Place the instrument in the free-run mode. Measurements are made continuously and the readings are stored in the instrument memory.	→ `INIT:CONT ON`
2 Set the signal source to read the sense signal inputs from the front output terminals of the instrument. The U3606A needs to be calibrated twice. Once for the internal sense source and again for the external sense source.	→ `SOUR:SENS INT`
3 Perform the current and voltage output adjustments for the front output terminals. See page 76.	
4 Set the signal source to read the sense signal inputs from the rear output terminals of the instrument. When you have completed the voltage and current output adjustments for the internal sense source, repeat the entire adjustment procedure again for the external sense source.	→ `SOUR:SENS EXT`
5 Perform current and voltage output adjustments for the rear output terminals. See page 76.	
6 Remove all connections from the instrument. Reset the calibration message and record the new calibration count.	→ `CAL:STR "<new_message>"` → `CAL:COUN?`

Adjustments for each function should be performed ONLY in the order shown.

Follow the steps outlined below. Review the “Test Considerations” described in the *U3606A User’s and Service Guide* before beginning this test.

Calibration steps	Remote commands
Current output adjustment — S2 (8 V/3 A) range	
1 Connect the ⊕ (red) and ⊖ (black) output terminals to the **I** (red) and **LO** (black) input terminals.	
2 Select the CC output, 3 A range.	→ `SOUR:CURR:RANG 3`
3 Calibrate the lower point for CC output.	→ `CAL:LEV MIN`
4 Calibrate the upper point for CC output.	→ `CAL:LEV MAX`
Current output adjustment — S1 (30 V/1 A) range	
5 Select the CC output, 1 A range.	→ `SOUR:CURR:RANG 1`
6 Calibrate the lower point for CC output.	→ `CAL:LEV MIN`
7 Calibrate the upper point for CC output.	→ `CAL:LEV MAX`
8 Connect a 30 Ω, 50 W load across the ⊕ (red) output terminal and the **I** (red) terminal. Leave the ⊖ (black) terminal and **LO** (black) terminal connected.	
9 Calibrate the load point for CC output.	→ `CAL:LEV LOAD`
Voltage output adjustment — S2 (8 V/3 A) range	
10 Connect the ⊕ (red) and ⊖ (black) output terminals to the **V** (red) and **LO** (black) input terminals.	
11 Select the CV output, 8 V range.	→ `SOUR:VOLT:RANG 8`
12 Calibrate the lower point for CV output.	→ `CAL:LEV MIN`
13 Calibrate the upper point for CV output.	→ `CAL:LEV MAX`

Calibration steps	Remote commands
Voltage output adjustment — S1 (30 V/1 A) range	
14 Select the CV output, 30 V range.	→ `SOUR:VOLT:RANG 30`
15 Calibrate the lower point for CV output.	→ `CAL:LEV MIN`
16 Calibrate the upper point for CV output.	→ `CAL:LEV MAX`
17 Connect an additional 30 Ω, 50 W load across the ⊕ (red) and ⊖ (black) output terminal. Leave the connections from the output terminals to the input terminals intact.	
18 Calibrate the load point for CV output.	→ `CAL:LEV LOAD`

Repeat the voltage output adjustment procedures again for the rear output terminals (send the `SOUR:SENS EXT` command). See the *U3606A User's and Service Guide* for more information on how to connect the load leads to the rear terminal block.

4
CONFigure Subsystem

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This chapter describes the CONFigure commands used to program the U3606A over a remote interface. Use the CONFigure commands to set the measurement function, range, and resolution without actually making a measurement.

NOTE

- Use the `INITiate[:IMMediate]` or `READ?` command to initiate the measurement.
- Some measurements may result in a delayed response time in the U3606A Multimeter | DC Power Supply. It is recommended that you increase the SCPI query timeout to 15000 milliseconds or longer to avoid SCPI query timeout errors.

CONFigure?

Syntax

`CONFigure?`

This query returns a series of comma-separated fields indicating the present measurement function, range, and resolution of the instrument. The short form of the function name is always returned (for example, `CURR:AC`, `FREQ:VOLT`, and so on).

Remarks

A Factory Reset (`*RST` command) or an Instrument Preset (`SYSTem:PRESet` command) will set all measurement parameters to their default factory settings, clear the reading memory, and clear all stored statistical data.

Example

→ CONF?	*This query returns the present measurement configuration of the instrument.*
← VOLT +1.000000E+01, +1.000000E-06	

See also

"*RST" on page 328

"SYSTem:PRESet" on page 301

CONFigure[:VOLTage][:DC]

Syntax

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

This command first resets all DC voltage measurement parameters and trigger parameters to their default values. Then, it configures the instrument for DC voltage measurements but does not initiate the measurement.

NOTE The `CONFigure[:VOLTage][:DC]` command does not place the instrument in the “wait-for-trigger” state. Use the `INITiate[:IMMediate]` or `READ?` command in conjunction with the `CONFigure[:VOLTage][:DC]` to place the instrument in the “wait-for-trigger” state.

Parameters

Item	Type	Range of values		Default value
range	Numeric	• 20 mV|MIN • 100 mV • 1 V • 10 V • 100 V • 1000 V|MAX • AUTO		AUTO

resolution	Numeric	• MAX (4½ digit)
		  • 1 uV
		  • 10 uV
		  • 100 uV
		  • 1 mV
		  • 10 mV
		  • 100 mV
			• MIN (5½ digit)
			  • 0.1 uV
			  • 1 uV
			  • 10 uV
			  • 100 uV
			  • 1 mV
			  • 10 mV
				MIN

Remarks

- You can allow the instrument to automatically select the measurement range using autoranging or you can select a fixed range using manual ranging. Autoranging is convenient because the instrument decides which range to use for each measurement based on the input signal. For faster measurements, use manual ranging on each measurement (some additional time is required for autoranging since the instrument has to make a range selection).
- The range is set to autoranging (AUTO) when the `<range>` parameter is omitted. The resolution is set 5½ digits (MIN) when the `<resolution>` parameter is omitted.
- This command also sets the trigger source to “immediate” and clears all calculation functions.
- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: “`+9.900000E+37`” or “OL” from the front panel.
  - Negative overload: “`-9.900000E+37`” or “–OL” from the front panel.
- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value “`+9.910000E+37`” will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.

Example 1

→ CONF	*This command configures the instrument for DC voltage measurements. The default range (autorange) and resolution (5½ digits) are used.*
→ READ?	*This command places the instrument in the "wait-for-trigger" state, triggers a measurement, and sends the reading to the instrument memory and output buffer.*
← +9.983721E+00	

Example 2

→ CONF 10, 0.001	*This command configures the instrument for DC voltage measurements. The 10 V range is selected with 1 mV resolution.*
→ INIT	*This command places the instrument in the "wait-for-trigger" state, triggers a measurement, and stores the reading in the instrument memory.*
→ FETC?	*This command transfers the reading from the instrument memory to the output buffer.*
← +9.985308E+00	

See also

"INITiate[:IMMediate]" on page 120

"FETCh?" on page 315

"READ?" on page 316

CONFigure[:VOLTage]:AC

Syntax

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

This command first resets all AC voltage measurement parameters and trigger parameters to their default values. Then, it configures the instrument for AC voltage measurements but does not initiate the measurement.

CAUTION

- The maximum range parameter is 750 V_{rms}, which is set by MAX. The rms voltage is waveform dependent. A sine wave is limited to 750 V_{ac} (rms), but a 1000 V_{pk} square wave is safe. Connections to AC MAINS are further limited to CAT II (300V).
- See the “Safety Information” section in the *U3606A User's and Service Guide* for a complete discussion of the safety features, and the procedures for safe operation of this instrument.

NOTE

The `CONFigure[:VOLTage]:AC` command does not place the instrument in the “wait-for-trigger” state. Use the `INITiate[:IMMediate]` or `READ?` command in conjunction with the `CONFigure[:VOLTage]:AC` to place the instrument in the “wait-for-trigger” state.

Parameters

Item	Type	Range of values		Default value
range	Numeric	• 100 mV|MIN • 1 V • 10 V • 100 V • 750 V|MAX • AUTO		AUTO
resolution	Numeric	• MAX (4½ digit) ◦ 10 uV ◦ 100 uV ◦ 1 mV ◦ 10 mV ◦ 100 mV	• MIN (5½ digit) ◦ 1 uV ◦ 10 uV ◦ 100 uV ◦ 1 mV ◦ 10 mV	MIN

Remarks

- You can allow the instrument to automatically select the measurement range using autoranging or you can select a fixed range using manual ranging. Autoranging is convenient because the instrument decides which range to use for each measurement based on the input signal. For faster measurements, use manual ranging on each measurement (some additional time is required for autoranging since the instrument has to make a range selection).
- The range is set to autoranging (AUTO) when the `<range>` parameter is omitted. The resolution is set 5½ digits (MIN) when the `<resolution>` parameter is omitted.
- This command also sets the trigger source to “immediate” and clears all calculation functions.
- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: “`+9.900000E+37`” or “OL” from the front panel.
  - Negative overload: “`-9.900000E+37`” or “–OL” from the front panel.

- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value "+9.910000E+37" will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.

Example 1

→ CONF:AC	*This command configures the instrument for AC voltage measurements. The default range (autorange) and resolution (5½ digits) are used.*
→ READ?	*This command places the instrument in the "wait-for-trigger" state, triggers a measurement, and sends the reading to the instrument memory and output buffer.*
← +3.769443E-03	

Example 2

→ CONF:AC 1	*This command configures the instrument for AC voltage measurements. The 1 V range is selected.*
→ INIT	*This command places the instrument in the "wait-for-trigger" state, triggers a measurement, and stores the reading in the instrument memory.*
→ FETC?	*This command transfers the reading from the instrument memory to the output buffer.*
← +1.516957E-03	

See also

"CONFigure?" on page 80

"INITiate[:IMMediate]" on page 120

"FETCh?" on page 315

"READ?" on page 316

CONFigure[:VOLTage]:ACDC|DCAC

Syntax

```
CONFigure[:VOLTage]:ACDC|DCAC
   [<range>|AUTO|MAX|MIN|DEF[,{<resolution>|MAX|MIN|DEF}]]
```

This command first resets all AC+DC voltage measurement parameters and trigger parameters to their default values. Then, it configures the instrument for AC+DC voltage measurements but does not initiate the measurement.

CAUTION

- The maximum range parameter is 750 V_{rms}, which is set by MAX. The rms voltage is waveform dependent. A sine wave is limited to 750 V_{ac} (rms), but a 1000 V_{pk} square wave is safe. Connections to AC MAINS are further limited to CAT II (300V).
- See the “Safety Information” section in the *U3606A User's and Service Guide* for a complete discussion of the safety features, and the procedures for safe operation of this instrument.

NOTE

The `CONFigure[:VOLTage]:ACDC|DCAC` command does not place the instrument in the “wait-for-trigger” state. Use the `INITiate[:IMMediate]` or `READ?` command in conjunction with the `CONFigure[:VOLTage]:ACDC|DCAC` to place the instrument in the “wait-for-trigger” state.

Parameters

Item	Type	Range of values		Default value
range	Numeric	• 100 mV|MIN • 1 V • 10 V • 100 V • 750 V|MAX • AUTO		AUTO
resolution	Numeric	• MAX (4½ digit) ◦ 10 uV ◦ 100 uV ◦ 1 mV ◦ 10 mV ◦ 100 mV	• MIN (5½ digit) ◦ 1 uV ◦ 10 uV ◦ 100 uV ◦ 1 mV ◦ 10 mV	MIN

Remarks

- You can allow the instrument to automatically select the measurement range using autoranging or you can select a fixed range using manual ranging. Autoranging is convenient because the instrument decides which range to use for each measurement based on the input signal. For faster measurements, use manual ranging on each measurement (some additional time is required for autoranging since the instrument has to make a range selection).
- The range is set to autoranging (AUTO) when the `<range>` parameter is omitted. The resolution is set 5½ digits (MIN) when the `<resolution>` parameter is omitted.
- This command also sets the trigger source to "immediate" and clears all calculation functions.
- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: "`+9.900000E+37`" or "OL" from the front panel.
  - Negative overload: "`-9.900000E+37`" or "–OL" from the front panel.

- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value "+9.910000E+37" will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.

Example 1

→ CONF:ACDC	*This command configures the instrument for AC+DC voltage measurements. The default range (autorange) and resolution (5½ digits) are used.*
→ READ?	*This command places the instrument in the "wait-for-trigger" state, triggers a measurement, and sends the reading to the instrument memory and output buffer.*
← +9.984319E+00	

Example 2

→ CONF:ACDC 10, 0.001	*This command configures the instrument for AC+DC voltage measurements. The 10 V range is selected with 1 mV resolution.*
→ INIT	*This command places the instrument in the "wait-for-trigger" state, triggers a measurement, and stores the reading in the instrument memory.*
→ FETC?	*This command transfers the reading from the instrument memory to the output buffer.*
← +9.9839877E+00	

See also

"CONFigure?" on page 80

"INITiate[:IMMediate]" on page 120

"FETCh?" on page 315

"READ?" on page 316

CONFigure:CURRent[:DC]

Syntax

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

This command first resets all DC current measurement parameters and trigger parameters to their default values. Then, it configures the instrument for DC current measurements but does not initiate the measurement.

NOTE The `CONFigure:CURRent[:DC]` command does not place the instrument in the “wait-for-trigger” state. Use the `INITiate[:IMMediate]` or `READ?` command in conjunction with the `CONFigure:CURRent[:DC]` to place the instrument in the “wait-for-trigger” state.

Parameters

Item	Type	Range of values		Default value
range	Numeric	• 10 mA|MIN • 100 mA • 1000 mA • 3 A|MAX • AUTO		AUTO

resolution	Numeric	• MAX (4½ digit)
		  ◦ 1 uA
		  ◦ 10 uA
		  ◦ 100 uA
		  ◦ 1 mA
			• MIN (5½ digit)
			  ◦ 0.1 uA
			  ◦ 1 uA
			  ◦ 10 uA
			  ◦ 100 uA
				MIN

Remarks

- You can allow the instrument to automatically select the measurement range using autoranging or you can select a fixed range using manual ranging. Autoranging is convenient because the instrument decides which range to use for each measurement based on the input signal. For faster measurements, use manual ranging on each measurement (some additional time is required for autoranging since the instrument has to make a range selection).
- The range is set to autoranging (AUTO) when the <range> parameter is omitted. The resolution is set 5½ digits (MIN) when the <resolution> parameter is omitted.
- This command also sets the trigger source to “immediate” and clears all calculation functions.
- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: “+9.900000E+37” or “OL” from the front panel.
  - Negative overload: “-9.900000E+37” or “–OL” from the front panel.
- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value “+9.910000E+37” will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.

Example 1

→ `CONF:CURR`	*This command configures the instrument for DC current measurements. The default range (autorange) and resolution (5½ digits) are used.*
→ `READ?`	*This command places the instrument in the "wait-for-trigger" state, triggers a measurement, and sends the reading to the instrument memory and output buffer.*
← `+0.203200E+00`	

Example 2

→ `CONF:CURR 1, 0.0001`	*This command configures the instrument for DC current measurements. The 1 A range is selected with 100 μA resolution.*
→ `INIT`	*This command places the instrument in the "wait-for-trigger" state, triggers a measurement, and stores the reading in the instrument memory.*
→ `FETC?`	*This command transfers the reading from the instrument memory to the output buffer.*
← `+0.223407E+00`	

See also

"CONFigure?" on page 80

"INITiate[:IMMediate]" on page 120

"FETCh?" on page 315

"READ?" on page 316

CONFigure:CURRent:AC

Syntax

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

This command first resets all AC current measurement parameters and trigger parameters to their default values. Then, it configures the instrument for AC current measurements but does not initiate the measurement.

NOTE

The `CONFigure:CURRent:AC` command does not place the instrument in the “wait-for-trigger” state. Use the `INITiate[:IMMediate]` or `READ?` command in conjunction with the `CONFigure:CURRent:AC` to place the instrument in the “wait-for-trigger” state.

Parameters

Item	Type	Range of values		Default value
range	Numeric	• 10 mA|MIN • 100 mA • 1000 mA • 3 A|MAX • AUTO		AUTO
resolution	Numeric	• MAX (4½ digit) ◦ 1 uA ◦ 10 uA ◦ 100 uA ◦ 1 mA	• MIN (5½ digit) ◦ 0.1 uA ◦ 1 uA ◦ 10 uA ◦ 100 uA	MIN

Remarks

- You can allow the instrument to automatically select the measurement range using autoranging or you can select a fixed range using manual ranging. Autoranging is convenient because the instrument decides which range to use for each measurement based on the input signal. For faster measurements, use manual ranging on each measurement (some additional time is required for autoranging since the instrument has to make a range selection).
- The range is set to autoranging (AUTO) when the `<range>` parameter is omitted. The resolution is set 5½ digits (MIN) when the `<resolution>` parameter is omitted.
- This command also sets the trigger source to “immediate” and clears all calculation functions.
- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: “`+9.900000E+37`” or “OL” from the front panel.
  - Negative overload: “`-9.900000E+37`” or “–OL” from the front panel.
- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value “`+9.910000E+37`” will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.

Example 1

→ CONF:CURR:AC	*This command configures the instrument for AC current measurements. The default range (autorange) and resolution (5½ digits) are used.*
→ READ?	*This command places the instrument in the "wait-for-trigger" state, triggers a measurement, and sends the reading to the instrument memory and output buffer.*
← +8.545300E-02	

Example 2

→ CONF:CURR:AC 1, 0.0001	*This command configures the instrument for AC current measurements. The 1 A range is selected with 100 μA resolution.*
→ INIT	*This command places the instrument in the "wait-for-trigger" state, triggers a measurement, and stores the reading in the instrument memory.*
→ FETC?	*This command transfers the reading from the instrument memory to the output buffer.*
← +8.632510E-02	

See also

"CONFigure?" on page 80

"INITiate[:IMMediate]" on page 120

"FETCh?" on page 315

"READ?" on page 316

CONFigure:CURRent:ACDC|DCAC

Syntax

```
CONFigure:CURRent:ACDC|DCAC
   [<range>|AUTO|MAX|MIN|DEF[,{<resolution>|MAX|MIN|DEF}]]
```

This command first resets all AC+DC current measurement parameters and trigger parameters to their default values. Then, it configures the instrument for AC+DC current measurements but does not initiate the measurement.

NOTE

The `CONFigure:CURRent:ACDC|DCAC` command does not place the instrument in the “wait-for-trigger” state. Use the `INITiate[:IMMediate]` or `READ?` command in conjunction with the `CONFigure:CURRent:ACDC|DCAC` to place the instrument in the “wait-for-trigger” state.

Parameters

Item	Type	Range of values		Default value
range	Numeric	• 10 mA|MIN • 100 mA • 1000 mA • 3 A|MAX • AUTO		AUTO

resolution	Numeric	• MAX (4½ digit)
		  • 1 uA
		  • 10 uA
		  • 100 uA
		  • 1 mA
			• MIN (5½ digit)
			  • 0.1 uA
			  • 1 uA
			  • 10 uA
			  • 100 uA
				MIN

Remarks

- You can allow the instrument to automatically select the measurement range using autoranging or you can select a fixed range using manual ranging. Autoranging is convenient because the instrument decides which range to use for each measurement based on the input signal. For faster measurements, use manual ranging on each measurement (some additional time is required for autoranging since the instrument has to make a range selection).
- The range is set to autoranging (AUTO) when the `<range>` parameter is omitted. The resolution is set 5½ digits (MIN) when the `<resolution>` parameter is omitted.
- This command also sets the trigger source to "immediate" and clears all calculation functions.
- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: "`+9.900000E+37`" or "OL" from the front panel.
  - Negative overload: "`-9.900000E+37`" or "–OL" from the front panel.
- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value "`+9.910000E+37`" will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.

Example 1

→ CONF:CURR:ACDC	*This command configures the instrument for AC+DC current measurements. The default range (autorange) and resolution (5½ digits) are used.*
→ READ?	*This command places the instrument in the “wait-for-trigger” state, triggers a measurement, and sends the reading to the instrument memory and output buffer.*
← +9.535700E-02	

Example 2

→ CONF:CURR:ACDC 1, 0.0001	*This command configures the instrument for AC current measurements. The 1 A range is selected with 100 μA resolution.*
→ INIT	*This command places the instrument in the “wait-for-trigger” state, triggers a measurement, and stores the reading in the instrument memory.*
→ FETC?	*This command transfers the reading from the instrument memory to the output buffer.*
← +9.832310E-02	

See also

“CONFigure?” on page 80

“INITiate[:IMMediate]” on page 120

“FETCh?” on page 315

“READ?” on page 316

CONFigure:RESistance

Syntax

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

This command first resets all resistance measurement parameters and trigger parameters to their default values. Then, it configures the instrument for 2-wire resistance measurements but does not initiate the measurement.

NOTE

The `CONFigure:RESistance` command does not place the instrument in the "wait-for-trigger" state. Use the `INITiate[:IMMediate]` or `READ?` command in conjunction with the `CONFigure:RESistance` to place the instrument in the "wait-for-trigger" state.

Parameters

Item	Type	Range of values		Default value
range	Numeric	• 100 Ω|MIN • 1 kΩ • 10 kΩ • 100 kΩ • 1 MΩ • 10 MΩ • 100 MΩ|MAX • AUTO		AUTO
resolution	Numeric	• MAX (4½ digit) ◦ 10 mΩ ◦ 100 mΩ ◦ 1 Ω ◦ 10 Ω ◦ 100 Ω ◦ 1 kΩ ◦ 10 kΩ	• MIN (5½ digit) ◦ 1 mΩ ◦ 10 mΩ ◦ 100 mΩ ◦ 1 Ω ◦ 10 Ω ◦ 100 Ω ◦ 1 kΩ	MIN

Remarks

- You can allow the instrument to automatically select the measurement range using autoranging or you can select a fixed range using manual ranging. Autoranging is convenient because the instrument decides which range to use for each measurement based on the input signal. For faster measurements, use manual ranging on each measurement (some additional time is required for autoranging since the instrument has to make a range selection).
- The range is set to autoranging (AUTO) when the `<range>` parameter is omitted. The resolution is set 5½ digits (MIN) when the `<resolution>` parameter is omitted.
- This command also sets the trigger source to “immediate” and clears all calculation functions.
- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: “`+9.900000E+37`” or “OL” from the front panel.
  - Negative overload: “`-9.900000E+37`” or “–OL” from the front panel.
- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value “`+9.910000E+37`” will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.

Example 1

→ CONF:RES	*This command configures the instrument for 2-wire resistance measurements. The default range (autorange) and resolution (5½ digits) are used.*
→ READ?	*This command places the instrument in the "wait-for-trigger" state, triggers a measurement, and sends the reading to the instrument memory and output buffer.*
← +1.321300E+04	

Example 2

→ CONF:RES 1000, 0.1	*This command configures the instrument for 2-wire resistance measurements. The 1000 Ω range is selected with 0.1 Ω resolution.*
→ INIT	*This command places the instrument in the "wait-for-trigger" state, triggers a measurement, and stores the reading in the instrument memory.*
→ FETC?	*This command transfers the reading from the instrument memory to the output buffer.*
← +4.271500E+02	

See also

"CONFigure?" on page 80

"INITiate[:IMMediate]" on page 120

"FETCh?" on page 315

"READ?" on page 316

CONFigure:CONTinuity

Syntax

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

This command first resets all continuity test parameters and trigger parameters to their default values. Then, it configures the instrument for continuity tests but does not initiate the test. Continuity is a special type of fixed-range 2-wire resistance measurement.

NOTE The `CONFigure:CONTinuity` command does not place the instrument in the “wait-for-trigger” state. Use the `INITiate[:IMMediate]` or `READ?` command in conjunction with the `CONFigure:CONTnuity` to place the instrument in the “wait-for-trigger” state.

Parameters

Item	Type	Range of values	Default value
range	Numeric	• 100 Ω|MIN • 1 kΩ • 10 kΩ • 100 kΩ • 1 MΩ • 10 MΩ • 100 MΩ|MAX • AUTO	1 kΩ

resolution	Numeric	• MAX|MIN (4½ digit)
		  ◦ 10 mΩ
		  ◦ 100 mΩ
		  ◦ 1 Ω
		  ◦ 10 Ω
		  ◦ 100 Ω
		  ◦ 1 kΩ
		  ◦ 10 kΩ
			MAX|MIN

Remarks

- The range is set to 1 kΩ (1 kΩ) when the <range> parameter is omitted.
- The resolution is set 4½ digits (MAX|MIN) when the <resolution> parameter is omitted.
- This command also sets the trigger source to “immediate” and clears all calculation operations.
- From 10 Ω to 1.2 kΩ the actual resistance reading is displayed on the front pane. If the reading exceeds 1.2 kΩ, “OPEn” is displayed on the front panel.
- The FETCh?, READ?, and MEASure:CONTinuity? commands returns the measured resistance, regardless of its value.

Example

→ CONF:CONT	*This command configures the instrument for continuity tests. The default range (1 kΩ) and resolution (4½ digits) are used.*
→ READ?	*This command places the instrument in the “wait-for-trigger” state, triggers a measurement, and sends the reading to the instrument memory and output buffer.*
← +1.721500E-02	

See also

“CONFigure?” on page 80

“INITiate[:IMMediate]” on page 120

“FETCh?” on page 315

“READ?” on page 316

CONFigure:LRESistance

Syntax

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

This command first resets all low-resistance measurement parameters and trigger parameters to their default values. Then, it configures the instrument for 4-wire low-resistance measurements but does not initiate the measurement.

NOTE

The `CONFigure:LRESistance` command does not place the instrument in the “wait-for-trigger” state. Use the `INITiate[:IMMediate]` or `READ?` command in conjunction with the `CONFigure:LRESistance` to place the instrument in the “wait-for-trigger” state.

Parameters

Item	Type	Range of values		Default value
range	Numeric	• 100 mΩ|MIN • 1000 mΩ • 10 Ω|MAX • AUTO		AUTO

resolution	Numeric	• MAX (4½ digit)
		  • 10 uΩ
		  • 100 uΩ
		  • 1 mΩ
			• MIN (5½ digit)
			  • 1 uΩ
			  • 10 uΩ
			  • 100 uΩ
				MIN

Remarks

- You can allow the instrument to automatically select the measurement range using autoranging or you can select a fixed range using manual ranging. Autoranging is convenient because the instrument decides which range to use for each measurement based on the input signal. For faster measurements, use manual ranging on each measurement (some additional time is required for autoranging since the instrument has to make a range selection).
- The range is set to autoranging (AUTO) when the `<range>` parameter is omitted. The resolution is set 5½ digits (MIN) when the `<resolution>` parameter is omitted.
- This command also sets the trigger source to "immediate" and clears all calculation functions.
- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: "`+9.900000E+37`" or "OL" from the front panel.
  - Negative overload: "`-9.900000E+37`" or "–OL" from the front panel.
- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value "`+9.910000E+37`" will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.
- For measuring low-resistance, a delayed response should be expected from the front panel display. For remote interface operation, increase the SCPI query timeout value. (Typically 15000 ms.)

Example 1

→ `CONF:LRES`	*This command configures the instrument for 4-wire low-resistance measurements. The default range (autorange) and resolution (5½ digits) are used.*
→ `READ?`	*This command places the instrument in the "wait-for-trigger" state, triggers a measurement, and sends the reading to the instrument memory and output buffer.*
← `+2.931830E-03`	

Example 2

→ `CONF:LRES 1, 0.00001`	*This command configures the instrument for 4-wire low-resistance measurements. The 1000 mΩ range is selected with 10 uΩ resolution.*
→ `INIT`	*This command places the instrument in the "wait-for-trigger" state, triggers a measurement, and stores the reading in the instrument memory.*
→ `FETC?`	*This command transfers the reading from the instrument memory to the output buffer.*
← `+4.154700E-02`	

See also

"CONFigure?" on page 80

"INITiate[:IMMediate]" on page 120

"FETCh?" on page 315

"READ?" on page 316

CONFigure:CAPacitance

Syntax

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

This command first resets all capacitance measurement parameters and trigger parameters to their default values. Then, it configures the instrument for capacitance measurements but does not initiate the measurement.

NOTE The `CONFigure:CAPacitance` command does not place the instrument in the "wait-for-trigger" state. Use the `INITiate[:IMMediate]` or `READ?` command in conjunction with the `CONFigure:CAPacitance` to place the instrument in the "wait-for-trigger" state.

Parameters

Item	Type	Range of values	Default value
range	Discrete	• 1 nF|MIN • 10 nF • 100 nF • 1 uF • 10 uF • 100 uF • 1 mF • 10 mF|MAX • AUTO	AUTO

resolution	Discrete	• MIN|MAX (3½ digit)
		  • 1 pF
		  • 10 pF
		  • 100 pF
		  • 1 nF
		  • 10 nF
		  • 100 nF
		  • 1 uF
		  • 1 uF (4½ digit)
			MIN|MAX

Remarks

- You can allow the instrument to automatically select the measurement range using autoranging or you can select a fixed range using manual ranging. Autoranging is convenient because the instrument decides which range to use for each measurement based on the input signal. For faster measurements, use manual ranging on each measurement (some additional time is required for autoranging since the instrument has to make a range selection).
- The range is set to autoranging (AUTO) when the `<range>` parameter is omitted. The resolution is set 3½ digits (MIN|MAX) when the `<resolution>` parameter is omitted.
- This command also sets the trigger source to “immediate” and clears all calculation functions.
- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: “`+9.900000E+37`” or “OL” from the front panel.
  - Negative overload: “`-9.900000E+37`” or “–OL” from the front panel.
- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value “`+9.910000E+37`” will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.
- For measuring capacitance values greater than 1 mF, a delayed response should be expected from the front panel display. For remote interface operation, increase the SCPI query timeout value. (Typically more than 10000 ms.)

Example 1

→ CONF:CAP	*This command configures the instrument for capacitance measurements. The default range (autorange) and resolution (3½ digits) are used.*
→ READ?	*This command places the instrument in the "wait-for-trigger" state, triggers a measurement, and sends the reading to the instrument memory and output buffer.*
← +4.545300E-11	

Example 2

→ CONF:CAP 100n, 100p	*This command configures the instrument for capacitance measurements. The 100 nF range is selected with 100 pF resolution.*
→ INIT	*This command places the instrument in the "wait-for-trigger" state, triggers a measurement, and stores the reading in the instrument memory.*
→ FETC?	*This command transfers the reading from the instrument memory to the output buffer.*
← +4.288699E-11	

See also

"CONFigure?" on page 80

"INITiate[:IMMediate]" on page 120

"FETCh?" on page 315

"READ?" on page 316

CONFigure:DIODe

Syntax

```
CONFigure:DIODe
```

This command first resets all diode test parameters and trigger parameters to their default values. Then, it configures the instrument for diode tests but does not initiate the test.

NOTE The `CONFigure:DIODe` command does not place the instrument in the "wait-for-trigger" state. Use the `INITiate[:IMMediate]` or `READ?` command in conjunction with the `CONFigure:DIODe` to place the instrument in the "wait-for-trigger" state.

Remarks

- The range and resolution are fixed for diode tests. The range is 1 VDC (with a 1 mA or 0.83 mA current source output) and the resolution is set to 4½ digits.
- The voltage is displayed on the front panel if it is in the 0 V to 1.2 V range. The meter beeps when the signal transitions to the 0.3 V to 0.8 V threshold (unless beep is disabled). If the signal is greater than 1.2 V, "OPEn" is displayed on the front panel.
- The `FETCh?`, `READ?`, and `MEASure:DIODe?` commands all returns the measured voltage, regardless of its value.
- This command also sets the trigger source to "immediate" and clears all calculation functions.

Example

→ CONF:DIOD	*This command configures the instrument for diode tests.*
→ READ?	*This command places the instrument in the "wait-for-trigger" state, triggers a measurement, and sends the reading to the instrument memory and output buffer.*
← +1.321300E-01	

See also

"CONFigure?" on page 80

"INITiate[:IMMediate]" on page 120

"FETCh?" on page 315

"READ?" on page 316

CONFigure:FREQuency

Syntax

`CONFigure:FREQuency`

This command first resets all frequency measurement parameters and trigger parameters to their default values. Then, it configures the instrument for frequency measurements but does not initiate the measurement.

There are two measuring paths for the frequency measurement — voltage or current. Therefore, before setting the frequency measurement, you have to configure the voltage (see "CONFigure[:VOLTage]:AC" on page 84) or current (see "CONFigure:CURRent:AC" on page 93) measurements first.

NOTE

- The range and resolution of the frequency measurement follows the configuration of the AC voltage or the AC current function.
- The `CONFigure:FREQuency` command does not place the instrument in the "wait-for-trigger" state. Use the `INITiate[:IMMediate]` or `READ?` command in conjunction with the `CONFigure:FREQuency` to place the instrument in the "wait-for-trigger" state.

CAUTION

If the frequency signal measured is below 20 Hz, you must manually set the range of the AC voltage or AC current measurement to acquire a stable reading.

Remarks

- This command also sets the trigger source to "immediate" and clears all calculation functions.
- When no signal is applied, "`0`" is returned.
- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range

- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: "+9.900000E+37" or "OL" from the front panel.
  - Negative overload: "-9.900000E+37" or "–OL" from the front panel.
- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value "+9.910000E+37" will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.

Example

→ CONF:CURR:AC	*This command configures the instrument for AC current measurements. The default range (autorange) and resolution (5½ digits) are used.*
→ CONF:FREQ	*This command configures the instrument for frequency measurements via the current path. The range and resolution follows the configuration of the AC current function.*
→ READ?	*This command places the instrument in the "wait-for-trigger" state, triggers a measurement, and sends the reading to the instrument memory and output buffer.*
← +1.012300E+02	

See also

"CONFigure?" on page 80

"CONFigure[:VOLTage]:AC" on page 84

"CONFigure:CURRent:AC" on page 93

"INITiate[:IMMediate]" on page 120

"FETCh?" on page 315

"READ?" on page 316

CONFigure:PWIDth

Syntax

`CONFigure:PWIDth`

This command first resets all pulse width measurement parameters and trigger parameters to their default values. Then, it configures the instrument for pulse width measurements but does not initiate the measurement.

There are two measuring paths for the pulse width measurement — voltage or current. Therefore, before setting the frequency measurement, you have to configure the voltage (see "CONFigure[:VOLTage]:AC" on page 84) or current (see "CONFigure:CURRent:AC" on page 93) measurements first.

NOTE

- The range and resolution of the pulse width measurement follows the configuration of the AC voltage or the AC current function.
- The `CONFigure:PWIDth` command does not place the instrument in the "wait-for-trigger" state. Use the `INITiate[:IMMediate]` or `READ?` command in conjunction with the `CONFigure:PWIDth` to place the instrument in the "wait-for-trigger" state.

CAUTION

If the frequency signal measured is below 20 Hz, you must manually set the range of the AC voltage or AC current measurement to acquire a stable reading.

Remarks

- This command also sets the trigger source to "immediate" and clears all calculation functions.
- When no signal is applied, "`0`" is returned.
- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range

- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: "`+9.900000E+37`" or "OL" from the front panel.
  - Negative overload: "`-9.900000E+37`" or "–OL" from the front panel.
- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value "`+9.910000E+37`" will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.

Example

→ `CONF:AC`	*This command configures the instrument for AC voltage measurements. The default range (autorange) and resolution (5½ digits) are used.*
→ `CONF:PWID`	*This command configures the instrument for pulse width measurements via the voltage path. The range and resolution follows the configuration of the AC voltage function.*
→ `READ?`	*This command places the instrument in the "wait-for-trigger" state, triggers a measurement, and sends the reading to the instrument memory and output buffer.*
← `+2.403553E-05`	

See also

"CONFigure?" on page 80

"CONFigure[:VOLTage]:AC" on page 84

"CONFigure:CURRent:AC" on page 93

"INITiate[:IMMediate]" on page 120

"FETCh?" on page 315

"READ?" on page 316

CONFigure:DCYCle

Syntax

`CONFigure:DCYCle`

This command first resets all duty cycle measurement parameters and trigger parameters to their default values. Then, it configures the instrument for duty cycle measurements but does not initiate the measurement.

There are two measuring paths for the duty cycle measurement — voltage or current. Therefore, before setting the frequency measurement, you have to configure the voltage (see “CONFigure[:VOLTage]:AC” on page 84) or current (see “CONFigure:CURRent:AC” on page 93) measurements first.

NOTE

- The range and resolution of the duty cycle measurement follows the configuration of the AC voltage or the AC current function.
- The `CONFigure:DCYCle` command does not place the instrument in the “wait-for-trigger” state. Use the `INITiate[:IMMediate]` or `READ?` command in conjunction with the `CONFigure:DCYCle` to place the instrument in the “wait-for-trigger” state.

CAUTION

If the frequency signal measured is below 20 Hz, you must manually set the range of the AC voltage or AC current measurement to acquire a stable reading.

Remarks

- This command also sets the trigger source to “immediate” and clears all calculation functions.
- When no signal is applied, “`0`” is returned.
- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range

- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: “`+9.900000E+37`” or “OL” from the front panel.
  - Negative overload: “`-9.900000E+37`” or “–OL” from the front panel.
- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value “`+9.910000E+37`” will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.

Example

→ `CONF:AC`	*This command configures the instrument for AC voltage measurements. The default range (autorange) and resolution (5½ digits) are used.*
→ `CONF:DCYC`	*This command configures the instrument for duty cycle measurements via the voltage path. The range and resolution follows the configuration of the AC voltage function.*
→ `READ?`	*This command places the instrument in the “wait-for-trigger” state, triggers a measurement, and sends the reading to the instrument memory and output buffer.*
← `+4.982930E+01`	

See also

“CONFigure?” on page 80

“CONFigure[:VOLTage]:AC” on page 84

“CONFigure:CURRent:AC” on page 93

“INITiate[:IMMediate]” on page 120

“FETCh?” on page 315

“READ?” on page 316

5
INITiate Subsystem

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This chapter describes the INITiate commands used to program the U3606A over a remote interface. Use the INITiate commands to change the state of the triggering system in the U3606A.

INITiate[:IMMediate]

Syntax

`INITiate[:IMMediate]`

This command changes the state of the triggering system from the "idle" state to the "wait-for-trigger" state. Measurements will begin when the specified trigger conditions are satisfied following the receipt of the `INITiate`[:IMMediate] command.

NOTE The `INITiate[:IMMediate]` command also clears the previous reading from memory.

Remarks

- Storing readings in the memory using the `INITiate[:IMMediate]` command is faster than sending readings to the output buffer using the `READ?` command.
- To retrieve the readings from memory, use the `FETCh?` command. The `ABORt` command may be used to return to idle.

Example

→ CONF 10, 0.0001	*This command configures the instrument for DC voltage measurements. The 10 V range is selected with 0.1 mV resolution.*
→ TRIG:SOUR BUS	*This command selects the bus (software) trigger source.*
→ INIT	*This command places the instrument in the "wait-for-trigger" state, triggers a measurement, and stores the reading in the instrument memory.*
→ *TRG	*This command triggers the instrument.*
→ FETC?	*This command transfers the reading from the instrument memory to the output buffer.*
← +4.271500E-03	

See also

"FETCh?" on page 315

"READ?" on page 316

"ABORt" on page 314

"TRIGger:SOURce" on page 310

"*TRG" on page 333

INITiate:CONTinuous

Syntax

`INITiate:CONTinuous {0|1|OFF|ON}`

This command sets the state of the initiate continuous mode. If the state is set to `ON`, the measurements will be in free run (continuous) mode and you can just use the `FETCh?` command to acquire readings without triggering the source multimeter.

- `0|OFF`: Initiates triggering mode
- `1|ON`: Initiates continuous mode

NOTE Sending the `INITiate[:IMMediate]` and the `READ?` command will set the state of the initiate continuous mode to `OFF`.

`INITiate:CONTinuous?`

This query returns a boolean value that represents the initiate continuous mode.

Parameter

Item	Type	Range of values	Default value
continuous	Boolean	0|1|OFF|ON	1

Example

→ CONF 10, 0.0001	*This command configures the instrument for DC voltage measurements. The 10 V range is selected with 0.1 mV resolution.*
→ INIT:CONT ON	*This command places the instrument in the free-run mode. Measurements are made continuously and the readings are stored in the instrument memory.*
→ FETC?	*This command transfers the reading from the instrument memory to the output buffer.*
← +4.271500E-03	

See also

"INITiate[:IMMediate]" on page 120

"FETCh?" on page 315

"READ?" on page 316

6
MEASure Subsystem

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This chapter describes the MEASure commands used to program the U3606A over a remote interface. The MEASure? command provides the easiest way to program the U3606A for measurements. When you execute this command, the U3606A immediately performs the measurement. The reading is sent directly to the U3606A output buffer.

NOTE Some measurements may result in a delayed response time in the U3606A Multimeter | DC Power Supply. It is recommended that you increase the SCPI query timeout to 15000 milliseconds or longer to avoid SCPI query timeout errors.

MEASure[:VOLTage][:DC]?

Syntax

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

This command first resets all DC voltage measurement parameters and trigger parameters to their default values. Then, it configures the instrument for DC voltage measurements and immediately triggers a measurement. A single reading is returned.

Parameters

Item	Type	Range of values		Default value
range	Numeric	• 20 mV|MIN • 100 mV • 1 V • 10 V • 100 V • 1000 V|MAX • AUTO		AUTO
resolution	Numeric	• MAX (4½ digit) ◦ 1 uV ◦ 10 uV ◦ 100 uV ◦ 1 mV ◦ 10 mV ◦ 100 mV	• MIN (5½ digit) ◦ 0.1 uV ◦ 1 uV ◦ 10 uV ◦ 100 uV ◦ 1 mV ◦ 10 mV	MIN

Remarks

- You can allow the instrument to automatically select the measurement range using autoranging or you can select a fixed range using manual ranging. Autoranging is convenient because the instrument decides which range to use for each measurement based on the input signal. For faster measurements, use manual ranging on each measurement (some additional time is required for autoranging since the instrument has to make a range selection).

- The range is set to autoranging (AUTO) when the `<range>` parameter is omitted. The resolution is set 5½ digits (MIN) when the `<resolution>` parameter is omitted.
- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: "`+9.900000E+37`" or "OL" from the front panel.
  - Negative overload: "`-9.900000E+37`" or "–OL" from the front panel.
- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value "`+9.910000E+37`" will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.

Example

→ `MEAS?`	*This command configures the instrument for DC voltage measurements, triggers the instrument to take a reading, and then transfers the reading to the instrument output buffer. The default range (autorange) and resolution (5½ digits) are used.*

← `+9.983721E+00`

Example 2

→ `MEAS? 1, 0.00001`	*This command configures the instrument for DC voltage measurements, triggers the instrument to take a reading, and then transfers the reading to the instrument output buffer. The 1 V range is selected with a 10 µV resolution.*

← `+4.271508E-05`

MEASure[:VOLTage]:AC?

Syntax

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

This command first resets all AC voltage measurement parameters and trigger parameters to their default values. Then, it configures the instrument for AC voltage measurements and immediately triggers a measurement. A single reading is returned.

CAUTION

- The maximum range parameter is 750 V_{rms}, which is set by MAX. The rms voltage is waveform dependent. A sine wave is limited to 750 V_{ac} (rms), but a 1000 V_{pk} square wave is safe. Connections to AC MAINS are further limited to CAT II (300V).
- See the "Safety Information" section in the *U3606A User's and Service Guide* for a complete discussion of the safety features, and the procedures for safe operation of this instrument.

Parameters

Item	Type	Range of values		Default value
range	Numeric	• 100 mV|MIN • 1 V • 10 V • 100 V • 750 V|MAX • AUTO		AUTO
resolution	Numeric	• MAX (4½ digit) ◦ 10 uV ◦ 100 uV ◦ 1 mV ◦ 10 mV ◦ 100 mV	• MIN (5½ digit) ◦ 1 uV ◦ 10 uV ◦ 100 uV ◦ 1 mV ◦ 10 mV	MIN

Remarks

- You can allow the instrument to automatically select the measurement range using autoranging or you can select a fixed range using manual ranging. Autoranging is convenient because the instrument decides which range to use for each measurement based on the input signal. For faster measurements, use manual ranging on each measurement (some additional time is required for autoranging since the instrument has to make a range selection).
- The range is set to autoranging (AUTO) when the `<range>` parameter is omitted. The resolution is set 5½ digits (MIN) when the `<resolution>` parameter is omitted.
- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: "`+9.900000E+37`" or "OL" from the front panel.
  - Negative overload: "`-9.900000E+37`" or "–OL" from the front panel.
- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value "`+9.910000E+37`" will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.

Example 1

→ MEAS:AC?	*This command configures the instrument for AC voltage measurements, triggers the instrument to take a reading, and then transfers the reading to the instrument output buffer. The default range (autorange) and resolution (5½ digits) are used.*

← +3.769443E-03

Example 2

→ MEAS:AC? 1	*This command configures the instrument for AC voltage measurements, triggers the instrument to take a reading, and then transfers the reading to the instrument output buffer. The 1 V range is selected.*

← +1.516957E-03

MEASure[:VOLTage]:ACDC|DCAC?

Syntax

```
MEASure[:VOLTage]:ACDC|DCAC?
   [<range>|AUTO|MAX|MIN|DEF[,{<resolution>|MAX|MIN|DEF}]]
```

This command first resets all AC+DC voltage measurement parameters and trigger parameters to their default values. Then, it configures the instrument for AC+DC voltage measurements and immediately triggers a measurement. A single reading is returned.

CAUTION

- The maximum range parameter is 750 V_{rms}, which is set by MAX. The rms voltage is waveform dependent. A sine wave is limited to 750 V_{ac} (rms), but a 1000 V_{pk} square wave is safe. Connections to AC MAINS are further limited to CAT II (300V).
- See the "Safety Information" section in the *U3606A User's and Service Guide* for a complete discussion of the safety features, and the procedures for safe operation of this instrument.

Parameters

Item	Type	Range of values		Default value
range	Numeric	• 100 mV|MIN • 1 V • 10 V • 100 V • 750 V|MAX • AUTO		AUTO

resolution	Numeric	• MAX (4½ digit)
		  ◦ 10 uV
		  ◦ 100 uV
		  ◦ 1 mV
		  ◦ 10 mV
		  ◦ 100 mV
			• MIN (5½ digit)
			  ◦ 1 uV
			  ◦ 10 uV
			  ◦ 100 uV
			  ◦ 1 mV
			  ◦ 10 mV
				MIN

Remarks

- You can allow the instrument to automatically select the measurement range using autoranging or you can select a fixed range using manual ranging. Autoranging is convenient because the instrument decides which range to use for each measurement based on the input signal. For faster measurements, use manual ranging on each measurement (some additional time is required for autoranging since the instrument has to make a range selection).
- The range is set to autoranging (AUTO) when the `<range>` parameter is omitted. The resolution is set 5½ digits (MIN) when the `<resolution>` parameter is omitted.
- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: "`+9.900000E+37`" or "OL" from the front panel.
  - Negative overload: "`-9.900000E+37`" or "–OL" from the front panel.
- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value "`+9.910000E+37`" will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.

Example 1

→ MEAS:ACDC?	*This command configures the instrument for AC+DC voltage measurements, triggers the instrument to take a reading, and then transfers the reading to the instrument output buffer. The default range (autorange) and resolution (5½ digits) are used.*

← +9.984319E+00

Example 2

→ MEAS:ACDC? 10, 0.001	*This command configures the instrument for AC+DC voltage measurements, triggers the instrument to take a reading, and then transfers the reading to the instrument output buffer. The 10 V range is selected with 1 mV resolution.*

← +9.9839877E+00

MEASure:CURRent[:DC]?

Syntax

```
MEASure:CURRent[:DC]?
   [<range>|AUTO|MAX|MIN|DEF[,{<resolution>|MAX|MIN|DEF}]]
```

This command first resets all DC current measurement parameters and trigger parameters to their default values. Then, it configures the instrument for DC current measurements and immediately triggers a measurement. A single reading is returned.

Parameters

Item	Type	Range of values		Default value
range	Numeric	• 10 mA|MIN • 100 mA • 1000 mA • 3 A|MAX • AUTO		AUTO
resolution	Numeric	• MAX (4½ digit) ◦ 1 uA ◦ 10 uA ◦ 100 uA ◦ 1 mA	• MIN (5½ digit) ◦ 0.1 uA ◦ 1 uA ◦ 10 uA ◦ 100 uA	MIN

Remarks

- You can allow the instrument to automatically select the measurement range using autoranging or you can select a fixed range using manual ranging. Autoranging is convenient because the instrument decides which range to use for each measurement based on the input signal. For faster measurements, use manual ranging on each measurement (some additional time is required for autoranging since the instrument has to make a range selection).
- The range is set to autoranging (AUTO) when the `<range>` parameter is omitted. The resolution is set 5½ digits (MIN) when the `<resolution>` parameter is omitted.

- The range is set to autoranging (AUTO) when the `<range>` parameter is omitted. The resolution is set 5½ digits (MIN) when the `<resolution>` parameter is omitted.
- This command also sets the trigger source to "immediate" and clears all calculation functions.
- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: "`+9.900000E+37`" or "OL" from the front panel.
  - Negative overload: "`-9.900000E+37`" or "–OL" from the front panel.
- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value "`+9.910000E+37`" will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.

Example 1

→ `MEAS:CURR?`	*This command configures the instrument for DC current measurements, triggers the instrument to take a reading, and then transfers the reading to the instrument output buffer. The default range (autorange) and resolution (5½ digits) are used.*

← `+0.203200E+00`

Example 2

→ `MEAS:CURR? 1, 0.0001`	*This command configures the instrument for DC current measurements, triggers the instrument to take a reading, and then transfers the reading to the instrument output buffer. The 1 A range is selected with 100 µA resolution.*

← `+0.223407E+00`

MEASure:CURRent:AC?

Syntax

```
MEASure:CURRent:AC?
   [<range>|AUTO|MAX|MIN|DEF[,{<resolution>|MAX|MIN|DEF}]]
```

This command first resets all AC current measurement parameters and trigger parameters to their default values. Then, it configures the instrument for AC current measurements and immediately triggers a measurement. A single reading is returned.

Parameters

Item	Type	Range of values		Default value
range	Numeric	• 10 mA|MIN • 100 mA • 1000 mA • 3 A|MAX • AUTO		AUTO
resolution	Numeric	• MAX (4½ digit) ◦ 1 uA ◦ 10 uA ◦ 100 uA ◦ 1 mA	• MIN (5½ digit) ◦ 0.1 uA ◦ 1 uA ◦ 10 uA ◦ 100 uA	MIN

Remarks

- You can allow the instrument to automatically select the measurement range using autoranging or you can select a fixed range using manual ranging. Autoranging is convenient because the instrument decides which range to use for each measurement based on the input signal. For faster measurements, use manual ranging on each measurement (some additional time is required for autoranging since the instrument has to make a range selection).
- The range is set to autoranging (AUTO) when the `<range>` parameter is omitted. The resolution is set 5½ digits (MIN) when the `<resolution>` parameter is omitted.

- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range

- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: "`+9.900000E+37`" or "OL" from the front panel.
  - Negative overload: "`-9.900000E+37`" or "–OL" from the front panel.
- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value "`+9.910000E+37`" will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.

Example 1

→ `MEAS:CURR:AC?`	*This command configures the instrument for AC current measurements, triggers the instrument to take a reading, and then transfers the reading to the instrument output buffer. The default range (autorange) and resolution (5½ digits) are used.*

← `+8.545300E-02`

Example 2

→ `MEAS:CURR:AC? 1, 0.0001`	*This command configures the instrument for AC current measurements, triggers the instrument to take a reading, and then transfers the reading to the instrument output buffer. The 1 A range is selected with 100 μA resolution.*

← `+8.632510E-02`

MEASure:CURRent:ACDC|DCAC?

Syntax

```
MEASure:CURRent:ACDC|DCAC?
   [<range>|AUTO|MAX|MIN|DEF[,{<resolution>|MAX|MIN|DEF}]]
```

This command first resets all AC+DC current measurement parameters and trigger parameters to their default values. Then, it configures the instrument for AC+DC current measurements and immediately triggers a measurement. A single reading is returned.

Parameters

Item	Type	Range of values		Default value
range	Numeric	• 10 mA|MIN • 100 mA • 1000 mA • 3 A|MAX • AUTO		AUTO
resolution	Numeric	• MAX (4½ digit) ◦ 1 uA ◦ 10 uA ◦ 100 uA ◦ 1 mA	• MIN (5½ digit) ◦ 0.1 uA ◦ 1 uA ◦ 10 uA ◦ 100 uA	MIN

Remarks

- You can allow the instrument to automatically select the measurement range using autoranging or you can select a fixed range using manual ranging. Autoranging is convenient because the instrument decides which range to use for each measurement based on the input signal. For faster measurements, use manual ranging on each measurement (some additional time is required for autoranging since the instrument has to make a range selection).
- The range is set to autoranging (AUTO) when the `<range>` parameter is omitted. The resolution is set 5½ digits (MIN) when the `<resolution>` parameter is omitted.

- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range

- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: "`+9.900000E+37`" or "OL" from the front panel.
  - Negative overload: "`-9.900000E+37`" or "–OL" from the front panel.
- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value "`+9.910000E+37`" will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.

Example 1

→ `MEAS:CURR:ACDC?`	*This command configures the instrument for AC+DC current measurements, triggers the instrument to take a reading, and then transfers the reading to the instrument output buffer. The default range (autorange) and resolution (5½ digits) are used.*

← `+9.535700E-02`

Example 2

→ `MEAS:CURR:ACDC? 1, 0.0001`	*This command configures the instrument for AC+DC current measurements, triggers the instrument to take a reading, and then transfers the reading to the instrument output buffer. The 1 A range is selected with 100 µA resolution.*

← `+9.832310E-02`

MEASure:RESistance?

Syntax

```
MEASure:RESistance?
   [<range>|AUTO|MAX|MIN|DEF[,{<resolution>|MAX|MIN|DEF}]]
```

This command first resets all resistance measurement parameters and trigger parameters to their default values. Then, it configures the instrument for 2-wire resistance measurements and immediately triggers a measurement. A single reading is returned.

Parameters

Item	Type	Range of values		Default value
range	Numeric	• 100 Ω|MIN • 1 kΩ • 10 kΩ • 100 kΩ • 1 MΩ • 10 MΩ • 100 MΩ|MAX • AUTO		AUTO
resolution	Numeric	• MAX (4½ digit) ◦ 10 mΩ ◦ 100 mΩ ◦ 1 Ω ◦ 10 Ω ◦ 100 Ω ◦ 1 kΩ ◦ 10 kΩ	• MIN (5½ digit) ◦ 1 mΩ ◦ 10 mΩ ◦ 100 mΩ ◦ 1 Ω ◦ 10 Ω ◦ 100 Ω ◦ 1 kΩ	MIN

Remarks

- You can allow the instrument to automatically select the measurement range using autoranging or you can select a fixed range using manual ranging. Autoranging is convenient because the instrument decides which range to use for each measurement based on the input signal. For faster measurements, use manual ranging on each measurement (some additional time is required for autoranging since the instrument has to make a range selection).
- The range is set to autoranging (AUTO) when the `<range>` parameter is omitted. The resolution is set 5½ digits (MIN) when the `<resolution>` parameter is omitted.
- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: "`+9.900000E+37`" or "OL" from the front panel.
  - Negative overload: "`-9.900000E+37`" or "–OL" from the front panel.
- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value "`+9.910000E+37`" will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.

Example 1

→ MEAS:RES?	*This command configures the instrument for 2-wire resistance measurements, triggers the instrument to take a reading, and then transfers the reading to the instrument output buffer. The default range (autorange) and resolution (5½ digits) are used.*

← +1.321300E+04

Example 2

→ MEAS:RES? 1000, 0.1	*This command configures the instrument for 2-wire resistance measurements, triggers the instrument to take a reading, and then transfers the reading to the instrument output buffer. The 1000Ω range is selected with 0.1 Ω resolution.*

← +4.271500E+02

MEASure:CONTinuity?

Syntax

```
MEASure:CONTinuity?
   [<range>|AUTO|MAX|MIN|DEF[,{<resolution>|MAX|MIN|DEF}]]
```

This command first resets all continuity test parameters and trigger parameters to their default values. Then, it configures the instrument for continuity tests and immediately triggers the test. Continuity is a special type of fixed-range 2-wire resistance measurement. A single reading is returned.

Parameters

Item	Type	Range of values	Default value
range	Numeric	• 100 Ω|MIN • 1 kΩ • 10 kΩ • 100 kΩ • 1 MΩ • 10 MΩ • 100 MΩ|MAX • AUTO	1 kΩ

resolution	Numeric	• MAX|MIN (4½ digit)
		  ◦ 10 mΩ
		  ◦ 100 mΩ
		  ◦ 1 Ω
		  ◦ 10 Ω
		  ◦ 100 Ω
		  ◦ 1 kΩ
		  ◦ 10 kΩ
			MAX|MIN

Remarks

- The range is set to 1 kΩ (1 kΩ) when the `<range>` parameter is omitted.
- The resolution is set 4½ digits (MAX|MIN) when the `<resolution>` parameter is omitted.

- From 10 Ω to 1.2 kΩ the actual resistance reading is displayed on the front pane. If the reading exceeds 1.2 kΩ, “OPEn” is displayed on the front panel.
- The `MEASure:CONTinuity?` command returns the measured resistance, regardless of its value.

Example

→ `MEAS:CONT?`	*This command configures the instrument for continuity measurements, triggers the instrument to take a reading, and then transfers the reading to the instrument output buffer. The default range (1 kΩ) and resolution (4½ digits) are used.*

← `+1.721500E-02`

MEASure:LRESistance?

Syntax

```
MEASure:LRESistance?
   [<range>|AUTO|MAX|MIN|DEF[,{<resolution>|MAX|MIN|DEF}]]
```

This command first resets all low-resistance measurement parameters and trigger parameters to their default values. Then, it configures the instrument for 4-wire low-resistance measurements and immediately triggers a measurement. A single reading is returned.

Parameters

Item	Type	Range of values		Default value
range	Numeric	• 100 mΩ|MIN • 1000 mΩ • 10 Ω|MAX • AUTO		AUTO
resolution	Numeric	• MAX (4½ digit) ◦ 10 uΩ ◦ 100 uΩ ◦ 1 mΩ	• MIN (5½ digit) ◦ 1 uΩ ◦ 10 uΩ ◦ 100 uΩ	MIN

Remarks

- You can allow the instrument to automatically select the measurement range using autoranging or you can select a fixed range using manual ranging. Autoranging is convenient because the instrument decides which range to use for each measurement based on the input signal. For faster measurements, use manual ranging on each measurement (some additional time is required for autoranging since the instrument has to make a range selection).
- The range is set to autoranging (AUTO) when the `<range>` parameter is omitted. The resolution is set 5½ digits (MIN) when the `<resolution>` parameter is omitted.
- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range

- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: "`+9.900000E+37`" or "OL" from the front panel.
  - Negative overload: "`-9.900000E+37`" or "–OL" from the front panel.
- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value "`+9.910000E+37`" will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.
- For measuring low-resistance a delayed response should be expected from the front panel display. For remote interface operation, increase the SCPI query timeout value. (Typically 15000 ms.)

Example 1

→ `MEAS:LRES?`	*This command configures the instrument for 4-wire low-resistance measurements, triggers the instrument to take a reading, and then transfers the reading to the instrument output buffer. The default range (autorange) and resolution (5½ digits) are used.*

← `+2.931830E-03`

Example 2

→ `MEAS:LRES? 1, 0.00001`	*This command configures the instrument for 4-wire low-resistance measurements, triggers the instrument to take a reading, and then transfers the reading to the instrument output buffer. The 1000 mΩ range is selected with 10 uΩ resolution.*

← `+4.154700E-02`

MEASure:CAPacitance?

Syntax

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

This command first resets all capacitance measurement parameters and trigger parameters to their default values. Then, it configures the instrument for capacitance measurements and immediately triggers a measurement. A single reading is returned.

Parameters

Item	Type	Range of values	Default value
range	Discrete	• 1 nF|MIN • 10 nF • 100 nF • 1 uF • 10 uF • 100 uF • 1 mF • 10 mF|MAX • AUTO	AUTO

resolution	Discrete	• MIN|MAX (3½ digit)
		  • 1 pF
		  • 10 pF
		  • 100 pF
		  • 1 nF
		  • 10 nF
		  • 100 nF
		  • 1 uF
		  • 1 uF (4½ digit)
			MIN|MAX

Remarks

- You can allow the instrument to automatically select the measurement range using autoranging or you can select a fixed range using manual ranging. Autoranging is convenient because the instrument decides which range to use for each measurement based on the input signal. For faster measurements, use manual ranging on each measurement (some additional time is required for autoranging since the instrument has to make a range selection).
- The range is set to autoranging (AUTO) when the `<range>` parameter is omitted. The resolution is set 3½ digits (MIN|MAX) when the `<resolution>` parameter is omitted.
- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: "`+9.900000E+37`" or "OL" from the front panel.
  - Negative overload: "`-9.900000E+37`" or "–OL" from the front panel.
- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value "`+9.910000E+37`" will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.
- For measuring capacitance values greater than 1 mF, a delayed response should be expected from the front panel display. For remote interface operation, increase the SCPI query timeout value. (Typically > 10000 ms.)

Example 1

→ MEAS:CAP?	*This command configures the instrument for capacitance measurements, triggers the instrument to take a reading, and then transfers the reading to the instrument output buffer. The default range (autorange) and resolution (3½ digits) are used.*

← +4.545300E-11

Example 2

→ MEAS:CAP? 100n, 100p	*This command configures the instrument for capacitance measurements, triggers the instrument to take a reading, and then transfers the reading to the instrument output buffer. The 100 nF range is selected with 100 pF resolution.*

← +4.288699E-11

MEASure:DIODe?

Syntax

```
MEASure:DIODe?
```

This command first resets all diode test parameters and trigger parameters to their default values. Then, it configures the instrument for diode tests and immediately triggers the test. A single reading is returned.

Remarks

- The range and resolution are fixed for diode tests. The range is 1 VDC (with a 1 mA current source output) and the resolution is set to 4½ digits.
- The voltage is displayed on the front panel if it is in the 0 V to 1.2 V range. The meter beeps when the signal transitions to the 0.3 V to 0.8 V threshold (unless beep is disabled). If the signal is greater than 1.2 V, “OPEn” is displayed on the front panel.
- The `MEASure:DIODe?` command returns the measured voltage, regardless of its value.

Example

→ `MEAS:DIOD?`	*This command configures the instrument for continuity measurements, triggers the instrument to take a reading, and then transfers the reading to the instrument output buffer.*

← `+1.321300E-01`

MEASure:FREQuency?

Syntax

`MEASure:FREQuency?`

This command first resets all frequency measurement parameters and trigger parameters to their default values. Then, it configures the instrument for frequency measurements and immediately triggers a measurement. A single reading is returned.

There are two measuring paths for the frequency measurement — voltage or current. Therefore, before setting the frequency measurement, you have to configure the voltage (see "MEASure[:VOLTage]:AC?" on page 128) or current (see "MEASure:CURRent:AC?" on page 136) measurements first.

NOTE The range and resolution of the frequency measurement follow the configuration of the AC voltage or the AC current function.

CAUTION If the frequency signal measured is below 20 Hz, you must manually set the range of the AC voltage or AC current measurement to acquire a stable reading.

Remarks

- When no signal is applied, "`0`" is returned.
- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: "`+9.900000E+37`" or "OL" from the front panel.
  - Negative overload: "`-9.900000E+37`" or "–OL" from the front panel.
- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value "`+9.910000E+37`" will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.

Example

→ CONF:CURR:AC	*This command configures the instrument for AC current measurements. The default range (autorange) and resolution (5½ digits) are used.*
→ MEAS:FREQ?	*This command configures the instrument for continuity measurements via the current path, triggers the instrument to take a reading, and then transfers the reading to the instrument output buffer. The range and resolution follows the configuration of the AC current function.*
← +1.012300E+02	

See also

"MEASure[:VOLTage][:DC]?" on page 126

"MEASure[:VOLTage]:AC?" on page 128

"MEASure:CURRent:AC?" on page 136

MEASure:PWIDth?

Syntax

```
MEASure:PWIDth?
```

This command first resets all pulse width measurement parameters and trigger parameters to their default values. Then, it configures the instrument for pulse width measurements and immediately triggers a measurement. A single reading is returned.

There are two measuring paths for the pulse width measurement — voltage or current. Therefore, before setting the frequency measurement, you have to configure the voltage (see "MEASure[:VOLTage]:AC?" on page 128) or current (see "MEASure:CURRent:AC?" on page 136) measurements first.

NOTE The range and resolution of the pulse width measurement follow the configuration of the AC voltage or the AC current function.

CAUTION If the frequency signal measured is below 20 Hz, you must manually set the range of the AC voltage or AC current measurement to acquire a stable reading.

Remarks

- When no signal is applied, "0" is returned.
- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: "+9.900000E+37" or "OL" from the front panel.
  - Negative overload: "-9.900000E+37" or "–OL" from the front panel.
- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value "+9.910000E+37" will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.

Example

→ `CONF:AC`	*This command configures the instrument for AC voltage measurements. The default range (autorange) and resolution (5½ digits) are used.*
→ `MEAS:PWID?`	*This command configures the instrument for pulse width measurements via the current path, triggers the instrument to take a reading, and then transfers the reading to the instrument output buffer. The range and resolution follows the configuration of the AC current function.*
← `+2.403553E-05`	

See also

"MEASure[:VOLTage][:DC]?" on page 126

"MEASure[:VOLTage]:AC?" on page 128

"MEASure:CURRent:AC?" on page 136

MEASure:DCYCle?

Syntax

```
MEASure:DCYCle?
```

This command first resets all duty cycle measurement parameters and trigger parameters to their default values. Then, it configures the instrument for duty cycle measurements and immediately triggers a measurement. A single reading is returned.

There are two measuring paths for the duty cycle measurement — voltage or current. Therefore, before setting the frequency measurement, you have to configure the voltage (see "MEASure[:VOLTage]:AC?" on page 128) or current (see "MEASure:CURRent:AC?" on page 136) measurements first.

NOTE The range and resolution of the duty cycle measurement follow the configuration of the AC voltage or the AC current function.

CAUTION If the frequency signal measured is below 20 Hz, you must manually set the range of the AC voltage or AC current measurement to acquire a stable reading.

Remarks

- When no signal is applied, "0" is returned.
- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: "+9.900000E+37" or "OL" from the front panel.
  - Negative overload: "-9.900000E+37" or "–OL" from the front panel.
- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value "+9.910000E+37" will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.

Example

→ CONF:AC	*This command configures the instrument for AC voltage measurements. The default range (autorange) and resolution (5½ digits) are used.*
→ MEAS:DCYC?	*This command configures the instrument for duty cycle measurements via the voltage path, triggers the instrument to take a reading, and then transfers the reading to the instrument output buffer. The range and resolution follows the configuration of the AC voltage function.*
← +4.982930E+01	

See also

"MEASure[:VOLTage][:DC]?" on page 126

"MEASure[:VOLTage]:AC?" on page 128

"MEASure:CURRent:AC?" on page 136

7
MEMory Subsystem

MEMory:STATe:RECall:AUTO 158

This chapter describes the MEMory commands used to program the U3606A over a remote interface. Use the `MEMory:STATe:RECall:AUTO` command to enable or disable the automatic recall of the last power-off state when the power is cycled in the instrument.

MEMory:STATe:RECall:AUTO

Syntax

`MEMory:STATe:RECall:AUTO {0|1|OFF|ON}`

This command disables or enables the automatic recall of the last power-down instrument state when power is turned on.

The valid options are:

- `1|ON`: Automatically recalls the last power-off state (storage location 0) when the power is cycled.
- `0|OFF`: A factory reset is issued when the power is cycled.

`MEMory:STATe:RECall:AUTO?`

This query returns a boolean value that represents the automatic recall status of the source multimeter.

Parameter

Item	Type	Range of values	Default value
auto	Boolean	0|1|OFF|ON	1

Remarks

- With the `*SAV` command, you can use location 0 as an extra instrument state. However, keep in mind that location is automatically overwritten with the power-down state when power is cycled.
- When shipped from the factory, storage locations 1 through 16 are empty and the instrument is configured such that a Factory Reset (`*RST` command) is issued when power is cycled.
- A Factory Reset (`*RST` command) does not affect the mode set.

Example

→ MEM:STAT:REC:AUTO OFF	*This command disables the automatic recall of the last power-down state.*
→ MEM:STAT:REC:AUTO?	*This query returns the automatic recall setting.*
← 0	

See also

"*RCL" on page 327

"*RST" on page 328

"*SAV" on page 329

8
OUTPut Subsystem

OUTPut[:STATe] 162

This chapter describes the OUTPut commands used to program the U3606A over a remote interface. Use the `OUTPut[:STATe]` command to enable or disable (standby mode) the output of the instrument.

OUTPut[:STATe]

Syntax

`OUTPut[:STATe] {0|1|OFF|ON}`

This command enables or disables (output on standby) the source output of the source multimeter.

The valid options are:

- `0|OFF`: Output is on standby (the SBY annunciator turns on).
- `1|ON`: Output is active (the OUT annunciator turns on).

NOTE The ramp and scan output will be restarted when output is enabled.

`OUTPut[:STATe]?`

This query returns a boolean value that represents the instrument output state. A returned value of "1" indicates that the output is currently active. A returned value of "0" indicates that the output is currently on standby.

Parameter

Item	Type	Range of values	Default value
state	Boolean	0|1|OFF|ON	0

Example

→ `OUTP ON`	*This command enables the instrument output.*
→ `OUTP?`	*This query returns the output status of the instrument.*
← `1`	

9
SENSe Subsystem

[SENSe:]FUNCtion[:ON] 165
[SENSe:]VOLTage[:DC]:RANGe[:UPPer] 167
[SENSe:]VOLTage[:DC]:RANGe:AUTO 169
[SENSe:]VOLTage[:DC]:RESolution 171
[SENSe:]VOLTage:AC:RANGe[:UPPer] 173
[SENSe:]VOLTage:AC:RANGe:AUTO 175
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[SENSe:]VOLTage:ACDC | DCAC:RANGe[:UPPer] 179
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[SENSe:]CURRent[:DC]:RANGe[:UPPer] 185
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[SENSe:]CURRent:ACDC | DCAC:RANGe[:UPPer] 197
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[SENSe:]RESistance:RANGe[:UPPer] 203
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This chapter describes the SENSe commands used to program the U3606A over a remote interface. Use the SENSe commands to select the range and resolution settings for each measurement function.

[SENSe:]FUNCtion[:ON]

Syntax

```
[SENSe:]FUNCtion[:ON] "<function>"
```

This command selects the measurement function (all function-related measurement attributes are retained).

```
[SENSe:]FUNCtion[:ON]?
```

This query returns a string value that represents the present measurement function. The short form of the function name is always returned (for example, `CURR:AC`, `FREQ:VOLT`, and so on).

Parameter

Item	Type	Range of values	Default value
function	Discrete	Desired function enclosed in quotes: • CAPacitance • CONTinuity • CURRent:AC • CURRent:ACDC • CURRent:DCAC • CURRent[:DC] • DIODe • FREQuency • PWIDth • DCYCle • RESistance • LRESistance • VOLTage:AC • VOLTage:ACDC • VOLTage:DCAC • VOLTage[:DC]	-

Remarks

- If you change the measurement function, all measurement attributes of the previous function (range, resolution, and so on) are remembered. If you return to the original function, all previously-defined measurement attributes will be restored.
- This command has no default value. However, the instrument defaults to DC voltage measurement after a Factory Reset (`*RST` command).

Example

→ `FUNC "VOLT:AC"`	*This command selects the AC voltage function (double or single quotes are allowed).*
→ `FUNC?`	*This query returns the function selected.*
← `VOLT:AC`	

See also

"CONFigure Subsystem" on page 79

[SENSe:]VOLTage[:DC]:RANGe[:UPPer]

Syntax

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

This command selects the measurement range for DC voltage measurements.

```
[SENSe:]VOLTage[:DC]:RANGe[:UPPer]? [{MIN|MAX}]
```

This query returns a numeric value that represents the DC voltage measurement range.

Parameter

Item	Type	Range of values	Default value
range	Numeric	• 20 mV|MIN • 100 mV • 1 V • 10 V • 100 V • 1000 V|MAX • DEF (AUTO)	MIN

Remarks

- Selecting a discrete range will disable autoranging.
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: “+9.900000E+37” or “OL” from the front panel.
  - Negative overload: “-9.900000E+37” or “–OL” from the front panel.
- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value “+9.910000E+37” will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.
- The instrument is set to 100 mV, with autoranging enabled, after a Factory Reset (*RST command).

Example

→ `VOLT:RANG 10`	*This command selects the 10 V range.*
→ `VOLT:RANG?`	*This query returns the range selected.*
← `+1.000000E+01`	

See also

"CONFigure[:VOLTage][:DC]" on page 81

"[SENSe:]VOLTage[:DC]:RANGe:AUTO" on page 169

[SENSe:]VOLTage[:DC]:RANGe:AUTO

Syntax

`[SENSe:]VOLTage[:DC]:RANGe:AUTO <mode>`

This command disables or enables autoranging for DC voltage measurements. Autoranging is convenient because the instrument automatically selects the range for each measurement based on the input signal detected.

`[SENSe:]VOLTage[:DC]:RANGe:AUTO?`

This query returns a boolean value that represents the DC voltage autoranging setting: `0` or `1`

Parameter

Item	Type	Range of values	Default value
auto	Boolean	0|1|OFF|ON	1

Remarks

- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range

- With autoranging enabled, the instrument selects the appropriate range based on the input signal detected.
- Selecting a discrete range (see “[SENSe:]VOLTage[:DC]:RANGe[:UPPer]” on page 167) will disable autoranging.
- The instrument enables autoranging after a Factory Reset (`*RST` command).

Example

→ VOLT:RANG:AUTO OFF	*This command disables autoranging.*
→ VOLT:RANG:AUTO?	*This query returns the autoranging setting.*
← 0	

See also

"CONFigure[:VOLTage][:DC]" on page 81

"[SENSe:]VOLTage[:DC]:RANGe[:UPPer]" on page 167

[SENSe:]VOLTage[:DC]:RESolution

Syntax

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

This command selects the measurement resolution for DC voltage measurements. Specify the resolution in the same units as the selected measurement function, not in number of digits.

`[SENSe:]VOLTage[:DC]:RESolution? [{MIN|MAX}]`

The query returns a numeric value that represents the DC voltage resolution.

Parameter

Item	Type	Range of values		Default value
resolution	Numeric	• MAX (4½ digit) ◦ 1 uV ◦ 10 uV ◦ 100 uV ◦ 1 mV ◦ 10 mV ◦ 100 mV	• MIN (5½ digit) | DEF ◦ 0.1 uV ◦ 1 uV ◦ 10 uV ◦ 100 uV ◦ 1 mV ◦ 10 mV	MIN

Remarks

- For the `<resolution>` parameter, you can substitute `MIN` or `MAX` for a numeric value. `MIN` selects the smallest value accepted, which gives the highest resolution; `MAX` selects the largest value accepted, which gives the least resolution.
- The instrument sets the resolution to 5½ digits after a Factory Reset (`*RST` command).

Example

→ `VOLT:RES 1E-03`	*This command sets the measurement resolution to 1 mV.*
→ `VOLT:RES?`	*This query returns the resolution selected.*
← `+1.000000E-03`	

See also

"CONFigure[:VOLTage][:DC]" on page 81

[SENSe:]VOLTage:AC:RANGe[:UPPer]

Syntax

`[SENSe:]VOLTage:AC:RANGe[:UPPer] {<range>|MIN|MAX|DEF}`

This command selects the measurement range for AC voltage measurements.

`[SENSe:]VOLTage:AC:RANGe[:UPPer]? [{MIN|MAX}]`

This query returns a numeric value that represents the AC voltage measurement range.

Parameter

Item	Type	Range of values	Default value
range	Numeric	• 100 mV|MIN • 1 V • 10 V • 100 V • 1000 V|MAX • DEF (AUTO)	MIN

Remarks

- Selecting a discrete range will disable autoranging.
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: "`+9.900000E+37`" or "OL" from the front panel.
  - Negative overload: "`-9.900000E+37`" or "–OL" from the front panel.
- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value "`+9.910000E+37`" will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.
- The instrument is set to 100 mV, with autoranging enabled, after a Factory Reset (`*RST` command).

Example

→ `VOLT:AC:RANG 10`	*This command selects the 10 V range.*
→ `VOLT:AC:RANG?`	*This query returns the range selected.*
← `+1.000000E+01`	

See also

"CONFigure[:VOLTage]:AC" on page 84

"[SENSe:]VOLTage:AC:RANGe:AUTO" on page 175

[SENSe:]VOLTage:AC:RANGe:AUTO

Syntax

`[SENSe:]VOLTage:AC:RANGe:AUTO <mode>`

This command disables or enables autoranging for AC voltage measurements. Autoranging is convenient because the instrument automatically selects the range for each measurement based on the input signal detected.

`[SENSe:]VOLTage:AC:RANGe:AUTO?`

This query returns a boolean value that represents the AC voltage autoranging setting: `0` or `1`

Parameter

Item	Type	Range of values	Default value
auto	Boolean	0 | 1 | OFF | ON	1

Remarks

- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range
- With autoranging enabled, the instrument selects the appropriate range based on the input signal detected.
- Selecting a discrete range (see “[SENSe:]VOLTage:AC:RANGe[:UPPer]” on page 173) will disable autoranging.
- The instrument enables autoranging after a Factory Reset (`*RST` command).

Example

→	VOLT:RANG:AC:AUTO OFF	*This command disables autoranging.*
→	VOLT:RANG:AC:AUTO?	*This query returns the autoranging setting.*
←	0	

See also

"CONFigure[:VOLTage]:AC" on page 84

"[SENSe:]VOLTage:AC:RANGe[:UPPer]" on page 173

[SENSe:]VOLTage:AC:RESolution

Syntax

```
[SENSe:]VOLTage:AC:RESolution {<resolution>|MIN|MAX|DEF}
```

This command selects the measurement resolution for AC voltage measurements. Specify the resolution in the same units as the selected measurement function, not in number of digits.

```
[SENSe:]VOLTage:AC:RESolution? [{MIN|MAX}]
```

The query returns a numeric value that represents the AC voltage resolution.

Parameter

Item	Type	Range of values		Default value
resolution	Numeric	• MAX (4½ digit) ◦ 10 uV ◦ 100 uV ◦ 1 mV ◦ 10 mV ◦ 100 mV	• MIN (5½ digit) | DEF ◦ 1 uV ◦ 10 uV ◦ 100 uV ◦ 1 mV ◦ 10 mV	MIN

Remarks

- For the <resolution> parameter, you can substitute MIN or MAX for a numeric value. MIN selects the smallest value accepted, which gives the highest resolution; MAX selects the largest value accepted, which gives the least resolution.
- The instrument sets the resolution to 5½ digits after a Factory Reset (*RST command).

Example

→ `VOLT:AC:RES 1E-03`	*This command sets the measurement resolution to 1 mV.*
→ `VOLT:AC:RES?`	*This query returns the resolution selected.*
← `+1.000000E-03`	

See also

"CONFigure[:VOLTage]:AC" on page 84

[SENSe:]VOLTage:ACDC|DCAC:RANGe[:UPPer]

Syntax

```
[SENSe:]VOLTage:ACDC|DCAC:RANGe[:UPPer]
  {<range>|MIN|MAX|DEF}
```

This command selects the measurement range for AC+DC voltage measurements.

```
[SENSe:]VOLTage:ACDC|DCAC:RANGe[:UPPer]? [{MIN|MAX}]
```

This query returns a numeric value that represents the AC+DC voltage measurement range.

Parameter

Item	Type	Range of values	Default value
range	Numeric	• 100 mV|MIN • 1 V • 10 V • 100 V • 1000 V|MAX • DEF (AUTO)	MIN

Remarks

- Selecting a discrete range will disable autoranging.
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: "+9.900000E+37" or "OL" from the front panel.
  - Negative overload: "-9.900000E+37" or "–OL" from the front panel.
- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value "+9.910000E+37" will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.
- The instrument is set to 100 mV, with autoranging enabled, after a Factory Reset (*RST command).

Example

→ `VOLT:ACDC:RANG 10`	*This command selects the 10 V range.*
→ `VOLT:ACDC:RANG?`	*This query returns the range selected.*
← `+1.000000E+01`	

See also

“CONFigure[:VOLTage]:ACDC|DCAC” on page 87

“[SENSe:]VOLTage:ACDC|DCAC:RANGe:AUTO” on page 181

[SENSe:]VOLTage:ACDC|DCAC:RANGe:AUTO

Syntax

`[SENSe:]VOLTage:ACDC|DCAC:RANGe:AUTO <mode>`

This command disables or enables autoranging for AC+DC voltage measurements. Autoranging is convenient because the instrument automatically selects the range for each measurement based on the input signal detected.

`[SENSe:]VOLTage:ACDC|DCAC:RANGe:AUTO?`

This query returns a boolean value that represents the AC+DC voltage autoranging setting: `0` or `1`

Parameter

Item	Type	Range of values	Default value
auto	Boolean	0|1|OFF|ON	1

Remarks

- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range
- With autoranging enabled, the instrument selects the appropriate range based on the input signal detected.
- Selecting a discrete range (see "[SENSe:]VOLTage:ACDC|DCAC:RANGe[:UPPer]" on page 179) will disable autoranging.
- The instrument enables autoranging after a Factory Reset (`*RST` command).

Example

→ `VOLT:RANG:ACDC:AUTO OFF`	*This command disables autoranging.*
→ `VOLT:RANG:ACDC:AUTO?`	*This query returns the autoranging setting.*
← `0`	

See also

"CONFigure[:VOLTage]:ACDC|DCAC" on page 87

"[SENSe:]VOLTage:ACDC|DCAC:RANGe[:UPPer]" on page 179

[SENSe:]VOLTage:ACDC|DCAC:RESolution

Syntax

```
[SENSe:]VOLTage:ACDC|DCAC:RESolution
   {<resolution>|MIN|MAX|DEF}
```

This command selects the measurement resolution for AC+DC voltage measurements. Specify the resolution in the same units as the selected measurement function, not in number of digits.

```
[SENSe:]VOLTage:ACDC|DCAC:RESolution? [{MIN|MAX}]
```

The query returns a numeric value that represents the AC+DC voltage resolution.

Parameter

Item	Type	Range of values		Default value
resolution	Numeric	• MAX (4½ digit) ◦ 10 uV ◦ 100 uV ◦ 1 mV ◦ 10 mV ◦ 100 mV	• MIN (5½ digit)|DEF ◦ 1 uV ◦ 10 uV ◦ 100 uV ◦ 1 mV ◦ 10 mV	MIN

Remarks

- For the <resolution> parameter, you can substitute MIN or MAX for a numeric value. MIN selects the smallest value accepted, which gives the highest resolution; MAX selects the largest value accepted, which gives the least resolution.
- The instrument sets the resolution to 5½ digits after a Factory Reset (*RST command).

Example

→ VOLT:ACDC:RES 1E-03	*This command sets the measurement resolution to 1 mV.*
→ VOLT:ACDC:RES?	*This query returns the resolution selected.*
← +1.000000E-03	

See also

"CONFigure[:VOLTage]:ACDC|DCAC" on page 87

[SENSe:]CURRent[:DC]:RANGe[:UPPer]

Syntax

```
[SENSe:]CURRent[:DC]:RANGe[:UPPer] {<range>|MIN|MAX|DEF}
```

This command selects the measurement range for DC current measurements.

```
[SENSe:]CURRent[:DC]:RANGe[:UPPer]? [{MIN|MAX}]
```

This query returns a numeric value that represents the DC current measurement range.

Parameter

Item	Type	Range of values	Default value
range	Numeric	• 10 mA|MIN • 100 mA • 1000 mA • 3 A|MAX • DEF (AUTO)	MIN

Remarks

- Selecting a discrete range will disable autoranging.
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: "`+9.900000E+37`" or "OL" from the front panel.
  - Negative overload: "`-9.900000E+37`" or "–OL" from the front panel.
- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value "`+9.910000E+37`" will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.
- The instrument is set to 10 mA, with autoranging enabled, after a Factory Reset (`*RST` command).

Example

→ `CURR:RANG 0.1`	*This command selects the 100 mA range.*
→ `CURR:RANG?`	*This query returns the range selected.*
← `+1.000000E-01`	

See also

"CONFigure:CURRent[:DC]" on page 90

"[SENSe:]CURRent[:DC]:RANGe:AUTO" on page 187

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

Syntax

`[SENSe:]CURRent[:DC]:RANGe:AUTO <mode>`

This command disables or enables autoranging for DC current measurements. Autoranging is convenient because the instrument automatically selects the range for each measurement based on the input signal detected.

`[SENSe:]CURRent[:DC]:RANGe:AUTO?`

This query returns a boolean value that represents the DC current autoranging setting: `0` or `1`

Parameter

Item	Type	Range of values	Default value
auto	Boolean	0|1|OFF|ON	1

Remarks

- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range
- With autoranging enabled, the instrument selects the appropriate range based on the input signal detected.
- Selecting a discrete range (see “[SENSe:]CURRent[:DC]:RANGe[:UPPer]” on page 185) will disable autoranging.
- The instrument enables autoranging after a Factory Reset (`*RST` command).

Example

→ CURR:RANG:AUTO OFF	*This command disables autoranging.*
→ CURR:RANG:AUTO?	*This query returns the autoranging setting.*
← 0	

See also

"CONFigure:CURRent[:DC]" on page 90

"[SENSe:]CURRent[:DC]:RANGe[:UPPer]" on page 185

[SENSe:]CURRent[:DC]:RESolution

Syntax

```
[SENSe:]CURRent[:DC]:RESolution {<resolution>|MIN|MAX|DEF}
```

This command selects the measurement resolution for DC current measurements. Specify the resolution in the same units as the selected measurement function, not in number of digits.

```
[SENSe:]CURRent[:DC]:RESolution? [{MIN|MAX}]
```

The query returns a numeric value that represents the DC current resolution.

Parameter

Item	Type	Range of values		Default value
resolution	Numeric	• MAX (4½ digit) ◦ 1 uA ◦ 10 uA ◦ 100 uA ◦ 1 mA	• MIN (5½ digit)|DEF ◦ 0.1 uA ◦ 1 uA ◦ 10 uA ◦ 100 uA	MIN

Remarks

- For the `<resolution>` parameter, you can substitute `MIN` or `MAX` for a numeric value. `MIN` selects the smallest value accepted, which gives the highest resolution; `MAX` selects the largest value accepted, which gives the least resolution.
- The instrument sets the resolution to 5½ digits after a Factory Reset (`*RST` command).

Example

→ `CURR:RES 1E-03`	*This command sets the measurement resolution to 1 mA.*
→ `CURR:RES?`	*This query returns the resolution selected.*
← `+1.000000E-03`	

See also

"CONFigure:CURRent[:DC]" on page 90

[SENSe:]CURRent:AC:RANGe[:UPPer]

Syntax

`[SENSe:]CURRent:AC:RANGe[:UPPer] {<range>|MIN|MAX|DEF}`

This command selects the measurement range for AC current measurements.

`[SENSe:]CURRent:AC:RANGe[:UPPer]? [{MIN|MAX}]`

This query returns a numeric value that represents the AC current measurement range.

Parameter

Item	Type	Range of values	Default value
range	Numeric	• 10 mA|MIN • 100 mA • 1000 mA • 3 A|MAX • DEF (AUTO)	MIN

Remarks

- Selecting a discrete range will disable autoranging.
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: "`+9.900000E+37`" or "OL" from the front panel.
  - Negative overload: "`-9.900000E+37`" or "–OL" from the front panel.
- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value "`+9.910000E+37`" will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.
- The instrument is set to 10 mA, with autoranging enabled, after a Factory Reset (`*RST` command).

Example

→ CURR:AC:RANG 0.1	*This command selects the 100 mA range.*
→ CURR:AC:RANG?	*This query returns the range selected.*
← +1.000000E-01	

See also

"CONFigure:CURRent:AC" on page 93

"[SENSe:]CURRent:AC:RANGe:AUTO" on page 193

[SENSe:]CURRent:AC:RANGe:AUTO

Syntax

`[SENSe:]CURRent:AC:RANGe:AUTO <mode>`

This command disables or enables autoranging for AC current measurements. Autoranging is convenient because the instrument automatically selects the range for each measurement based on the input signal detected.

`[SENSe:]CURRent:AC:RANGe:AUTO?`

This query returns a boolean value that represents the AC current autoranging setting: `0` or `1`

Parameter

Item	Type	Range of values	Default value
auto	Boolean	0|1|OFF|ON	1

Remarks

- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range
- With autoranging enabled, the instrument selects the appropriate range based on the input signal detected.
- Selecting a discrete range (see “[SENSe:]CURRent:AC:RANGe[:UPPer]” on page 191) will disable autoranging.
- The instrument enables autoranging after a Factory Reset (`*RST` command).

Example

→ `CURR:AC:RANG:AUTO OFF`	*This command disables autoranging.*
→ `CURR:AC:RANG:AUTO?`	*This query returns the autoranging setting.*
← `0`	

See also

"CONFigure:CURRent:AC" on page 93

"[SENSe:]CURRent:AC:RANGe[:UPPer]" on page 191

[SENSe:]CURRent:AC:RESolution

Syntax

`[SENSe:]CURRent:AC:RESolution {<resolution>|MIN|MAX|DEF}`

This command selects the measurement resolution for AC current measurements. Specify the resolution in the same units as the selected measurement function, not in number of digits.

`[SENSe:]CURRent:AC:RESolution? [{MIN|MAX}]`

The query returns a numeric value that represents the AC current resolution.

Parameter

Item	Type	Range of values		Default value
resolution	Numeric	• MAX (4½ digit) ◦ 1 uA ◦ 10 uA ◦ 100 uA ◦ 1 mA	• MIN (5½ digit) | DEF ◦ 0.1 uA ◦ 1 uA ◦ 10 uA ◦ 100 uA	MIN

Remarks

- For the `<resolution>` parameter, you can substitute `MIN` or `MAX` for a numeric value. `MIN` selects the smallest value accepted, which gives the highest resolution; `MAX` selects the largest value accepted, which gives the least resolution.
- The instrument sets the resolution to 5½ digits after a Factory Reset (`*RST` command).

Example

→ `CURR:AC:RES 1E-03`	*This command sets the measurement resolution to 1 mA.*
→ `CURR:AC:RES?`	*This query returns the resolution selected.*
← `+1.000000E-03`	

See also

"CONFigure:CURRent:AC" on page 93

[SENSe:]CURRent:ACDC|DCAC:RANGe[:UPPer]

Syntax

```
[SENSe:]CURRent:ACDC|DCAC:RANGe[:UPPer]
  {<range>|MIN|MAX|DEF}
```

This command selects the measurement range for AC+DC current measurements.

```
[SENSe:]CURRent:ACDC|DCAC:RANGe[:UPPer]? [{MIN|MAX}]
```

This query returns a numeric value that represents the AC+DC current measurement range.

Parameter

Item	Type	Range of values	Default value
range	Numeric	• 10 mA|MIN • 100 mA • 1000 mA • 3 A|MAX • DEF (AUTO)	MIN

Remarks

- Selecting a discrete range will disable autoranging.
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: "+9.900000E+37" or "OL" from the front panel.
  - Negative overload: "-9.900000E+37" or "–OL" from the front panel.
- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value "+9.910000E+37" will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.
- The instrument is set to 10 mA, with autoranging enabled, after a Factory Reset (*RST command).

Example

→ `CURR:ACDC:RANG 0.1`	*This command selects the 100 mA range.*
→ `CURR:ACDC:RANG?`	*This query returns the range selected.*
← `+1.000000E-01`	

See also

"CONFigure:CURRent:ACDC|DCAC" on page 96

"[SENSe:]CURRent:ACDC|DCAC:RANGe:AUTO" on page 199

[SENSe:]CURRent:ACDC|DCAC:RANGe:AUTO

Syntax

`[SENSe:]CURRent:ACDC|DCAC:RANGe:AUTO <mode>`

This command disables or enables autoranging for AC+DC current measurements. Autoranging is convenient because the instrument automatically selects the range for each measurement based on the input signal detected.

`[SENSe:]CURRent:ACDC|DCAC:RANGe:AUTO?`

This query returns a boolean value that represents the AC+DC current autoranging setting: `0` or `1`

Parameter

Item	Type	Range of values	Default value
auto	Boolean	0|1|OFF|ON	1

Remarks

- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range

- With autoranging enabled, the instrument selects the appropriate range based on the input signal detected.
- Selecting a discrete range (see “[SENSe:]CURRent:ACDC|DCAC:RANGe[:UPPer]” on page 197) will disable autoranging.
- The instrument enables autoranging after a Factory Reset (`*RST` command).

Example

→ CURR:ACDC:RANG:AUTO OFF	*This command disables autoranging.*
→ CURR:ACDC:RANG:AUTO?	*This query returns the autoranging setting.*
← 0	

See also

"CONFigure:CURRent:ACDC|DCAC" on page 96

"[SENSe:]CURRent:ACDC|DCAC:RANGe[:UPPer]" on page 197

[SENSe:]CURRent:ACDC|DCAC:RESolution

Syntax

```
[SENSe:]CURRent:ACDC|DCAC:RESolution
  {<resolution>|MIN|MAX|DEF}
```

This command selects the measurement resolution for AC+DC current measurements. Specify the resolution in the same units as the selected measurement function, not in number of digits.

```
[SENSe:]CURRent:ACDC|DCAC:RESolution? [{MIN|MAX}]
```

The query returns a numeric value that represents the AC+DC current resolution.

Parameter

Item	Type	Range of values		Default value
resolution	Numeric	• MAX (4½ digit) ◦ 1 uA ◦ 10 uA ◦ 100 uA ◦ 1 mA	• MIN (5½ digit)|DEF ◦ 0.1 uA ◦ 1 uA ◦ 10 uA ◦ 100 uA	MIN

Remarks

- For the `<resolution>` parameter, you can substitute `MIN` or `MAX` for a numeric value. `MIN` selects the smallest value accepted, which gives the highest resolution; `MAX` selects the largest value accepted, which gives the least resolution.
- The instrument sets the resolution to 5½ digits after a Factory Reset (`*RST` command).

Example

→ `CURR:ACDC:RES 1E-03`	*This command sets the measurement resolution to 1 mA.*
→ `CURR:ACDC:RES?`	*This query returns the resolution selected.*
← `+1.000000E-03`	

See also

"CONFigure:CURRent:ACDC|DCAC" on page 96

[SENSe:]RESistance:RANGe[:UPPer]

Syntax

```
[SENSe:]RESistance:RANGe[:UPPer] {&lt;range&gt;|MIN|MAX|DEF}
```

This command selects the measurement range for 2-wire resistance measurements.

```
[SENSe:]RESistance:RANGe[:UPPer]? [{MIN|MAX}]
```

This query returns a numeric value that represents the 2-wire resistance measurement range.

Parameter

Item	Type	Range of values	Default value
range	Numeric	• 100 Ω|MIN • 1 kΩ • 10 kΩ • 100 kΩ • 1 MΩ • 10 MΩ • 100 MΩ|MAX • DEF (AUTO)	MIN

Remarks

- Selecting a discrete range will disable autoranging.
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: “+9.900000E+37” or “OL” from the front panel.
  - Negative overload: “-9.900000E+37” or “–OL” from the front panel.
- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value “+9.910000E+37” will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.
- The instrument is set to 100 Ω, with autoranging enabled, after a Factory Reset (*RST command).

Example

→ RES:RANG 10E+3	*This command selects the 10 kΩ range.*
→ RES:RANG?	*This query returns the range selected.*
← +1.000000E+04	

See also

"CONFigure:RESistance" on page 99

"[SENSe:]RESistance:RANGe:AUTO" on page 205

[SENSe:]RESistance:RANGe:AUTO

Syntax

`[SENSe:]RESistance:RANGe:AUTO <mode>`

This command disables or enables autoranging for 2-wire resistance measurements. Autoranging is convenient because the instrument automatically selects the range for each measurement based on the input signal detected.

`[SENSe:]RESistance:RANGe:AUTO?`

This query returns a boolean value that represents the 2-wire resistance autoranging setting: `0` or `1`

Parameter

Item	Type	Range of values	Default value
auto	Boolean	0|1|OFF|ON	1

Remarks

- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range
- With autoranging enabled, the instrument selects the appropriate range based on the input signal detected.
- Selecting a discrete range (see "[SENSe:]RESistance:RANGe[:UPPer]" on page 203) will disable autoranging.
- The instrument enables autoranging after a Factory Reset (`*RST` command).

Example

→ RES:RANG:AUTO OFF	*This command disables autoranging.*
→ RES:RANG:AUTO?	*This query returns the autoranging setting.*
← 0	

See also

"CONFigure:RESistance" on page 99

"[SENSe:]RESistance:RANGe[:UPPer]" on page 203

[SENSe:]RESistance:RESolution

Syntax

```
[SENSe:]RESistance:RESolution {<resolution>|MIN|MAX|DEF}
```

This command selects the measurement resolution for 2-wire resistance measurements. Specify the resolution in the same units as the selected measurement function, not in number of digits.

```
[SENSe:]RESistance:RESolution? [{MIN|MAX}]
```

The query returns a numeric value that represents the 2-wire resistance resolution.

Parameter

Item	Type	Range of values		Default value
resolution	Numeric	• MAX (4½ digit) • 10 mΩ • 100 mΩ • 1 Ω • 10 Ω • 100 Ω • 1 kΩ • 10 kΩ	• MIN (5½ digit) | DEF • 1 mΩ • 10 mΩ • 100 mΩ • 1 Ω • 10 Ω • 100 Ω • 1 kΩ	MIN

Remarks

- For the <resolution> parameter, you can substitute MIN or MAX for a numeric value. MIN selects the smallest value accepted, which gives the highest resolution; MAX selects the largest value accepted, which gives the least resolution.
- The instrument sets the resolution to 5½ digits after a Factory Reset (*RST command).

Example

→ `RES:RES 100`	*This command sets the measurement resolution to 100 Ω*
→ `RES:RES?`	*This query returns the resolution selected.*
← `+1.000000E+02`	

See also

"CONFigure:RESistance" on page 99

[SENSe:]CONTinuity:RANGe[:UPPer]

Syntax

```
[SENSe:]CONTinuity:RANGe[:UPPer] {<range>|MIN|MAX|DEF}
```

This command selects the measurement range for continuity tests. Continuity is a special type of fixed-range 2-wire resistance measurement.

```
[SENSe:]CONTinuity:RANGe[:UPPer]? [{MIN|MAX}]
```

This query returns a numeric value that represents the continuity test range.

Parameter

Item	Type	Range of values	Default value
range	Numeric	• 100 Ω|MIN • 1 kΩ|DEF • 10 kΩ • 100 kΩ • 1 MΩ • 10 MΩ • 100 MΩ|MAX	1 kΩ

Remarks

- Selecting a discrete range will disable autoranging.
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: "`+9.900000E+37`" or "OL" from the front panel.
  - Negative overload: "`-9.900000E+37`" or "–OL" from the front panel.
- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value "`+9.910000E+37`" will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.
- The instrument is set to 1 kΩ, with autoranging disabled, after a Factory Reset (`*RST` command).

Example

→ `CONT:RANG 10E+3`	*This command selects the 10 kΩ range.*
→ `CONT:RANG?`	*This query returns the range selected.*
← `+1.000000E+04`	

See also

"CONFigure:CONTinuity" on page 102

"[SENSe:]CONTinuity:RANGe:AUTO" on page 211

[SENSe:]CONTinuity:RANGe:AUTO

Syntax

`[SENSe:]CONTinuity:RANGe:AUTO <mode>`

This command disables or enables autoranging for continuity tests. Autoranging is convenient because the instrument automatically selects the range for each measurement based on the input signal detected.

`[SENSe:]CONTinuity:RANGe:AUTO?`

This query returns a boolean value that represents the continuity autoranging setting: `0` or `1`

Parameter

Item	Type	Range of values	Default value
auto	Boolean	0|1|OFF|ON	1

Remarks

- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range
- With autoranging enabled, the instrument selects the appropriate range based on the input signal detected.
- Selecting a discrete range (see “[SENSe:]CONTinuity:RANGe[:UPPer]” on page 209) will disable autoranging.
- The instrument disables autoranging after a Factory Reset (`*RST` command).

Example

→ `CONT:RANG:AUTO OFF`	*This command disables autoranging.*
→ `CONT:RANG:AUTO?`	*This query returns the autoranging setting.*
← `0`	

See also

"CONFigure:CONTinuity" on page 102

"[SENSe:]CONTinuity:RANGe[:UPPer]" on page 209

[SENSe:]LRESistance:RANGe[:UPPer]

Syntax

```
[SENSe:]LRESistance:RANGe[:UPPer] {<range>|MIN|MAX|DEF}
```

This command selects the measurement range for 4-wire low-resistance measurements.

```
[SENSe:]LRESistance:RANGe[:UPPer]? [{MIN|MAX}]
```

This query returns a numeric value that represents the 4-wire low-resistance measurement range.

Parameter

Item	Type	Range of values	Default value
range	Numeric	• 100 mΩ|MIN • 1000 mΩ • 10 Ω|MAX • DEF (AUTO)	MIN

Remarks

- Selecting a discrete range will disable autoranging.
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: "`+9.900000E+37`" or "OL" from the front panel.
  - Negative overload: "`-9.900000E+37`" or "–OL" from the front panel.
- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value "`+9.910000E+37`" will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.
- The instrument is set to 100 mΩ, with autoranging enabled, after a Factory Reset (`*RST` command).
- For measuring low-resistance a delayed response should be expected from the front panel display. For remote interface operation, increase the SCPI query timeout value. (Typically 15000 ms.)

Example

→ `LRES:RANG 10`	*This command selects the 10 Ω range.*
→ `LRES:RANG?`	*This query returns the range selected.*
← `+1.000000E+01`	

See also

"CONFigure:LRESistance" on page 104

"[SENSe:]LRESistance:RANGe:AUTO" on page 215

[SENSe:]LRESistance:RANGe:AUTO

Syntax

`[SENSe:]LRESistance:RANGe:AUTO <mode>`

This command disables or enables autoranging for 4-wire low-resistance measurements. Autoranging is convenient because the instrument automatically selects the range for each measurement based on the input signal detected.

`[SENSe:]LRESistance:RANGe:AUTO?`

This query returns a boolean value that represents the 4-wire low-resistance autoranging setting: `0` or `1`

Parameter

Item	Type	Range of values	Default value
auto	Boolean	0|1|OFF|ON	1

Remarks

- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range
- With autoranging enabled, the instrument selects the appropriate range based on the input signal detected.
- Selecting a discrete range (see “[SENSe:]LRESistance:RANGe[:UPPer]” on page 213) will disable autoranging.
- The instrument enables autoranging after a Factory Reset (`*RST` command).
- For measuring low-resistance a delayed response should be expected from the front panel display. For remote interface operation, increase the SCPI query timeout value. (Typically 15000 ms.)

Example

→ LRES:RANG:AUTO OFF	*This command disables autoranging.*
→ LRES:RANG:AUTO?	*This query returns the autoranging setting.*
← 0	

See also

"CONFigure:LRESistance" on page 104

"[SENSe:]LRESistance:RANGe[:UPPer]" on page 213

[SENSe:]LRESistance:RESolution

Syntax

```
[SENSe:]LRESistance:RESolution {<resolution>|MIN|MAX|DEF}
```

This command selects the measurement resolution for 4-wire low-resistance measurements. Specify the resolution in the same units as the selected measurement function, not in number of digits.

```
[SENSe:]LRESistance:RESolution? [{MIN|MAX}]
```

The query returns a numeric value that represents the 4-wire low-resistance resolution.

Parameter

Item	Type	Range of values		Default value
resolution	Numeric	• MAX (4½ digit) ◦ 10 uΩ ◦ 100 uΩ ◦ 1 mΩ	• MIN (5½ digit) | DEF ◦ 1 uΩ ◦ 10 uΩ ◦ 100 uΩ	MIN

Remarks

- For the <resolution> parameter, you can substitute MIN or MAX for a numeric value. MIN selects the smallest value accepted, which gives the highest resolution; MAX selects the largest value accepted, which gives the least resolution.
- The instrument sets the resolution to 5½ digits after a Factory Reset (*RST command).
- For measuring low-resistance a delayed response should be expected from the front panel display. For remote interface operation, increase the SCPI query timeout value. (Typically 15000 ms.)

Example

→ LRES:RES 0.0001	*This command sets the measurement resolution to 100 $\mu\Omega$*
→ LRES:RES?	*This query returns the resolution selected.*
← +1.000000E-04	

See also

"CONFigure:LRESistance" on page 104

[SENSe:]CAPacitance:RANGe[:UPPer]

Syntax

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

This command selects the measurement range for capacitance measurements.

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

This query returns a numeric value that represents the capacitance measurement range.

Parameter

Item	Type	Range of values	Default value
range	Numeric	• 1 nF|MIN • 10 nF • 100 nF • 1 uF • 10 uF • 100 uF • 1 mF • 10 mF|MAX • DEF (AUTO)	MIN

Remarks

- Selecting a discrete range will disable autoranging.
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: "`+9.900000E+37`" or "OL" from the front panel.
  - Negative overload: "`-9.900000E+37`" or "–OL" from the front panel.
- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value "`+9.910000E+37`" will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.
- The instrument is set to 1 nF, with autoranging enabled, after a Factory Reset (`*RST` command).

- For measuring capacitance values greater than 1 mF, a delayed response should be expected from the front panel display. For remote interface operation, increase the SCPI query timeout value. (Typically > 10000 ms.)

Example

→ `CAP:RANG 10`	*This command selects the 10 nF range.*
→ `CAP:RANG?`	*This query returns the range selected.*
← `+1.000000E+01`	

See also

"CONFigure:CAPacitance" on page 107

"[SENSe:]CAPacitance:RANGe:AUTO" on page 221

[SENSe:]CAPacitance:RANGe:AUTO

Syntax

`[SENSe:]CAPacitance:RANGe:AUTO <mode>`

This command disables or enables autoranging for capacitance measurements. Autoranging is convenient because the instrument automatically selects the range for each measurement based on the input signal detected.

`[SENSe:]CAPacitance:RANGe:AUTO?`

This query returns a boolean value that represents the capacitance autoranging setting: `0` or `1`

Parameter

Item	Type	Range of values	Default value
auto	Boolean	0|1|OFF|ON	1

Remarks

- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range

- With autoranging enabled, the instrument selects the appropriate range based on the input signal detected.
- Selecting a discrete range (see “[SENSe:]CAPacitance:RANGe[:UPPer]” on page 219) will disable autoranging.
- The instrument enables autoranging after a Factory Reset (`*RST` command).
- For measuring capacitance values greater than 1 mF, a delayed response should be expected from the front panel display. For remote interface operation, increase the SCPI query timeout value. (Typically more than 10000 ms.)

Example

→ CAP:RANG:AUTO OFF	*This command disables autoranging.*
→ CAP:RANG:AUTO?	*This query returns the autoranging setting.*
← 0	

See also

"CONFigure:CAPacitance" on page 107

"[SENSe:]CAPacitance:RANGe[:UPPer]" on page 219

[SENSe:]FREQuency:VOLTage:RANGe[:UPPer]

Syntax

```
[SENSe:]FREQuency:VOLTage:RANGe[:UPPer]
  {<voltage_range>|MIN|MAX|DEF}
```

This command selects the measurement range for frequency measurements via the voltage path.

```
[SENSe:]FREQuency:VOLTage:RANGe[:UPPer]? [{MIN|MAX}]
```

This query returns a numeric value that represents the frequency measurement range via the voltage path.

NOTE The `[SENSe:]FREQuency:VOLTage:RANGe[:UPPer]?` query is not applicable when autoranging is enabled. It is recommended to manually select the voltage range for frequency, pulse width, and duty cycle measurements.

Parameter

Item	Type	Range of values	Default value
voltage_ range	Numeric	• 100 mV|MIN • 1 V • 10 V • 100 V • 750 V|MAX • DEF (AUTO)	MIN

Remarks

- Selecting a discrete range will disable autoranging.
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: "`+9.900000E+37`" or "OL" from the front panel.
  - Negative overload: "`-9.900000E+37`" or "–OL" from the front panel.

- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value "+9.910000E+37" will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.
- The instrument is set to 100 mV, with autoranging enabled, after a Factory Reset (*RST command).

Example

→ FREQ:VOLT:RANG 10	*This command selects the 10 V range.*
→ FREQ:VOLT:RANG?	*This query returns the range selected.*
← +1.000000E+01	

See also

"CONFigure:FREQuency" on page 112

"[SENSe:]FREQuency:VOLTage:RANGe:AUTO" on page 225

[SENSe:]FREQuency:VOLTage:RANGe:AUTO

Syntax

```
[SENSe:]FREQuency:VOLTage:RANGe:AUTO <mode>
```

This command disables or enables autoranging for frequency measurements via the voltage path. Autoranging is convenient because the instrument automatically selects the range for each measurement based on the input signal detected.

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

This query returns a boolean value that represents the frequency autoranging setting: `0` or `1`

Parameter

Item	Type	Range of values	Default value
auto	Boolean	0|1|OFF|ON	1

Remarks

- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range
- With autoranging enabled, the instrument selects the appropriate range based on the input signal detected.
- Selecting a discrete range (see “[SENSe:]FREQuency:VOLTage:RANGe[:UPPer]” on page 223) will disable autoranging.
- The instrument enables autoranging after a Factory Reset (`*RST` command).

Example

→ FREQ:VOLT:RANG:AUTO OFF	*This command disables autoranging.*
→ FREQ:VOLT:RANG:AUTO?	*This query returns the autoranging setting.*
← 0	

See also

"CONFigure:FREQuency" on page 112

"[SENSe:]FREQuency:VOLTage:RANGe[:UPPer]" on page 223

[SENSe:]PWIDth:VOLTage:RANGe[:UPPer]

Syntax

```
[SENSe:]PWIDth:VOLTage:RANGe[:UPPer]
  {<voltage_range>|MIN|MAX|DEF}
```

This command selects the measurement range for pulse width measurements via the voltage path.

```
[SENSe:]PWIDth:VOLTage:RANGe[:UPPer]? [{MIN|MAX}]
```

This query returns a numeric value that represents the pulse width measurement range via the voltage path.

NOTE The `[SENSe:]PWIDth:VOLTage:RANGe[:UPPer]?` query is not applicable when autoranging is enabled. It is recommended to manually select the voltage range for frequency, pulse width, and duty cycle measurements.

Parameter

Item	Type	Range of values	Default value
voltage_ range	Numeric	• 100 mV|MIN • 1 V • 10 V • 100 V • 750 V|MAX • DEF (AUTO)	MIN

Remarks

- Selecting a discrete range will disable autoranging.
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: “`+9.900000E+37`” or “OL” from the front panel.
  - Negative overload: “`-9.900000E+37`” or “–OL” from the front panel.

- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value "+9.910000E+37" will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.
- The instrument is set to 100 mV, with autoranging enabled, after a Factory Reset (*RST command).

Example

→ PWID:VOLT:RANG 10	*This command selects the 10 V range.*
→ PWID:VOLT:RANG?	*This query returns the range selected.*
← +1.000000E+01	

See also

"CONFigure:PWIDth" on page 114

"[SENSe:]DCYCle:VOLTage:RANGe:AUTO" on page 233

[SENSe:]PWIDth:VOLTage:RANGe:AUTO

Syntax

`[SENSe:]PWIDth:VOLTage:RANGe:AUTO <mode>`

This command disables or enables autoranging for pulse width measurements via the voltage path. Autoranging is convenient because the instrument automatically selects the range for each measurement based on the input signal detected.

`[SENSe:]PWIDth:VOLTage:RANGe:AUTO?`

This query returns a boolean value that represents the duty cycle autoranging setting: `0` or `1`

Parameter

Item	Type	Range of values	Default value
auto	Boolean	0|1|OFF|ON	1

Remarks

- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range
- With autoranging enabled, the instrument selects the appropriate range based on the input signal detected.
- Selecting a discrete range (see "[SENSe:]PWIDth:VOLTage:RANGe[:UPPer]" on page 227) will disable autoranging.
- The instrument enables autoranging after a Factory Reset (`*RST` command).

Example

→ PWID:VOLT:RANG:AUTO OFF	*This command disables autoranging.*
→ PWID:VOLT:RANG:AUTO?	*This query returns the autoranging setting.*
← 0	

See also

"CONFigure:PWIDth" on page 114

"[SENSe:]PWIDth:VOLTage:RANGe[:UPPer]" on page 227

[SENSe:]DCYCle:VOLTage:RANGe[:UPPer]

Syntax

```
[SENSe:]DCYCle:VOLTage:RANGe[:UPPer]
  {<voltage_range>|MIN|MAX|DEF}
```

This command selects the measurement range for duty cycle measurements via the voltage path.

```
[SENSe:]DCYCle:VOLTage:RANGe[:UPPer]? [{MIN|MAX}]
```

This query returns a numeric value that represents the duty cycle measurement range via the voltage path.

NOTE The `[SENSe:]DCYCle:VOLTage:RANGe[:UPPer]?` query is not applicable when autoranging is enabled. It is recommended to manually select the voltage range for frequency, pulse width, and duty cycle measurements.

Parameter

Item	Type	Range of values	Default value
voltage_ range	Numeric	• 100 mV|MIN • 1 V • 10 V • 100 V • 750 V|MAX • DEF (AUTO)	MIN

Remarks

- Selecting a discrete range will disable autoranging.
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: “`+9.900000E+37`” or “OL” from the front panel.
  - Negative overload: “`-9.900000E+37`” or “–OL” from the front panel.

- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value "+9.910000E+37" will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.
- The instrument is set to 100 mV, with autoranging enabled, after a Factory Reset (*RST command).

Example

→ DCYC:VOLT:RANG 10	*This command selects the 10 V range.*
→ DCYC:VOLT:RANG?	*This query returns the range selected.*
← +1.000000E+01	

See also

"CONFigure:DCYCle" on page 116

"[SENSe:]DCYCle:VOLTage:RANGe:AUTO" on page 233

[SENSe:]DCYCle:VOLTage:RANGe:AUTO

Syntax

`[SENSe:]DCYCle:VOLTage:RANGe:AUTO <mode>`

This command disables or enables autoranging for duty cycle measurements via the voltage path. Autoranging is convenient because the instrument automatically selects the range for each measurement based on the input signal detected.

`[SENSe:]DCYCle:VOLTage:RANGe:AUTO?`

This query returns a boolean value that represents the duty cycle autoranging setting: `0` or `1`

Parameter

Item	Type	Range of values	Default value
auto	Boolean	0|1|OFF|ON	1

Remarks

- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range
- With autoranging enabled, the instrument selects the appropriate range based on the input signal detected.
- Selecting a discrete range (see “[SENSe:]DCYCle:VOLTage:RANGe[:UPPer]” on page 231) will disable autoranging.
- The instrument enables autoranging after a Factory Reset (`*RST` command).

Example

→	DCYC:VOLT:RANG:AUTO OFF	*This command disables autoranging.*
→	DCYC:VOLT:RANG:AUTO?	*This query returns the autoranging setting.*
←	0	

See also

"CONFigure:DCYCle" on page 116

"[SENSe:]DCYCle:VOLTage:RANGe[:UPPer]" on page 231

[SENSe:]FREQuency:CURRent:RANGe[:UPPer]

Syntax

```
[SENSe:]FREQuency:CURRent:RANGe[:UPPer]
   {<current_range>|MIN|MAX|DEF}
```

This command selects the measurement range for frequency measurements via the current path.

```
[SENSe:]FREQuency:CURRent:RANGe[:UPPer]? [{MIN|MAX}]
```

This query returns a numeric value that represents the frequency measurement range via the current path.

NOTE

The `[SENSe:]FREQuency:CURRent:RANGe[:UPPer]?` query is not applicable when autoranging is enabled. It is recommended to manually select the current range for frequency, pulse width, and duty cycle measurements.

Parameter

Item	Type	Range of values	Default value
current_range	Numeric	• 10 mA | MIN • 100 mA • 1000 mA • 3 A | MAX • DEF (AUTO)	MIN

Remarks

- Selecting a discrete range will disable autoranging.
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: "`+9.900000E+37`" or "OL" from the front panel.
  - Negative overload: "`-9.900000E+37`" or "–OL" from the front panel.

- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value "+9.910000E+37" will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.
- The instrument is set to 10 mA, with autoranging enabled, after a Factory Reset (*RST command).

Example

→ FREQ:CURR:RANG 0.1	*This command selects the 100 mA range.*
→ FREQ:CURR:RANG?	*This query returns the range selected.*
← +1.000000E-01	

See also

"CONFigure:FREQuency" on page 112

"[SENSe:]FREQuency:CURRent:RANGe:AUTO" on page 237

[SENSe:]FREQuency:CURRent:RANGe:AUTO

Syntax

```
[SENSe:]FREQuency:CURRent:RANGe:AUTO <mode>
```

This command disables or enables autoranging for frequency measurements via the current path. Autoranging is convenient because the instrument automatically selects the range for each measurement based on the input signal detected.

```
[SENSe:]FREQuency:CURRent:RANGe:AUTO?
```

This query returns a boolean value that represents the frequency autoranging setting: `0` or `1`

Parameter

Item	Type	Range of values	Default value
auto	Boolean	0|1|OFF|ON	1

Remarks

- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range
- With autoranging enabled, the instrument selects the appropriate range based on the input signal detected.
- Selecting a discrete range (see "[SENSe:]FREQuency:CURRent:RANGe[:UPPer]" on page 235) will disable autoranging.
- The instrument enables autoranging after a Factory Reset (`*RST` command).

Example

→ `FREQ:CURR:RANG:AUTO OFF`	*This command disables autoranging.*
→ `FREQ:CURR:RANG:AUTO?`	*This query returns the autoranging setting.*
← `0`	

See also

"CONFigure:FREQuency" on page 112

"[SENSe:]FREQuency:CURRent:RANGe[:UPPer]" on page 235

[SENSe:]PWIDth:CURRent:RANGe[:UPPer]

Syntax

```
[SENSe:]PWIDth:CURRent:RANGe[:UPPer]
  {<current_range>|MIN|MAX|DEF}
```

This command selects the measurement range for pulse width measurements via the current path.

```
[SENSe:]PWIDth:CURRent:RANGe[:UPPer]? [{MIN|MAX}]
```

This query returns a numeric value that represents the pulse width measurement range via the current path.

NOTE

The `[SENSe:]PWIDth:CURRent:RANGe[:UPPer]?` query is not applicable when autoranging is enabled. It is recommended to manually select the current range for frequency, pulse width, and duty cycle measurements.

Parameter

Item	Type	Range of values	Default value
current_ range	Numeric	• 10 mA|MIN • 100 mA • 1000 mA • 3 A|MAX • DEF (AUTO)	MIN

Remarks

- Selecting a discrete range will disable autoranging.
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: “`+9.900000E+37`” or “OL” from the front panel.
  - Negative overload: “`-9.900000E+37`” or “–OL” from the front panel.

- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value "+9.910000E+37" will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.
- The instrument is set to 10 mA, with autoranging enabled, after a Factory Reset (*RST command).

Example

→ PWID:CURR:RANG 0.1	*This command selects the 100 mA range.*
→ PWID:CURR:RANG?	*This query returns the range selected.*
← +1.000000E-01	

See also

"CONFigure:PWIDth" on page 114

"[SENSe:]PWIDth:CURRent:RANGe:AUTO" on page 241

[SENSe:]PWIDth:CURRent:RANGe:AUTO

Syntax

`[SENSe:]PWIDth:CURRent:RANGe:AUTO <mode>`

This command disables or enables autoranging for pulse width measurements via the current path. Autoranging is convenient because the instrument automatically selects the range for each measurement based on the input signal detected.

`[SENSe:]PWIDth:CURRent:RANGe:AUTO?`

This query returns a boolean value that represents the duty cycle autoranging setting: `0` or `1`

Parameter

Item	Type	Range of values	Default value
auto	Boolean	0|1|OFF|ON	1

Remarks

- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range
- With autoranging enabled, the instrument selects the appropriate range based on the input signal detected.
- Selecting a discrete range (see "[SENSe:]PWIDth:CURRent:RANGe[:UPPer]" on page 239) will disable autoranging.
- The instrument enables autoranging after a Factory Reset (`*RST` command).

Example

→ `PWID:CURR:RANG:AUTO OFF`	*This command disables autoranging.*
→ `PWID:CURR:RANG:AUTO?`	*This query returns the autoranging setting.*
← `0`	

See also

"CONFigure:PWIDth" on page 114

"[SENSe:]PWIDth:CURRent:RANGe[:UPPer]" on page 239

[SENSe:]DCYCle:CURRent:RANGe[:UPPer]

Syntax

```
[SENSe:]DCYCle:CURRent:RANGe[:UPPer]
  {<current_range>|MIN|MAX|DEF}
```

This command selects the measurement range for duty cycle measurements via the current path.

```
[SENSe:]DCYCle:CURRent:RANGe[:UPPer]? [{MIN|MAX}]
```

This query returns a numeric value that represents the duty cycle measurement range via the current path.

NOTE The `[SENSe:]DCYCle:CURRent:RANGe[:UPPer]?` query is not applicable when autoranging is enabled. It is recommended to manually select the current range for frequency, pulse width, and duty cycle measurements.

Parameter

Item	Type	Range of values	Default value
current_ range	Numeric	• 10 mA|MIN • 100 mA • 1000 mA • 3 A|MAX • DEF (AUTO)	MIN

Remarks

- Selecting a discrete range will disable autoranging.
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication.
  - Positive overload: "`+9.900000E+37`" or "OL" from the front panel.
  - Negative overload: "`-9.900000E+37`" or "–OL" from the front panel.

- If a range change is in progress (due to the autoranging setting) when you query the instrument, the value "+9.910000E+37" will be returned. Wait for the instrument to select an appropriate range before querying the instrument again.
- The instrument is set to 10 mA, with autoranging enabled, after a Factory Reset (*RST command).

Example

→ DCYC:CURR:RANG 0.1	*This command selects the 100 mA range.*
→ DCYC:CURR:RANG?	*This query returns the range selected.*
← +1.000000E-01	

See also

"CONFigure:DCYCle" on page 116

"[SENSe:]DCYCle:CURRent:RANGe:AUTO" on page 245

[SENSe:]DCYCle:CURRent:RANGe:AUTO

Syntax

`[SENSe:]DCYCle:CURRent:RANGe:AUTO <mode>`

This command disables or enables autoranging for duty cycle measurements via the current path. Autoranging is convenient because the instrument automatically selects the range for each measurement based on the input signal detected.

`[SENSe:]DCYCle:CURRent:RANGe:AUTO?`

This query returns a boolean value that represents the duty cycle autoranging setting: `0` or `1`

Parameter

Item	Type	Range of values	Default value
auto	Boolean	0|1|OFF|ON	1

Remarks

- Autorange thresholds:

  Down range at: <10% of range

  Up range at: >120% of range
- With autoranging enabled, the instrument selects the appropriate range based on the input signal detected.
- Selecting a discrete range (see "[SENSe:]DCYCle:CURRent:RANGe[:UPPer]" on page 243) will disable autoranging.
- The instrument enables autoranging after a Factory Reset (`*RST` command).

Example

→	DCYC:CURR:RANG:AUTO OFF	*This command disables autoranging.*
→	DCYC:CURR:RANG:AUTO?	*This query returns the autoranging setting.*
←	0	

See also

"CONFigure:DCYCle" on page 116

"[SENSe:]DCYCle:CURRent:RANGe[:UPPer]" on page 243

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[SOURce:]SENSe 248
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This chapter describes the SOURce commands used to program the U3606A over a remote interface. Use the SOURce commands to configure the output voltage and current of the instrument.

[SOURce:]SENSe

Syntax

`[SOURce:]SENSe {EXTernal|INTernal}`

This command selects the sense signal source. To read the sense signal inputs from the rear output terminals of the instrument, select `EXTernal` sense.

The valid options are:

- `EXTernal`: Enables external sense.
- `INTernal`: Disables external sense.

NOTE The rear output SENSE terminals (S+ and S–) are internally shorted to the output terminals at the front panel.

`[SOURce:]SENSe?`

This query returns a string value that represents the sense signal source of the instrument.

Parameter

Item	Type	Range of values	Default value
sense	Discrete	EXTernal | INTernal	INTernal

Example

→ `SENS EXT`	*This command sets the signal source to read the sense signal inputs from the rear output terminals of the instrument.*
→ `SENS?`	*This query returns the selected sense signal source.*
← `EXT`	

[SOURce:]SENSe:VOLTage[:LEVel]?

Syntax

`[SOURce:]SENSe:VOLTage[:LEVel]?`

This query returns a numeric value that represents the amplitude of the sensing voltage at the output.

Remarks

See “Remote Sensing” in the *U3606A User’s and Service Guide* for more information on how to connect the load leads to the rear terminal block for remote sensing connections.

Example

→ `SENS:VOLT?`	*This query returns the amplitude of the sensing voltage at the output.*

← `+1.000170E+00`

[SOURce:]SENSe:CURRent[:LEVel]?

Syntax

```
[SOURce:]SENSe:CURRent[:LEVel]?
```

This query returns a numeric value that represents the amplitude of the sensing current at the output.

Remarks

See “Remote Sensing” in the *U3606A User’s and Service Guide* for more information on how to connect the load leads to the rear terminal block for remote sensing connections.

Example

→ SENS:CURR?	*This query returns the amplitude of the sensing current at the output.*

← -8.624790E-02

SOURce:VOLTage:RANGe

Syntax

`SOURce:VOLTage:RANGe {<value>|30 V|8 V}`

This command sets the range for the voltage output. You can select to either operate the U3606A in the S1 (30 V/1 A) range or the S2 (8 V/3 A) range. The range selected is applied for all output operations (CV mode, CC mode, square-wave output, and sweep functions).

NOTE

- The S1 (30 V/1 A) range has a higher voltage range, but a lower current range.
- The S2 (8 V/3 A) range provides for a higher current range, but has a lower voltage range.

Parameter

Item	Type	Range of values	Default value
value	Numeric	• 8.4 V $<$ S1 $\leqslant$ 30 V • 0 V $\leqslant$ S2 $\leqslant$ 8.4 V	S1

Remarks

- You cannot change the range when the output is enabled (`OUTPut[:STATe] ON` command). The output should always be in standby state (`OUTPut[:STATe] OFF` command) before the range or output function is changed.
- The over-current limit will always be set to the maximum value with respect to the range selected.

Example

→ `SOUR:VOLT:RANG 8`	*This command sets the voltage output range to S2 (8 V/3 A).*

SOURce:CURRent:RANGe

Syntax

```
SOURce:CURRent:RANGe {<value>|3 A|1 A}
```

This command sets the range for the current output. You can select to either operate the U3606A in the S1 (30 V/1 A) range or the S2 (8 V/3 A) range. The range selected is applied for all output operations (CV mode, CC mode, square-wave output, and sweep functions).

NOTE

- The S1 (30 V/1 A) range has a higher voltage range, but a lower current range.
- The S2 (8 V/3 A) range provides for a higher current range, but has a lower voltage range.

Parameter

Item	Type	Range of values	Default value
value	Discrete	• 0 A ⩽ S1 ⩽ 1.05 A • 1.05 A < S2 ⩽ 3.15 A	S1

Remarks

- You cannot change the range when the output is enabled (`OUTPut[:STATe] ON` command). The output should always be in standby state (`OUTPut[:STATe] OFF` command) before the range or output function is changed.
- The over-voltage limit will always be set to the maximum value with respect to the range selected by default.

Example

→ `SOUR:CURR:RANG 3`	*This command sets the current output range to S2 (8 V/3 A).*

SOURce:SQUare:RANGe

Syntax

```
SOURce:SQUare:RANGe {<value>|30 V| 8 V}
```

This command sets the range for the square-wave output. You can select to either operate the U3606A in the S1 (30 V/1 A) range or the S2 (8 V/3 A) range. The range selected is applied for all output operations (CV mode, CC mode, square-wave output, and sweep functions).

NOTE

- The S1 (30 V/1 A) range has a higher voltage range, but a lower current range.
- The S2 (8 V/3 A) range provides for a higher current range, but has a lower voltage range.

Parameter

Item	Type	Range of values	Default value
value	Numeric	• 8.4 V < S1 ≤ 30 V • 0 V ≤ S2 ≤ 8.4 V	S1

Remarks

You cannot change the range when the output is enabled (`OUTPut[:STATe] ON` command). The output should always be in standby state (`OUTPut[:STATe] OFF` command) before the range or output function is changed.

Example

→ `SOUR:SQU:RANG 8`	*This command sets the voltage output range to S2 (8 V/3 A).*

[SOURce:]VOLTage:LIMit

Syntax

```
[SOURce:]VOLTage:LIMit <value>
```

This command sets the over-voltage limit for the constant current output. If the load effect exceeds the over-voltage limit setting, the instrument output will be dropped down to meet the over-voltage limit setting.

```
[SOURce:]VOLTage:LIMit?
```

This query returns a numeric value that represents the over-voltage limit value of the constant current output.

Parameter

Item	Type	Range of values			Default value
		Range	Min	Max	
value	Numeric	S1	0 V	31.5 V	30 V
		S2	0 V	8.4 V	8 V

Remarks

- If the over-voltage limit value is set to zero, the instrument output will be dropped down to zero for limiting.
- If the over-voltage limit value is set to a greater value than the over-voltage protection value, the over-voltage protection value will be adjusted to equal the over-voltage limit value.
- The `[SOURce:]VOLTage:LIMit` command is not applicable for square-wave output and 4-wire resistance measurements (Lo Ω).

Example

→ `VOLT:LIM 30`	*This command sets the over-voltage limit to 30 V for the constant current output.*
→ `VOLT:LIM?`	*This query returns the over-voltage limit value.*
← `+3.000000E+01`	

[SOURce:]CURRent:LIMit

Syntax

`[SOURce:]CURRent:LIMit <value>`

This command sets the over-current limit for the constant voltage output. If the load effect exceeds the over-current limit setting, the instrument output will be dropped down to meet the over-current limit setting.

`[SOURce:]CURRent:LIMit?`

This query returns a numeric value that represents the over-current limit value of the constant voltage output.

Parameter

Item	Type	Range of values			Default value
		Range	Min	Max	
value	Numeric	S1	0 A	1.05 A	1 A
		S2	0 A	3.15 A	3 A

Remarks

- If the over-current limit value is set to zero, the instrument output will be dropped down to zero for limiting.
- If the over-current limit value is set to a greater value than the over-current protection value, the over-current protection value will be adjusted to equal the over-current limit value.
- The `[SOURce:]CURRent:LIMit` command is not applicable for square-wave output and 4-wire resistance measurements (Lo Ω).

Example

→ `CURR:LIM 3`	*This command sets the over-current limit to 3 A for the constant voltage output.*
→ `CURR:LIM?`	*This query returns the over-current limit value.*
← `+3.000000E+00`	

[SOURce:]VOLTage:PROTection

Syntax

```
[SOURce:]VOLTage:PROTection <value>
```

This command sets the over-voltage protection for the constant current output. If the load effect exceeds the over-voltage protection setting, the instrument output will be disabled.

```
[SOURce:]VOLTage:PROTection?
```

This query returns a numeric value that represents the over-voltage protection value of the constant current output.

Parameter

Item	Type	Range of values			Default value
		Range	Min	Max	
value	Numeric	S1	0 V	33 V	Max
		S2	0 V	8.8 V	

Remarks

- If the over-voltage protection value is set to a lesser value than the over-voltage limit value, the over-voltage limit value will be adjusted to equal the over-voltage protection value.
- The `[SOURce:]VOLTage:PROTection` command is not applicable for square-wave output and 4-wire resistance measurements (Lo Ω).
- The instrument output will be disabled to protect the instrument when the voltage change exceeds the over-voltage programmed limit.

Example

→ `VOLT:PROT 30 V`	*This command sets the over-voltage protection to 30 V for the constant current output.*
→ `VOLT:PROT?`	*This query returns the over-voltage protection value.*
← `+3.000000E+01`	

[SOURce:]CURRent:PROTection

Syntax

```
[SOURce:]CURRent:PROTection <value>
```

This command sets the over-current protection for the constant voltage output. If the load effect exceeds the over-current protection setting, the instrument output will be disabled.

```
[SOURce:]CURRent:PROTection?
```

This query returns a numeric value that represents the over-current protection value of the constant voltage output.

Parameter

Item	Type	Range of values			Default value
		Range	Min	Max	
value	Numeric	S1	0 A	1.1 A	Max
		S2	0 A	3.3 A	

Remarks

- If the over-current protection value is set to a lesser value than the over-current limit value, the over-current limit value will be adjusted to equal the over-current protection value.
- The `[SOURce:]CURRent:PROTection` command is not applicable for square-wave output and 4-wire resistance measurements (Lo Ω).
- The instrument output will be disabled to protect the instrument when the current drawn exceeds the over-current programmed limit.

Example

→ `CURR:PROT 3 A`	*This command sets the over-current protection to 3 A for the constant voltage output.*
→ `CURR:PROT?`	*This query returns the over-current protection value.*
← `+3.000000E+00`	

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

Syntax

`[SOURce:]VOLTage[:LEVel][:IMMediate][:AMPLitude] <value>`

This command sets the amplitude for the constant voltage output.

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

This query returns a numeric value that represents the amplitude of the constant voltage output.

NOTE This command cannot change the range of the output. You should use the `SOURce:VOLTage:RANGe` command to change range of the output.

Parameter

Item	Type	Range of values			Default value
		Range	Min	Max	
value	Numeric	S1	0 V	31.5 V	Min
		S2	0 V	8.4 V	

Example

→ `VOLT 10.0`	*This command sets the immediate output voltage level to 10 V.*
→ `VOLT?`	*This query returns the output voltage level.*
← `+1.000000E+01`	

See also

“[SOURce:]SENSe:VOLTage[:LEVel]?” on page 249

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

Syntax

`[SOURce:]CURRent[:LEVel][:IMMediate][:AMPLitude] <value>`

This command sets the amplitude for the constant current output.

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

This query returns a numeric value that represents the amplitude of the constant current output.

NOTE This command cannot change the range of the output. You should use the `SOURce:CURRent:RANge` command to change range of the output.

Parameter

Item	Type	Range of values			Default value
		Range	Min	Max	
value	Numeric	S1	0 A	1.05 A	Min
		S2	0 A	3.15 A	

Example

→ `CURR 0.5`	*This command sets the immediate output current level to 0.5 A.*
→ `CURR?`	*This query returns the output current level.*
← `+5.000000E-01`	

See also

"SOURce:CURRent:RANGe" on page 252

[SOURce:]VOLTage[:LEVel]:RAMP[:AMPLitude]

Syntax

`[SOURce:]VOLTage[:LEVel]:RAMP[:AMPLitude] <value>`

This command sets the amplitude end position for the voltage ramp signal.

`[SOURce:]VOLTage[:LEVel]:RAMP[:AMPLitude]?`

This query returns a numeric value that represents the amplitude end position of the voltage ramp signal.

Parameter

Item	Type	Range of values			Default value
		Range	Min	Max	
value	Numeric	S1	0 V	31.5 V	30 V
		S2	0 V	8.4 V	8 V

Remarks

- When the output range is changed (`SOURce:VOLTage:RANGe` or `SOURce:CURRent:RANGe` command), the ramp amplitude end position will always be set to the maximum value.
- The ramp amplitude end position value is stored in the nonvolatile memory. It is not affected by a power-on cycle, Factory Reset (`*RST` command), Instrument Preset (`SYSTem:PRESet` command), or function change.

Example

→ VOLT:RAMP 8	*This command sets the amplitude end position of the voltage ramp signal to 8 V.*
→ VOLT:RAMP?	*This query returns the amplitude end position of the voltage ramp signal.*
← +8.000000E+00	

See also

"[SOURce:]SENSe:VOLTage[:LEVel]?" on page 249

"SOURce:CURRent:RANGe" on page 252

"SYSTem:PRESet" on page 301

"*RST" on page 328

[SOURce:]CURRent[:LEVel]:RAMP[:AMPLitude]

Syntax

`[SOURce:]CURRent[:LEVel]:RAMP[:AMPLitude] <value>`

This command sets the amplitude end position for the current ramp signal.

`[SOURce:]CURRent[:LEVel]:RAMP[:AMPLitude]?`

This query returns a numeric value that represents the amplitude end position of the current ramp signal.

Parameter

Item	Type	Range of values			Default value
		Range	Min	Max	
value	Numeric	S1	0 A	1.05 A	3 A
		S2	0 A	3.15 A	1 A

Remarks

- When the output range is changed (`SOURce:VOLTage:RANGe` or `SOURce:CURRent:RANGe` command), the ramp amplitude end position will always be set to the maximum value.
- The ramp amplitude end position value is stored in the nonvolatile memory. It is not affected by a power-on cycle, Factory Reset (`*RST` command), Instrument Preset (`SYSTem:PRESet` command), or function change.

Example

→ `CURR:RAMP 1`	*This command sets the amplitude end position of the current ramp signal to 1 A.*
→ `CURR:RAMP?`	*This query returns the amplitude end position of the current ramp signal .*
← `+1.000000E+00`	

See also

“[SOURce:]SENSe:VOLTage[:LEVel]?” on page 249

“SOURce:CURRent:RANGe” on page 252

“SYSTem:PRESet” on page 301

“*RST” on page 328

[SOURce:]VOLTage[:LEVel]:RAMP:STEP

Syntax

```
[SOURce:]VOLTage[:LEVel]:RAMP:STEP <value>
```

This command sets the number of steps for the voltage ramp signal.

```
[SOURce:]VOLTage[:LEVel]:RAMP:STEP
```

This query returns a numeric value that represents the number of steps in the voltage ramp signal.

Parameter

Item	Type	Range of values	Default value
value	Numeric	1 to 10000 (steps)	100 (steps)

Remarks

- When the output range is changed (`SOURce:VOLTage:RANGe` or `SOURce:CURRent:RANGe` command), the ramp step will remain unchanged.
- The ramp step value is stored in the nonvolatile memory. It is not affected by a power-on cycle, Factory Reset (`*RST` command), Instrument Preset (`SYSTem:PRESet` command), or function change.

Example

→ `VOLT:RAMP:STEP 10`	*This command sets the number of steps in the voltage ramp signal to 10.*
→ `VOLT:RAMP:STEP?`	*This query returns the number of steps in the voltage ramp signal.*
← `+1.000000E+01`	

See also

"SYSTem:PRESet" on page 301

"*RST" on page 328

[SOURce:]CURRent[:LEVel]:RAMP:STEP

Syntax

[SOURce:]CURRent[:LEVel]:RAMP:STEP <value>

This command sets the number of steps for the current ramp signal.

[SOURce:]CURRent[:LEVel]:RAMP:STEP

This query returns a numeric value that represents the number of steps in the current ramp signal.

Parameter

Item	Type	Range of values	Default value
value	Numeric	1 to 10000 (steps)	100 (steps)

Remarks

- When the output range is changed (SOURce:VOLTage:RANGe or SOURce:CURRent:RANGe command), the ramp step will remain unchanged.
- The ramp step value is stored in the nonvolatile memory. It is not affected by a power-on cycle, Factory Reset (*RST command), Instrument Preset (SYSTem:PRESet command), or function change.

Example

→ CURR:RAMP:STEP 10	*This command sets the number of steps in the current ramp signal to 10.*
→ CURR:RAMP:STEP?	*This query returns the number of steps in the current ramp signal.*
← +1.000000E+01	

See also

"SYSTem:PRESet" on page 301

"*RST" on page 328

[SOURce:]VOLTage[:LEVel]:SCAN[:AMPLitude]

Syntax

`[SOURce:]VOLTage[:LEVel]:SCAN[:AMPLitude] <value>`

This command sets the amplitude end position for the voltage scan signal.

`[SOURce:]VOLTage[:LEVel]:SCAN[:AMPLitude]?`

This query returns a numeric value that represents the amplitude end position of the voltage scan signal.

Parameter

Item	Type	Range of values			Default value
		Range	Min	Max	
value	Numeric	S1	0 V	31.5 V	30 V
		S2	0 V	8.4 V	8 V

Remarks

- When the output range is changed (`SOURce:VOLTage:RANGe` or `SOURce:CURRent:RANGe` command), the scan amplitude end position will always be set to the maximum value.
- The scan amplitude end position value is stored in the nonvolatile memory. It is not affected by a power-on cycle, Factory Reset (`*RST` command), Instrument Preset (`SYSTem:PRESet` command), or function change.

Example

→ VOLT:SCAN 8	*This command sets the amplitude end position of the voltage scan signal to 8 V .*
→ VOLT:SCAN?	*This query returns the amplitude end position of the voltage scan signal.*
← +8.000000E+00	

See also

“[SOURce:]SENSe:VOLTage[:LEVel]?” on page 249

“SOURce:CURRent:RANGe” on page 252

“SYSTem:PRESet” on page 301

“*RST” on page 328

[SOURce:]CURRent[:LEVel]:SCAN[:AMPLitude]

Syntax

`[SOURce:]CURRent[:LEVel]:SCAN[:AMPLitude] <value>`

This command sets the amplitude end position for the current scan signal.

`[SOURce:]CURRent[:LEVel]:SCAN[:AMPLitude]?`

This query returns a numeric value that represents the amplitude end position of the current scan signal.

Parameter

Item	Type	Range of values			Default value
		Range	Min	Max	
value	Numeric	S1	0 A	1.05 A	1 A
		S2	0 A	3.15 A	3 A

Remarks

- When the output range is changed (`SOURce:VOLTage:RANGe` or `SOURce:CURRent:RANGe` command), the scan amplitude end position will always be set to the maximum value.
- The scan amplitude end position value is stored in the nonvolatile memory. It is not affected by a power-on cycle, Factory Reset (`*RST` command), Instrument Preset (`SYSTem:PRESet` command), or function change.

Example

→ `CURR:SCAN 1`	*This command sets the amplitude end position of the current scan signal to 1 A.*
→ `CURR:SCAN?`	*This query returns the amplitude end position of the current scan signal.*
← `+1.000000E+00`	

See also

"[SOURce:]SENSe:VOLTage[:LEVel]?" on page 249

"SOURce:CURRent:RANGe" on page 252

"SYSTem:PRESet" on page 301

"*RST" on page 328

[SOURce:]VOLTage[:LEVel]:SCAN:STEP

Syntax

`[SOURce:]VOLTage[:LEVel]:SCAN:STEP <value>`

This command sets the number of steps for the voltage scan signal.

`[SOURce:]VOLTage[:LEVel]:SCAN:STEP`

This query returns a numeric value that represents the number of steps in the voltage scan signal.

Parameter

Item	Type	Range of values	Default value
value	Numeric	1 to 100 (steps)	10 (steps)

Remarks

- When the output range is changed (`SOURce:VOLTage:RANGe` or `SOURce:CURRent:RANGe` command), the scan step will remain unchanged.
- The scan step value is stored in the nonvolatile memory. It is not affected by a power-on cycle, Factory Reset (`*RST` command), Instrument Preset (`SYSTem:PRESet` command), or function change.

Example

→ `VOLT:SCAN:STEP 20`	*This command sets the number of steps in the voltage scan signal to 20.*
→ `VOLT:SCAN:STEP?`	*This query returns the number of steps in the voltage scan signal.*
← `+2.000000E+01`	

See also

"SYSTem:PRESet" on page 301

"*RST" on page 328

[SOURce:]CURRent[:LEVel]:SCAN:STEP

Syntax

`[SOURce:]CURRent[:LEVel]:SCAN:STEP <value>`

This command sets the number of steps for the current scan signal.

`[SOURce:]CURRent[:LEVel]:SCAN:STEP`

This query returns a numeric value that represents the number of steps in the current scan signal.

Parameter

Item	Type	Range of values	Default value
value	Numeric	1 to 100 (steps)	100 (steps)

Remarks

- When the output range is changed (`SOURce:VOLTage:RANGe` or `SOURce:CURRent:RANGe` command), the scan step will remain unchanged.
- The scan step value is stored in the nonvolatile memory. It is not affected by a power-on cycle, Factory Reset (`*RST` command), Instrument Preset (`SYSTem:PRESet` command), or function change.

Example

→ `CURR:SCAN:STEP 20`	*This command sets the number of steps in the current scan signal to 20.*
→ `CURR:SCAN:STEP?`	*This query returns the number of steps in the current scan signal.*
← `+2.000000E+01`	

See also

"SYSTem:PRESet" on page 301

"*RST" on page 328

[SOURce:]VOLTage[:LEVel]:SCAN:DWELling

Syntax

`[SOURce:]VOLTage[:LEVel]:SCAN:DWELling <value>`

This command sets the dwelling time for the voltage scan signal.

`[SOURce:]VOLTage[:LEVel]:SCAN:DWELling?`

This query returns a numeric value that represents the dwelling time in the voltage scan signal.

Parameter

Item	Type	Range of values	Default value
value	Numeric	1 s to 99 s	2 s

Remarks

- When the output range is changed (`SOURce:VOLTage:RANGe` or `SOURce:CURRent:RANGe` command), the scan dwelling time will remain unchanged.
- The scan dwelling time is stored in the nonvolatile memory. It is not affected by a power-on cycle, Factory Reset (`*RST` command), Instrument Preset (`SYSTem:PRESet` command), or function change.

Example

→ `VOLT:SCAN:DWEL 1`	*This command sets the dwelling time in the voltage scan signal to 1 s.*
→ `VOLT:SCAN:DWEL?`	*This query returns the dwelling time in the voltage scan signal.*
← `+1.000000E+00`	

[SOURce:]CURRent[:LEVel]:SCAN:DWELling

Syntax

`[SOURce:]CURRent[:LEVel]:SCAN:DWELling <value>`

This command sets the dwelling time for the current scan signal.

`[SOURce:]CURRent[:LEVel]:SCAN:DWELling?`

This query returns a numeric value that represents the dwelling time in the current scan signal.

Parameter

Item	Type	Range of values	Default value
value	Numeric	1 s to 99 s	2 s

Remarks

- When the output range is changed (`SOURce:VOLTage:RANGe` or `SOURce:CURRent:RANGe` command), the scan dwelling time will remain unchanged.
- The scan dwelling time is stored in the nonvolatile memory. It is not affected by a power-on cycle, Factory Reset (`*RST` command), Instrument Preset (`SYSTem:PRESet` command), or function change.

Example

→ `CURR:SCAN:DWEL 1`	*This command sets the dwelling time in the current scan signal to 1 s.*
→ `CURR:SCAN:DWEL?`	*This query returns the dwelling time in the current scan signal.*
← `+1.000000E+00`	

[SOURce:]SQUare[:LEVel][:IMMediate]:AMPLitude

Syntax

`[SOURce:]SQUare[:LEVel][:IMMediate]:AMPLitude <value>`

This command sets the amplitude for the square-wave output.

`[SOURce:]SQUare[:LEVel][:IMMediate]:AMPLitude?`

This query returns a numeric value that represents the amplitude of the square-wave output.

NOTE This command cannot change the range of the output. You should use the `SOURce:VOLTage:RANge` command to change range of the output.

Parameter

Item	Type	Range of values			Default value
		Range	Min	Max	
value	Numeric	S1	0 V	30 V	Min
		S2	0 V	8 V	

Example

→ `SQU 10.0`	*This command sets the immediate square-wave output voltage to 10.0 V.*
→ `SQU?`	*This query returns the square-wave output voltage.*
← `+1.000000E+01`	

See also

"[SOURce:]SENSe:VOLTage[:LEVel]?" on page 249

[SOURce:]SQUare[:LEVel][:IMMediate]:FREQuency

Syntax

`[SOURce:]SQUare[:LEVel][:IMMediate]:FREQuency <value>`

This command sets the frequency for the square-wave output.

`[SOURce:]SQUare[:LEVel][:IMMediate]:FREQuency?`

This query returns a numeric value that represents the frequency of the square-wave output.

Parameter

Item	Type	Range of values	Default value
value	Discrete	0.5, 2, 5, 6, 10, 15, 25, 30, 40, 50, 60, 75, 80, 100, 120, 150, 200, 240, 300, 400, 480, 600, 800, 1200, 1600, 2400, 4800 (Hz)[1]	600 (Hz)

[1] If you choose to enter a numeric value of your own choice, the U3606A automatically selects the nearest predefined setting that is equal or greater than the numeric value. For example, sending the `SQU:FREQ 49` command will result in the predefined setting of 50 Hz being selected.

Example

→ `SQU:FREQ 800`	*This command sets the square-wave output frequency to 800 Hz.*
→ `SQU:FREQ?`	*This query returns the square-wave output frequency.*
← `+8.000000E+02`	

[SOURce:]SQUare[:LEVel][:IMMediate]:DCYCle

Syntax

`[SOURce:]SQUare[:LEVel][:IMMediate]:DCYCle <value>`

This command sets the duty cycle for the square-wave output.

`[SOURce:]SQUare[:LEVel][:IMMediate]:DCYCle?`

This query returns a numeric value that represents the duty cycle of the square-wave output.

Parameter

Item	Type	Range of values	Default value
value	Numeric	0 (%) to 100 (%)	50 (%)

Remarks

The duty cycle can be stepped through 256 steps, with each step equivalent to 0.390625%. The U3606A will adjust the input value to the nearest step, calculated by the following equation:

$$Nearest\ step = \frac{\left(\frac{Input\ value \times 256}{100}\right)^{*}}{256} \times 100$$

*All decimal parts are truncated. For example, 51.2 is truncated to 51.

As an example, when you send the command `SQU:DCYC 20`, the duty cycle is adjusted to `19.92%`. If you send the command `SQU:DCYC 0`, the nearest duty cycle step, `0.39%` will be selected.

Example

→ SQU:DCYC 20	*This command sets the square-wave output duty cycle to approximately 20%.*
→ SQU:DCYC?	*This query returns the square-wave output duty cycle.*
← +1.992180E+01	

[SOURce:]SQUare[:LEVel][:IMMediate]:PWIDth

Syntax

```
[SOURce:]SQUare[:LEVel][:IMMediate]:PWIDth <second>
```

This command sets the pulse width for the square-wave output.

```
[SOURce:]SQUare[:LEVel][:IMMediate]:PWIDth?
```

This query returns a numeric value that represents the pulse width of the square-wave output.

Parameter

Item	Type	Range of values	Default value
second	Numeric	0 (ms) to MAX[1] (ms)	0.8333 (ms)

[1] The maximum time (MAX) is dependent on the frequency value of the square–wave output. Default frequency value is 600 Hz.

Remarks

The pulse width can be stepped through 256 steps, with each step equivalent to 1/(256 × frequency). The input value is always calculated to the duty cycle first.

$$Duty\ cycle\ (\%) = Pulse\ width\ (s) \times Frequency\ (Hz) \times 100\ (\%)$$

The duty cycle value calculated in the equation above will be used to calculate the nearest duty cycle step available in the U3606A.

$$Nearest\ step\ (Duty\ cycle) = \frac{\left(\frac{Duty\ cycle \times 256}{100}\right)^{*}}{256} \times 100$$

*All decimal parts are truncated. For example, 184.32 is truncated to 184.

The U3606A will then adjust the input value to the nearest pulse width step, calculated by the following equation:

$$Nearest\ step\ (Pulse\ width) = \frac{Duty\ cycle}{Frequency \times 100}$$

Example

→ SQU:PWID 0.0012	*This command sets the square-wave output pulse width to approximately 1.2 ms.*
→ SQU:PWID?	*This query returns the square-wave output duty cycle.*
← +1.197910E-03	

Calculation example

The pulse width can be stepped through 256 steps, with each step equivalent to 1/(256 × frequency). The input value is always calculated to the duty cycle first.

$$Duty\ cycle\ (\%) = Pulse\ width\ (s) \times Frequency\ (Hz) \times 100\ (\%)$$

$$Duty\ cycle\ (\%) = 0.0012\ (s) \times 600\ (Hz) \times 100\ (\%) = 72\ (\%)$$

The duty cycle value calculated in the equation above will be used to calculate the nearest duty cycle step available in the U3606A.

$$Nearest\ step\ (Duty\ cycle) = \frac{\left(\frac{Duty\ cycle \times 256}{100}\right)^*}{256} \times 100$$

$$Nearest\ step\ (Duty\ cycle) = \frac{\left(\frac{72 \times 256}{100}\right)^*}{256} \times 100 = 71.875\ (\%)$$

*All decimal parts are truncated, for example 184.32 is truncated to 184.

The U3606A will then adjust the input value to the nearest pulse width step, calculated by the following equation:

$$Nearest\ step\ (Pulse\ width) = \frac{Duty\ cycle}{Frequency \times 100}$$

$$Nearest\ step\ (Pulse\ width) = \frac{71.875}{600 \times 100} = 1.19791\ (ms)$$

[SOURce:]PROTection[:STATe]

Syntax

`[SOURce:]PROTection[:STATe] {0|1|OFF|ON}`

This command sets the output protection state.

`[SOURce:]PROTection[:STATe]?`

This query returns a boolean value that represents the output protection state.

Parameter

Item	Type	Range of values	Default value
state	Boolean	• 0 | OFF: Disable circuit trip • 1 | ON: Enable circuit trip	1

CAUTION Disabling the output protection state may result in equipment damage if an over–voltage or over–current condition occurs.

Remarks

- The source protection state is stored in the nonvolatile memory. It is not affected by a power-on cycle, Factory Reset (`*RST` command), Instrument Preset (`SYSTem:PRESet` command), or function change.

Example

→ `PROT:STAT OFF`	*This command disables the output circuit trip.*
→ `PROT:STAT?`	*This query returns the output protection state.*
← `0`	

See also

"SYSTem:PRESet" on page 301

"*RST" on page 328

11
STATus Subsystem

STATus:OPERation:CONDition? 284
STATus:OPERation:ENABle 285
STATus:OPERation[:EVENt]? 287
STATus:PRESet 288
STATus:QUEStionable:CONDition? 289
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STATus:QUEStionable[:EVENt]? 292

This chapter describes the STATus commands used to program the U3606A over a remote interface. Use the STATus commands to determine the operating condition of the U3606A at any time.

STATus:OPERation:CONDition?

Syntax

`STATus:OPERation:CONDition?`

This query reads the condition register for the Standard Operation register group and returns a decimal value which corresponds to the binary-weighted sum of all bits set in the condition register (Table 11-1 on page 285). For example, if bit 5 (decimal value = 32) and bit 9 (decimal value = 512) are set, this command will return the decimal value "`+544`".

NOTE

This is a read-only register and the bits are not cleared when you read the register. For more information on the bit definitions of the Standard Operation register and the SCPI status diagram see the "SCPI Status System" on page 12.

Remarks

- A condition register continuously monitors the state of the instrument. The bits in the condition register are updated in real time and the bits are not latched or buffered.
- The condition register bits reflect the current condition of the instrument. If a condition goes away, the corresponding bit is cleared in the condition register.

Example

→ `STAT:OPER:COND?`	*This command reads the condition register (bit 5 is set).*
← `+32`	

See also

"STATus:OPERation:ENABle" on page 285

"STATus:OPERation[:EVENt]?" on page 287

STATus:OPERation:ENABle

Syntax

`STATus:OPERation:ENABle <enable_value>`

This command enables bits in the enable register for the Standard Operation register group. The selected bits are then reported to the Status Byte register.

Table 11-1 Standard Operation register mapping

Bit number	Decimal value	Meaning
0	1	Calibration in progress
1 to 3	Not used	Not used
4	16	Measuring
5	32	Waiting for trigger
6 to 7	Not used	Not used
8	256	Configuration change
9	Not used	Not used
10	1024	Instrument locked
11 to 15	Not used	Not used

`STATus:OPERation:ENABle?`

This query reads the enable register and returns a decimal value that corresponds to the binary-weighted sum of all bits set in the register. For example, if bit 8 (decimal value = 256) and bit 10 (decimal value = 1024) are enabled, the query command will return "`+1280`".

NOTE For more information on the bit definitions of the Standard Operation register and the SCPI status diagram, see "SCPI Status System" on page 12.

Parameter

Item	Type	Range of values	Default value
enable_ value	Numeric	0 to 65535[1]	0

[1] Refer to Table 11-1 for the list of bit definitions for the Standard Operation register. To enable more than one bit at a time, use the binary-weighted sum of the intended bits. For example, to set bit 4 and 5, use `48` (16 + 32) as your value.

Remarks

- An enable register defines which bits in the event register will be reported to the Status Byte register group. You can write to or read from an enable register.
- The `*CLS` (clear status) command will not clear the enable register but it does clear all bits in the event register.
- The `STATus:PRESet` command will clear all bits in the enable register.
- The `*RST` and `SYSTem:PRESet` commands have no effect on this register.
- The `*PSC` command affects whether this register is cleared at power on.

Example

→ `STAT:OPER:ENAB 32`	*This command enables bit 5 (decimal value = 32) in the enable register.*
→ `STAT:OPER:ENAB?`	*This query returns which bits are enabled in the register.*
← `32`	

See also

"STATus:PRESet" on page 288

"SYSTem:PRESet" on page 301

"*PSC" on page 326

STATus:OPERation[:EVENt]?

Syntax

`STATus:OPERation[:EVENt]?`

This query reads the event register for the Standard Operation register group and returns a decimal value which corresponds to the binary-weighted sum of all bits set in the event register (Table 11-1 on page 285). For example, if bit 0 (decimal value = 1) and bit 4 (decimal value = 16) are set (and the corresponding bits are enabled), this command will return the decimal value "+17".

NOTE

This is a read-only register and the bits are cleared when you read the register. For more information on the bit definitions of the Standard Operation register and the SCPI status diagram, see "SCPI Status System" on page 12.

Remarks

- Once a bit is set, it remains set until cleared by reading the event register.
- The *RST, SYSTem:PRESet, STATus:PRESet, and *PSC commands have no effect on this register.

Example

→ STAT:OPER?	*This command reads the event register (bit 9 is set).*

← +512

See also

"STATus:PRESet" on page 288

"SYSTem:PRESet" on page 301

"*PSC" on page 326

STATus:PRESet

Syntax

`STATus:PRESet`

This command clears all bits in the Status Questionable enable register and the Status Operation enable register.

Remarks

An enable register defines which bits in the event register will be reported to the Status Byte register group. You can write to or read from an enable register.

Example

→ STAT:PRES	*This command clears the enable register bits.*

STATus:QUEStionable:CONDition?

Syntax

`STATus:QUEStionable:CONDition?`

This command queries the condition register for the Questionable Data register group and returns a decimal value which corresponds to the binary-weighted sum of all bits set in the condition register (Table 11-2 on page 290). For example, if bit 0 (decimal value = 1) and bit 2 (decimal value = 4) are set, this command will return the decimal value "+5".

NOTE This is a read-only register and the bits are not cleared when you read the register. For more information on the bit definitions of the Questionable Data register and the SCPI status diagram see the "SCPI Status System" on page 12.

Remarks

- A condition register continuously monitors the state of the instrument. The bits in the condition register are updated in real time and the bits are not latched or buffered.
- The condition register bits reflect the current condition of the instrument. If a condition goes away, the corresponding bit is cleared in the condition register. A Factory Reset (`*RST` command) will clear all bits in the condition register.

Example

→ `STAT:QUES:COND?`	*This command reads the condition register (bit 12 is set).*
← `+4096`	

See also

"STATus:QUEStionable:ENABle" on page 290

"STATus:QUEStionable[:EVENt]?" on page 292

STATus:QUEStionable:ENABle

Syntax

`STATus:QUEStionable:ENABle <enable_value>`

This command enables bits in the enable register for the Questionable Data register group. The selected bits are then reported to the Status Byte.

Table 11-2 Questionable Data register mapping

Bit number	Decimal value	Meaning
0	1	Voltage overload
1	2	Current overload
2	4	Output over voltage
3	8	Output over current
4	Not used	Not used
5	32	Frequency overload/underflow
6 to 7	Not used	Not used
8	256	Calibration corrupt
9	512	Resistance overload
10	1024	Capacitance overload/underflow
11	2048	Lower limit failed
12	4096	Upper limit failed
13 to 15	Not used	Not used

`STATus:QUEStionable:ENABle?`

This query reads the enable register and returns a decimal value that corresponds to the binary-weighted sum of all bits set in the register. For example, if bit 8 (decimal value = 256) and bit 10 (decimal value = 1024) are enabled, the query command will return “`+1280`”.

NOTE For more information on the bit definitions of the Questionable Data register and the SCPI status diagram, see "SCPI Status System" on page 12.

Parameter

Item	Type	Range of values	Default value
enable_ value	Numeric	0 to 65535[1]	0

[1] Refer to Table 11-2 for the list of bit definitions for the Questionable Data register. To enable more than one bit at a time, use the binary-weighted sum of the intended bits. For example, to set bit 3 and 5, use `40` (8 + 32) as your value.

Remarks

- An enable register defines which bits in the event register will be reported to the Status Byte register group. You can write to or read from an enable register.
- The `*CLS` (clear status) command will not clear the enable register but it does clear all bits in the event register.
- The `STATus:PRESet` command will clear all bits in the enable register.
- The `*RST` and `SYSTem:PRESet` commands have no effect on this register.
- The `*PSC` command affects whether this register is cleared at power on.

Example

→ `STAT:QUES:ENAB 512`	*This command enables bit 9 (decimal value = 512) in the enable register.*
→ `STAT:QUES:ENAB?`	*This query returns which bits are enabled in the register.*
← `+512`	

STATus:QUEStionable[:EVENt]?

Syntax

`STATus:QUEStionable[:EVENt]?`

This command queries the event register for the Questionable Data register group and returns a decimal value which corresponds to the binary-weighted sum of all bits set in the condition register. For example, if bit 1 (decimal value = 2) and bit 9 (decimal value = 512) are set, this command will return the decimal value "`+514`".

NOTE This is a read-only register and the bits are cleared when you read the register. For more information on the bit definitions of the Questionable Data register and the SCPI status diagram see the "SCPI Status System" on page 12.

Remarks

- An event register latches the various events from the condition register. There is no buffering in this register; while an event bit is set, subsequent events corresponding to that bit are ignored.
- Once a bit is set, it remains set until cleared by reading the event register.
- The `STATus:PRESet`, `SYSTem:PRESet`, `*RST`, and `*PSC` commands have no effect on this register.

Example

→ `STAT:QUES?`	*This command reads the event register for the Questionable Data register group.*
← `+2568`	

See also

"STATus:PRESet" on page 288

"SYSTem:PRESet" on page 301

12
SYSTem Subsystem

SYSTem:BEEPer[:IMMediate] 294
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SYSTem:DEFault 297
SYSTem:ERRor? 298
SYSTem:LOCal 300
SYSTem:PRESet 301
SYSTem:RWLock 302
SYSTem:SMOoth[:STATe] 303
SYSTem:SMOoth:FLUCtuation 305
SYSTem:SMOoth:POINts 307
SYSTem:VERSion? 308

This chapter describes the SYSTem commands used to program the U3606A over a remote interface. Use the SYSTem commands to enable or disable the beeper tone, to lock or unlock the front panel keys, or to return the error numbers and messages from the error queue.

SYSTem:BEEPer[:IMMediate]

Syntax

`SYSTem:BEEPer[:IMMediate]`

This command issues a single beep immediately from the instrument. This may be useful for program development and troubleshooting.

Remarks

This command does not override the current beeper state (`SYSTem:BEEPer:STATe` command). You must enable the beeper (`SYSTem:BEEPer:STATe ON`) before using this command.

Example

→ `SYST:BEEP`	*This command issues a single beep from the instrument.*

See also

"SYSTem:BEEPer[:IMMediate]" on page 294

SYSTem:BEEPer:STATe

Syntax

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

This command enables or disables the beeper tone.

The valid options are:

- `0|OFF`: Disables the beeper tone
- `1|ON`: Enables the beeper tone

`SYSTem:BEEPer:STATe?`

This query returns a boolean value that represents the beeper state of the instrument.

Parameter

Item	Type	Range of values	Default value
state	Boolean	0|1|OFF|ON	1

Remarks

- A beep tone is emitted only if the beep state is `ON` in the following cases:
  - An error is generated.
  - A set low or high limit is exceeded in a limit test.
  - A stable reading is captured in the reading hold mode.
  - A forward-biased diode is measured in the diode test function.
- The beeper setting is stored in nonvolatile memory, and does not change when power has been off, after a Factory Reset (`*RST` command), or after an Instrument Preset (`SYSTem:PRESet` command).

Example

→ SYST:BEEP:STAT OFF	*This command disables the beeper tone in the instrument.*
→ SYST:BEEP:STAT	*This query returns the beeper state of the instrument.*
← 0	

See also

"SYSTem:BEEPer[:IMMediate]" on page 294

"SYSTem:PRESet" on page 301

"*RST" on page 328

SYSTem:DEFault

Syntax

```
SYSTem:DEFault
```

This command set the default factory settings without the calibrated data to the nonvolatile memory. The instrument will reset after the command is completed.

Example

→ `SYST:DEF`	*This command resets the instrument to its factory default state.*

SYSTem:ERRor?

Syntax

`SYSTem:ERRor?`

This command reads and clears one error from the instrument's error queue. A record of up to 20 errors can be stored in the U3606A error queue.

For SCPI command errors, this command returns the following format string: `<Number,"Error String">`

The error string may contain up to 255 characters and consists of an error number and an error string enclosed in double quotes.

For example: `-113,"Undefined header"`

Errors are retrieved in a first-in-first-out (FIFO) order. The first error returned is the first error that was stored. Reading this error will clear this error allowing the next error to be read (if there are other errors stored).

Remarks

- The U3606A beeps once each time a command syntax or hardware error occurs.
- If more than 20 errors have occurred, the last error stored in the queue (the most recent error) is replaced with error number `-350,"Error queue overflow"`. No additional errors are stored until you remove errors from the queue.
- If no errors have occurred when you read the error queue, the instrument responds with `+0,"No error"`.
- Error conditions are also summarized in the Status Byte register.
- The error queue is cleared by the clear status (`*CLS`) command (for I/O session), and when power is cycled (for all errors). However, the error queue will not be cleared by a factory reset (`*RST`) command.

Example

→ SYST:ERR?	*This query reads and clears one error.*
← +0,"No error"	*There are no errors recorded.*
→ SOUR:CURR:RANG 3	*A command syntax error is generated when this command is sent.*
→ SYST:ERR?	
← -113,"Undefined header"	*An invalid command was specified.*

See also

"*CLS" on page 320

"*RST" on page 328

SYSTem:LOCal

Syntax

`SYSTem:LOCal`

Description

This command places the instrument in the local state. All keys on the front panel are now fully functional.

Example

→ SYST:LOC	*This command places the instrument in the local state.*

See also

"SYSTem:RWLock" on page 302

SYSTem:PRESet

Syntax

`SYSTem:PRESet`

This command resets the instrument to its factory default state, which is the state when the U3606A is powered-on for the first time. This command is included for compatibility with other products and performs the same actions as the `*RST` command.

Example

→ `SYST:PRES`	*This command resets the instrument to its factory default state.*

See also

"*RST" on page 328

SYSTem:RWLock

Syntax

`SYSTem:RWLock`

This command places the instrument in the remote state. All keys on the front panel are now disabled.

NOTE This command locks all keys in the front panel including the Local Shift key.

Example

→ `SYST:RWL`	*This command places the instrument in the remote state.*

See also

"SYSTem:LOCal" on page 300

SYSTem:SMOoth[:STATe]

`SYSTem:SMOoth[:STATe] {0|1|OFF|ON}`

This command disables or enables the smooth function.

`SYSTem:SMOoth[:STATe]?`

This command queries the state of the smooth function and returns a boolean value that represent the state.

Parameter

Item	Type	Range of values	Default value
state	Boolean	• 0 | OFF: Disable smooth function • 1 | ON: Enable smooth function	0

Remarks

- If the instrument encounters a signal that is out of range, the instrument gives an overload indication.
  - Positive overload: "+9.900000E+37" or "OL" from the front panel.
  - Negative overload: "-9.900000E+37" or "-OL" from the front panel.

  The smooth function calculations will restart once the signals are back in range.
- If the trigger mode is enabled while the smooth function is ON, the smooth function will be disabled automatically. The smooth function will reactivate once the trigger mode is exited.
- The smooth function state is stored in the nonvolatile memory. It is not affected by a power-on cycle, Factory Reset (*RST command), Instrument Preset (SYSTem:PRESet command), or function change.

Example

→ SYST:SMO:STAT OFF	*This command disables the smooth function of the instrument.*
→ SYST:SMO:STAT?	*This query returns the smooth function state.*
← 0	

See also

"SYSTem:PRESet" on page 301

"SYSTem:SMOoth:FLUCtuation" on page 305

"SYSTem:SMOoth:POINts" on page 307

"*RST" on page 328

SYSTem:SMOoth:FLUCtuation

Syntax

`SYSTem:SMOoth:FLUCtuation <value>`

This command sets the fluctuation count of the smooth function.

`SYSTem:SMOoth:FLUCtuation?`

This command queries the fluctuation count setting of the smooth function and returns the numeric fluctuation count value.

Parameter

Item	Type	Range of values	Default value
value	Numeric	0.0% to 9.9%	1.0%

Remarks

- When the value of the fluctuation count is set to 0.0%, the fluctuation function of the smooth function is disabled.
- The smooth function state is stored in the nonvolatile memory. It is not affected by a power-on cycle, Factory Reset (`*RST` command), Instrument Preset (`SYSTem:PRESet` command), or function change.

NOTE Input signal readings that are more than or less than the fluctuation count of the previous signal will reset the smooth function. It is recommended that the fluctuation count is enabled.

Example

→ `SYST:SMO:FLUC 0.5`	*This command sets the value of the fluctuation count to 0.5%.*
→ `SYST:SMO:FLUC?`	*This query returns the value of the fluctuation count.*
← `0.5`	

See also

"SYSTem:PRESet" on page 301

"SYSTem:SMOoth[:STATe]" on page 303

"SYSTem:SMOoth:POINts" on page 307

"*RST" on page 328

SYSTem:SMOoth:POINts

Syntax

`SYSTem:SMOoth:POINts <value>`

This command sets the number of points for the smooth function.

`SYSTem:SMOoth:POINts?`

This command queries the number of points of the smooth function and returns the numeric number of points value.

Parameter

Item	Type	Range of values	Default value
value	Numeric	2 to 1999	10

Remarks

- The smooth function state is stored in the nonvolatile memory. It is not affected by a power-on cycle, Factory Reset (`*RST` command), Instrument Preset (`SYSTem:PRESet` command), or function change.

Example

→ `SYST:SMO:POIN 100`	*This command sets the number of points to 100.*
→ `SYST:SMO:POIN?`	*This query returns the number of points value of points.*
← `100`	

See also

"SYSTem:PRESet" on page 301

"SYSTem:SMOoth[:STATe]" on page 303

"SYSTem:SMOoth:FLUCtuation" on page 305

"*RST" on page 328

SYSTem:VERSion?

Syntax

`SYSTem:VERSion?`

This query returns a numeric value that represents the version of the SCPI (Standard Commands for Programmable Instruments) standard with which the instrument is in compliance. This instrument complies with the rules and conventions of the indicated version of the SCPI standard.

NOTE You cannot query the SCPI version from the front panel.

The command returns a string in the form “`YYYY.V`”, where “`YYYY`” represents the year of the version and “`V`” represents a version for that year.

Example

→ `SYST:VERS?`	*This query returns the SCPI standard version of the instrument.*
← `1999.0`	

13
TRIGger Subsystem

TRIGger:SOURce 310

This chapter describes the TRIGger command used to program the U3606A over a remote interface. Use the `TRIGger:SOURce` command to select a trigger source for measurements in the instrument.

TRIGger:SOURce

Syntax

`TRIGger:SOURce {IMMediate|BUS}`

This command selects the trigger source for measurements. The U3606A will accept a software (bus) command or an immediate (continuous) trigger.

The valid options are:

- `IMMediate`: For the `IMMediate` (continuous) source, the trigger signal is always present. When you place the instrument in the "wait-for-trigger" state, the trigger is issued immediately.
- `BUS`: For the `BUS` (software) source, the instrument is triggered by the `*TRG` command received over the remote interface. The `*TRG` command will not be accepted unless the instrument is in the "wait-for-trigger" state.

`TRIGger:SOURce?`

This query returns a string value that represents the trigger source selected in the U3606A.

Parameter

Item	Type	Range of values	Default value
source	Discrete	IMMediate|BUS	IMMediate

Remarks

- After selecting the trigger source, you must place the instrument in the "wait-for-trigger" state by using the `INITiate[:IMMediate]` command or `READ?` query. A trigger will not be accepted from the selected trigger source until the instrument is in the "wait-for-trigger" state.

NOTE The `INITiate[:IMMediate]` command only initiates the measurement and needs a trigger (`BUS` or `IMMediate`) to make the actual measurement.

- The `CONFigure` commands and `MEASure?` queries automatically sets the trigger source to `IMMediate`.
- For the `IMMediate` (continuous) source, the trigger signal is always present. When you place the instrument in the "wait-for-trigger" state, the trigger is issued immediately.
- For the `BUS` (software) source, the instrument is triggered by the `*TRG` command received over the remote interface. The `*TRG` command will not be accepted unless the internal instrument is in the "wait-for-trigger" state.
- The instrument selects the `IMMediate` trigger source after a Factory Reset (`*RST` command) or an Instrument Preset (`SYSTem:PRESet` command).
- If the selected trigger source is invalid due to a settings conflict, the source reverts automatically to `IMMediate`. A settings conflict error message is also generated.

Example

→ CONF	*This command configures the instrument for DC voltage measurements. The default range (autorange) and resolution (5½ digits) are used.*
→ TRIG:SOUR BUS	*This command selects the bus (software) trigger source.*
→ INIT	*This command places the instrument in the "wait-for-trigger" state.*
→ *TRG	*This command triggers the instrument.*
→ FETC?	*This command transfers the reading from the instrument memory to the output buffer.*
← +9.985308E+00	

See also

Chapter 4, “CONFigure Subsystem,” starting on page 79

“INITiate[:IMMediate]” on page 120

Chapter 6, “MEASure Subsystem,” starting on page 125

“SYSTem:PRESet” on page 301

“FETCh?” on page 315

“READ?” on page 316

“*RST” on page 328

“*TRG” on page 333

14
Root Commands

ABORt 314
FETCh? 315
READ? 316

This chapter describes the root commands used to program the U3606A U3606A over a remote interface. Use the `ABORt` command to abort a measurement in progress, and the `FETCh?` and `READ?` commands to retrieve a reading from the instrument output buffer.

ABORt

Syntax

`ABORt`

This command aborts a measurement in progress.

Remarks

- This command may be useful to abort a measurement when the instrument is waiting for a trigger, for a long measurement, or for a long series of timed measurements.
- The command will abort a measurement in progress and stop, returning the instrument to the trigger idle state.
- The Factory Reset (`*RST`) and Instrument Preset (`SYSTem:PRESet`) command will abort a measurement and set all measurement parameters to their factory settings.

Example

→ `ABOR`	*This command aborts the measurement in progress.*

See also

"SYSTem:PRESet" on page 301

"*RST" on page 328

FETCh?

Syntax

`FETCh?`

This command transfers readings to the instrument output buffer where you can read them into your PC. The readings are not erased from the instrument memory when you read them. You can send this command multiple times to retrieve the same data in the instrument memory.

Remarks

- The `FETCh?` command will wait until the measurement is complete to terminate.
- The instrument clears all readings from volatile memory after a Factory Reset (`*RST` command), after an Instrument Preset (`SYSTem:PRESet` command), when power is cycled, when the measurement configuration is changed (see Chapter 4, "CONFigure Subsystem," starting on page 79), or on an `INITiate[:IMMediate]` command.

Example

→ `CONF:RES`	*This command configures the instrument for 2-wire resistance measurements. The default range (autorange) and resolution (5½ digits) are used.*
→ `INIT`	*This command places the instrument in the "wait-for-trigger" state, triggers a measurement, and stores the reading in the instrument memory.*
→ `FETC?`	*This command transfers the reading from the instrument memory to the output buffer.*
← `+9.999632E+06`	

See also

Chapter 4, "CONFigure Subsystem," starting on page 79

"INITiate[:IMMediate]" on page 120

READ?

Syntax

READ?

This command changes the instrument triggering system from the “idle state” to the “wait-for-trigger” state. Measurements will begin when the specified trigger conditions are satisfied following the receipt of the READ? command. Readings are then sent immediately to the volatile memory and the output buffer of the instrument.

NOTE The command sends readings directly to reading memory and the output buffer of the instrument.

Remarks

- When the trigger source is set to IMMediate, sending the READ? command is similar to sending the INITiate[:IMMediate] command followed immediately by the FETCh? command.
- When the trigger source is set to BUS, sending the READ? command causes an error.
- The instrument clears all readings from volatile memory after a Factory Reset (*RST command), after an Instrument Preset (SYSTem:PRESet command), when power is cycled, when the measurement configuration is changed (see Chapter 4, “CONFigure Subsystem,” starting on page 79), or on an INITiate[:IMMediate] command.

Example

→ `CONF:RES`	*This command configures the instrument for 2-wire resistance measurements. The default range (autorange) and resolution (5½ digits) are used.*
→ `TRIG:SOUR IMM`	*This command selects the immediate (continuous) trigger source.*
→ `READ?`	*This command places the instrument in the "wait-for-trigger" state, triggers a measurement, and sends the reading to the instrument memory and output buffer.*
← `+1.999632E+07`	

15
IEEE-488.2 Common Commands

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*ESE 321
*ESR? 323
*IDN? 324
*OPC 325
*PSC 326
*RCL 327
*RST 328
*SAV 329
*SRE 330
*STB? 332
*TRG 333
*TST? 334
*WAI 335

This chapter gives an introduction to the IEEE-488.2 common commands. It defines a set of common commands that perform functions such as reset, self-test, and status operations.

*CLS

Syntax

`*CLS`

The `*CLS` (CLear Status) is used to clear the event registers in all register groups. This command also clears the error queue.

Remarks

This commands also clears overvoltage protection and overcurrent protection condition.

Example

→ `*CLS`	*This command clears the event register bits and the error queue.*

See also

"*ESR?" on page 323

*ESE

Syntax

`*ESE <enable_value>`

The `*ESE` (Event Status Enable) enables bits in the enable register for the Standard Event register group. The selected bits are then reported to bit 5 of the Status Byte register.

Table 15-1 Standard Event register mapping

Bit number	Decimal value	Meaning
0	1	Operation complete
1	Not used	Not used
2	4	Query error
3	8	Device-specific error
4	16	Execution error
5	32	Command error
6	Not used	Not used
7	128	Power-on

`*ESE?`

This query reads the enable register and returns a decimal value that corresponds to the binary-weighted sum of all bits set in the register. For example, if bit 3 (decimal value = 8) and bit 7 (decimal value = 128) are enabled, this query returns "`+136`".

NOTE For more information on the bit definitions of the Standard Event register and the SCPI status diagram, see "SCPI Status System" on page 12.

Parameter

Item	Type	Range of values	Default value
enable_ value	Numeric	0 to 255[1]	0

[1] Refer to Table 15-1 for the list of bit definitions for the Standard Event register. To enable more than one bit at a time, use the binary-weighted sum of the intended bits. For example, to set bit 2, 3, and 4, use 28 (4 + 8 + 16) as your value.

Remarks

- An enable register defines which bits in the event register is reported to the Status Byte register group. You can write to or read from an enable register.
- The *CLS (clear status) command will not clear the enable register but it will clear all bits in the event register.
- You can use the *PSC command to control whether the Standard Event enable register is cleared on power-on.
- Refer to Figure 1-1 on page 13 for the status system diagram.

Example

→ *ESE 16	*This command enables bit 4 (decimal value = 16) in the enable register. If an execution error occurs, this condition will be reported to the Status Byte register (bit 5 will be set to high).*
→ *ESE?	*This query returns which bits are enabled in the register.*
← +16	

See also

"*CLS" on page 320

"*ESR?" on page 323

"*PSC" on page 326

*ESR?

Syntax

`*ESR?`

The `*ESR?` (Event Status Register) query reads the event register for the Standard Event register group and returns a decimal value which corresponds to the binary-weighted sum of all bits set in the event register (Table 15-1 on page 321). For example, if bit 0 (decimal value = 1) and bit 4 (decimal value = 16) are set (and the corresponding bits are enabled), this query returns the decimal value "`+17`".

NOTE This is a read-only register and the bits are cleared when you read the register. For more information on the bit definitions of the Standard Event register and the SCPI status diagram, see "SCPI Status System" on page 12.

Remarks

- An event register latches the various events from the condition register. There is no buffering in this register; while an event bit is set, subsequent events corresponding to that bit are ignored. This is a read-only register.
- The `*CLS` (clear status) command will clear all bits in the event register.
- Refer to Figure 1-1 on page 13 for the status system diagram.

Example

→ `*ESR?`	*This command reads the event register (bits 3 and 4 are set).*

← `+24`

*IDN?

Syntax

`*IDN?`

The `*IDN?` (IDeNtify) query returns the instrument's identification string which contains four comma-separated fields. The first field returned is the manufacturer's name, followed by the instrument model number, serial number, and firmware revision code.

```
<Manufacturer>, <Model_no>, <Serial_no>,
  <ii.ii-mm.mm-ss.ss>
```

Where, `ii.ii` represents the interface board firmware revision number, `mm.mm` represents the measurement board firmware revision number, and `ss.ss` represents the source board firmware revision number.

Example

→ `*IDN?`	*This query returns the instrument's identification string.*
← `Agilent Technologies, U3606A,KS08080027, 00.12-00.42-00.20`	

*OPC

Syntax

`*OPC`

The `*OPC` (OPeration Complete) command sets the “Operation complete” bit (bit 0) in the Standard Event register at the completion of the current operation.

`*OPC?`

This query returns the value “+1” to the output buffer at the completion of the current operation.

NOTE For more information on the bit definitions of the Standard Event register and the SCPI status diagram, see “SCPI Status System” on page 12.

Remarks

- The purpose of this command is to synchronize your application with the instrument.
- Note the difference between the `*OPC` command and the `*OPC?` query. The latter returns “1” to the output buffer at the completion of the current operation.

Example

→ `*OPC?`	*This query returns the value “+1” to the output buffer at the completion of the current operation.*

← `1`

*PSC

Syntax

`*PSC {0|1}`

The `*PSC` (Power-on Status Clear) command enables or disables the clearing of certain enable registers at power-on. With `*PSC 0` specified, these registers are not cleared at power-on. All enable registers are affected.

NOTE The `*PSC` command does not affect the clearing of the condition or event registers, just the enable registers.

`*PSC?`

This query returns "0" (do not clear at power on) or "1" (clear at power on).

Parameter

Item	Type	Range of values	Default value
setting	Boolean	0|1	1

Example

→ `*PSC 0`	*This command disables the power-on clearing of the affected registers.*
→ `*PSC?`	*This query returns the power-on status clear setting.*
← `0`	

*RCL

Syntax

```
*RCL {0|1|2|3|4|5|6|7|8|9|10|11|12|13|14|15|16}
```

This *RCL (ReCaLl) command recalls the instrument state stored in the specified storage location. If you recall the instrument state from a storage location that is empty, the U3606A always sets to the factory default settings. When shipped from the factory, storage locations 1 through 16 are empty. (Location 0 holds the power-on state.)

Use the *SAV command to store the current instrument state.

Parameter

Item	Type	Range of values	Default value
state	Discrete	0 to 16	-

Remarks

- The instrument has sixteen storage locations in nonvolatile memory to store instrument states. The instrument uses location 0 to automatically hold the state of the instrument at power down. You can only recall a state from a location that contains a previously stored state.
- A Factory Reset (*RST command) or SYSTem:PRESet command does not affect the configurations stored in memory. Once a state is stored, it remains until it is overwritten.

Example

→ *RCL 1	*This command recalls the instrument state previously stored in location 1.*

See also

"*SAV" on page 329

*RST

Syntax

`*RST`

The `*RST` (ReSeT) command resets the instrument to its factory default state, which is the state when the U3606A is powered-on for the first time.

Remarks

- The `*RST` command does not clear the event registers and the error queue. To clear the event registers and the error queue, send the `*CLS` command.
- This command does not affect any previously stored instrument states. For more information on saving and recalling previously stored instrument states, see "*SAV" on page 329 and "*RCL" on page 327.

Example

→ `*RST`	*This command resets the instrument to its factory default state.*

See also

"*CLS" on page 320

"*RCL" on page 327

"*SAV" on page 329

*SAV

Syntax

```
*SAV {0|1|2|3|4|5|6|7|8|9|10|11|12|13|14|15|16}
```

The `*SAV` (SAVe) command stores (saves) the current instrument state in the designated storage location. Any state previously stored in the same location is overwritten (with no error generated).

Use the `*RCL` command to recall a stored instrument state.

Parameter

Item	Type	Range of values	Default value
state	Discrete	0 to 16	-

Remarks

- The instrument has sixteen storage locations in nonvolatile memory to store instrument states. The instrument uses location 0 to automatically hold the state of the instrument at power down. You can only recall a state from a location that contains a previously stored state.
- When shipped from the factory, storage locations 1 through 16 are empty and the instrument is configured to automatically recall the power-down state (location 0) when power is restored. You can change the factory configuration such that a Factory Reset (`*RST` command) is issued when power is restored.
- A Factory Reset (`*RST` command) or `SYSTem:PRESet` command does not affect the configurations stored in memory. Once a state is stored, it remains until it is overwritten.

Example

→ `*SAV 1`	*This command stores the current instrument state in location 1.*

See also

"*RCL" on page 327

*SRE

Syntax

`*SRE <value>`

The `*SRE` (Service Request Enable) command enables bits in the enable register for the Status Byte register group. Once enabled, the corresponding bits may generate a Request for Service (RQS) in the Status Byte. This RQS event may generate a “call back” to your application as a type of asynchronous interrupt.

Table 15-2 Status Byte register mapping

Bit number	Decimal value	Definition
0	Not used	Not used
1	Not used	Not used
2	4	Error queue
3	8	Questionable Data summary
4	16	Message available
5	32	Standard Event summary
6	Not used	Not used
7	128	Standard Operation summary

`*SRE?`

This command reads the enable register and returns a decimal value which corresponds to the binary-weighted sum of all bits set in the register. For example, if bit 2 (decimal value = 4) and bit 4 (decimal value = 16) are enabled, the query returns “`+20`”.

NOTE For more information on the bit definitions of the Status Byte register and the SCPI status diagram, see “SCPI Status System” on page 12.

Parameter

Item	Type	Range of values	Default value
value	Numeric	0 to 255[1]	0

[1] Refer to Table 15-2 for the list of bit definitions for the Status Byte register. To enable more than one bit at a time, use the binary-weighted sum of the intended bits. For example, to set bit 2, 4, and 5, use `52` (4 + 16 + 32) as your value.

Remarks

- An enable register defines which bits in the event register is reported to the Status Byte register group. You can write to or read from an enable register.
- The `*CLS` (clear status) command will not clear the enable register but it does clear all bits in the event register.
- The `*PSC` (power-on status clear) command determines whether or not the Status Byte enable register is cleared at power on, or not cleared.
- A `STATus:PRESet`, `SYSTem:PRESet`, `*CLS`, or `*RST` command does not clear the bits in the Status Byte enable register.
- Refer to Figure 1-1 on page 13 for the status system diagram.

Example

→ `*SRE 16`	*This command enables bit 4 (decimal value = 16) in the enable register.*
→ `*SRE?`	*This query returns which bits are enabled in the register.*
← `16`	

See also

"STATus:PRESet" on page 288

"SYSTem:PRESet" on page 301

"*PSC" on page 326

"*STB?" on page 332

*STB?

Syntax

`*STB?`

The `*STB?` (STatus Byte) query returns the condition register for the Status Byte register group. This command is similar to a Serial Poll but it is processed like any other instrument command.

NOTE This is a read-only register and the bits are not cleared when you read the register. For more information on the bit definitions of the Status Byte register and the SCPI status diagram, see "SCPI Status System" on page 12.

Remarks

- A condition register continuously monitors the state of the instrument. The bits in the condition register are updated in real time and the bits are not latched or buffered.
- A Factory Reset (`*RST` command) or power-on cycle clears all bits in the condition register.
- Refer to Figure 1-1 on page 13 for the status system diagram.

Example

→ `*STB?`	*This command reads the condition register (bits 3 and 5 are set).*

← `+40`

See also

"*SRE" on page 330

"*RST" on page 328

*TRG

Syntax

`*TRG`

The `*TRG` (TRiGger) is used in conjunction with the `TRIGger:SOURCe` command to trigger the instrument from the remote interface.

Remarks

- Use the `TRIGger:SOURCe` command to select the `BUS` (software) trigger source.
- After setting the trigger source, you must place the multimeter in the "wait-for-trigger" state using the `INITiate[:IMMediate]` command. The `*TRG` command will not be accepted unless the multimeter is in the "wait-for-trigger" state.

Example

→ `TRIG:SOUR BUS`	*This command selects the bus (software) trigger source.*
→ `INIT`	*This command places the instrument in the "wait-for-trigger" state.*
→ `*TRG`	*This command triggers the instrument.*

See also

"INITiate[:IMMediate]" on page 120

"TRIGger:SOURce" on page 310

*TST?

Syntax

*TST?

The *TST? (TeST) query performs a self-test of the instrument and returns a pass/fail indication. The self-test runs a series of tests and takes a few seconds to complete. If all tests pass, you can have a high confidence that the instrument is operational. The command returns "+0" (all tests passed) or "+1" (one or more tests failed).

Remarks

- If one or more tests fail, "+1" is returned and an error is stored in the error queue. For a complete listing of the error messages related to self-test failures, see Chapter 16, "List of Error Messages," starting on page 337.
- If one or more tests fail, see the *U3606A User's and Service Guide* for instructions on obtaining service.
- Following the *TST? query, the instrument issues a Factory Reset (*RST command).

Example

→ *TST?	*This command begins the self-test process and returns a pass/fail indication.*
← +0	*The returned value "+0" indicates that the instrument has passed all tests performed.*

*WAI

Syntax

`*WAI`

The `*WAI` (WAIt) command configures the instrument's output buffer to wait until all pending operations are complete, before executing any subsequent commands or queries.

Example

→ `*WAI`	*This command waits until all pending operations complete.*

16
List of Error Messages

Error Messages 338
Command errors 339
Execution errors 340
Internal errors 341
Query errors 341
Device specific errors 341
Self-test errors 342
Calibration errors 343

The U3606A error messages are summarized in this chapter.

Error Messages

Error messages are created once an erroneous condition is detected.

Errors are retrieved in first-in-first-out (FIFO) order using the `SYSTem:ERRor?` query or read from the front panel (see "Reading error messages" in the *U3606A User's and Service Guide*).

The first error returned is the first error that was stored. Reading this error will clear this error allowing the next stored error to be read (if there are other errors stored). Once you have read all of the interface-specific errors, the errors in the global error queue will be retrieved.

If more than 20 errors have occurred, the last error stored in the queue (the most recent error) is replaced with error number: `-350,"Queue overflow"`. No additional errors are stored until you remove the previously stored errors from the queue.

If no errors have occurred when you read the error queue, the instrument responds with the message: `+0,"No error"` or "nonE" if read from the front panel.

The interface-specific and global error queues are cleared by the clear status (`*CLS`) command and when the instrument power is cycled. The error queue will not be cleared by a Factory Reset (`*RST` command) or an Instrument Preset (`SYSTem:PRESet` command).

Command errors

The following table shows the list of command errors. These errors set the Standard Event Status register bit 5.

Error code	Error message
+0	No error
–100	Command error
–101	Invalid character
–102	Syntax error
–103	Invalid separator
–104	Data type error
–108	Parameter not allowed
–109	Missing parameter
–112	Program mnemonic too long
–113	Undefined header
–120	Numeric data error
–121	Invalid character in number
–123	Exponent too large
–128	Numeric data not allowed
–130	Suffix error
–131	Invalid suffix
–134	Suffix too long
–138	Suffix not allowed
–141	Invalid character data
–144	Character data too long
–148	Character data not allowed
–150	String data error

Error code	Error message
–151	Invalid string data
–158	String data not allowed

Execution errors

The following table shows the list of execution errors. These errors set the Standard Event Status register bit 4.

Error code	Error message
–200	Execution error
–211	Trigger ignored
–213	Init ignored
–214	Trigger deadlock
–220	Parameter error
–221	Settings conflict
–222	Data out of range
–223	Too much data
–230	Data corrupt or stale

Internal errors

The following table shows the list of internal errors.

Error code	Error message
–350	Queue overflow

Query errors

The following table shows the list of query errors. These errors set the Standard Event Status register bit 2.

Error code	Error message
–410	Queue INTERRUPTED
–420	Query UNTERMINATED

Device specific errors

The following table shows the list of device specific errors. These errors set the Standard Event Status register bit 3.

Error code	Error message
510	Voltage output over protection
511	Current output over protection
512	Voltage output over limit setting
513	Current output over limit setting
521	Input buffer overflow
532	Cannot achieve requested resolution
540	Cannot use overload as math reference

Self-test errors

The following errors indicate failures that may occur during a self-test.

Error code	Error message
630	EEPROM read failure
631	Program ROM Checksum failed
632	Program RAM failed
633	Display board failed
634	ADC failed
635	Interface board failed
636	Source board failed
637	I/O Processor Failed Self-Test
638	Source Processor Failed Self-Test
639	DC Path error
640	AC Path attenuated error
641	AC Path attenuated 10 error
642	AC Path attenuated 100 or amplified 10 error
643	Frequency measurement path failed
644	Constant Current 0.2V/1kohm error
645	Constant Current 0.2V/10kohm or amplified 11 error
646	Constant Current 0.8V/100kohm or amplified 11 error
647	Constant Current 0.8V/1.1Mohm or amplified 11 error

Calibration errors

The following errors indicate failures that may occur during a calibration.

Error code	Error message
701	Cal security pads short
702	Cal secured
703	Invalid secure code
704	Secure code too long
705	Cal aborted
706	Cal value out of range
707	Cal signal measurement out of range
708	Cal signal frequency out of range
709	No cal for this function or range
710	EEPROM write failure
720	Cal DCV offset out of range
721	Cal DCI offset out of range
722	Cal RES offset out of range
723	Cal CAP offset out of range
726	Cal RES open out of range
742	Cal checksum failed, DCV corrections
743	Cal checksum failed, DCI corrections
744	Cal checksum failed, RES corrections
745	Cal checksum failed, ACV corrections
746	Cal checksum failed, ACI corrections
747	Cal checksum failed, FREQ correction
748	Cal checksum failed, CAP corrections

Error code	Error message
750	Source board failed on reading
751	Source board failed on sense

Command Quick Reference

Root keyword	Second-level	Third-level	Fourth-level	Fifth-level	Page
CALCulate	:FUNCtion				See page 20
	:FUNCtion?				See page 21
	[:STATe]				See page 23
	[:STATe]?				See page 23
	:AVERage	:AVERage?			See page 25
		COUNt?			See page 26
		MAXimum?			See page 27
		MINimum?			See page 28
		PRESent?			See page 29
	:DB	:REFerence			See page 30
		:REFerence?			See page 30
	:DBM	:REFerence			See page 32
		:REFerence?			See page 32
	:HOLD	:VARiation			See page 34
		:VARiation?			See page 34
		:THReshold			See page 36
		:THReshold?			See page 36
	:LIMit	:LOWer			See page 38
		:LOWer?			See page 38
		:UPPer			See page 40
		:UPPer?			See page 40
	:NULL	:OFFSet			See page 42
		:OFFSet?			See page 42

Root keyword	Second-level	Third-level	Fourth-level	Fifth-level	Page
CALibration	[:ALL]?				See page 46
	:COUNt?				See page 47
	:SECure	:CODE			See page 48
		:STATe			See page 49
		:STATe?			See page 49
	:STRing				See page 51
	:STRing?				See page 51
	:VALue				See page 53
	:VALue?				See page 53
	:LEVel				See page 55
CONFigure?					See page 80
CONFigure	[:VOLTage]	[:DC]			See page 81
		:AC			See page 84
		:ACDC|DCAC			See page 87
	:CURRent	[:DC]			See page 90
		:AC			See page 93
		:ACDC|DCAC			See page 96
	:RESistance				See page 99
	:CONTinuity				See page 102
	:LRESistance				See page 104
	:CAPacitance				See page 107
	:DIODe				See page 110
	:FREQuency				See page 112
	:PWIDth				See page 114
	:DCYCle				See page 116

Root keyword	Second-level	Third-level	Fourth-level	Fifth-level	Page
INITiate	[:IMMediate]				See page 120
	CONTinuous				See page 122
	CONTinuous?				See page 122
MEASure	[:VOLTage]	[:DC]?			See page 126
		AC?			See page 128
		ACDC|DCAC?			See page 131
	:CURRent	[:DC]?			See page 134
		AC?			See page 136
		ACDC|DCAC?			See page 138
	:RESistance?				See page 140
	:CONTinuity?				See page 143
	:LRESistance?				See page 145
	:CAPacitance?				See page 147
	:DIODe?				See page 150
	:FREQuency?				See page 151
	:PWIDth?				See page 153
	:DCYCle?				See page 155
MEMory	:STATe	:RECall	:AUTO		See page 158
			:AUTO?		See page 158
OUTPut	[:STATe]				See page 162
	[:STATe]?				See page 162

Root keyword	Second-level	Third-level	Fourth-level	Fifth-level	Page
[SENSe:]	FUNCtion	[:ON]			See page 165
		[:ON]?			See page 165
	VOLTage	[:DC]	:RANGe	[:UPPer]	See page 167
				[:UPPer]?	See page 167
				:AUTO	See page 169
				:AUTO?	See page 169
			:RESolution		See page 171
			:RESolution?		See page 171
		:AC	:RANGe	[:UPPer]	See page 173
				[:UPPer]?	See page 173
				:AUTO	See page 175
				:AUTO?	See page 175
			:RESolution		See page 177
			:RESolution?		See page 177
		:ACDC|DCAC	:RANGe	[:UPPer]	See page 179
				[:UPPer]?	See page 179
				:AUTO	See page 181
				:AUTO?	See page 181
			:RESolution		See page 183
			:RESolution?		See page 183
	CURRent	[:DC]	:RANGe	[:UPPer]	See page 185
				[:UPPer]?	See page 185
				:AUTO	See page 187
				:AUTO?	See page 187
			:RESolution		See page 189
			:RESolution?		See page 189

Root keyword	Second-level	Third-level	Fourth-level	Fifth-level	Page
[SENSe:]	CURRent	:AC	:RANGe	[:UPPer]	See page 191
				[:UPPer]?	See page 191
				:AUTO	See page 193
				:AUTO?	See page 193
			:RESolution		See page 195
			:RESolution?		See page 195
		:ACDC|DCAC	:RANGe	[:UPPer]	See page 197
				[:UPPer]?	See page 197
				:AUTO	See page 199
				:AUTO?	See page 199
			:RESolution		See page 201
			:RESolution?		See page 201
		RESistance	:RANGe	[:UPPer]	See page 203
				[:UPPer]?	See page 203
				:AUTO	See page 205
				:AUTO?	See page 205
			:RESolution		See page 207
			:RESolution?		See page 207
		CONTinuity	:RANGe	[:UPPer]	See page 209
				[:UPPer]?	See page 209
				:AUTO	See page 211
				:AUTO?	See page 211

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[SENSe:]	LRESistance	:RANGe	[:UPPer]		See page 213
			[:UPPer]?		See page 213
			:AUTO		See page 215
			:AUTO?		See page 215
		:RESolution			See page 217
		:RESolution?			See page 217
	CAPacitance	:RANGe	[:UPPer]		See page 219
			[:UPPer]?		See page 219
			:AUTO		See page 221
			:AUTO?		See page 221
	FREQuency	:VOLTage	:RANGe	[:UPPer]	See page 223
				[:UPPer]?	See page 223
				:AUTO	See page 225
				:AUTO?	See page 225
	PWIDth	:VOLTage	:RANGe	[:UPPer]	See page 227
				[:UPPer]?	See page 227
				:AUTO	See page 229
				:AUTO?	See page 229
	DCYCle	:VOLTage	:RANGe	[:UPPer]	See page 231
				[:UPPer]?	See page 231
				:AUTO	See page 233
				:AUTO?	See page 233

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[SENSe:]	FREQuency	:CURRent	:RANGe	[:UPPer]	See page 235
				[:UPPer]?	See page 235
				:AUTO	See page 237
				:AUTO?	See page 237
	PWIDth	:CURRent	:RANGe	[:UPPer]	See page 239
				[:UPPer]?	See page 239
				:AUTO	See page 241
				:AUTO?	See page 241
	DCYCle	:CURRent	:RANGe	[:UPPer]	See page 243
				[:UPPer]?	See page 243
				:AUTO	See page 245
				:AUTO?	See page 245
SOURce	:VOLTage	:RANGe			See page 249
	:CURRent	:RANGe			See page 252
	:SQUare	:RANGe			See page 253
[SOURce:]	SENSe				See page 248
		:VOLtage	[:LEVel]?		See page 249
		:CURRent	[:LEVel]?		See page 250
	SENSe?				See page 248
	VOLTage	:LIMit			See page 254
		:LIMit?			See page 254
		:PROTection			See page 256
		:PROTection?			See page 256
		[:LEVel]	[:IMMediate]	[:AMPLitude]	See page 258
				[:AMPLitude]?	See page 258
			RAMP	[:AMPLitude]	See page 260

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[SOURce:]	VOLTage	[:LEVel]	RAMP	[:AMPLitude]?	See page 260
				:STEP	See page 264
				:STEP?	See page 264
			SCAN	[:AMPLitude]	See page 266
				[:AMPLitude]?	See page 266
				:STEP	See page 270
				:STEP?	See page 270
				DWELling	See page 272
				DWELling?	See page 272
	CURRent	:LIMit			See page 255
		:LIMit?			See page 255
		:PROTection			See page 257
		:PROTection?			See page 257
		[:LEVel]	[:IMMediate]	[:AMPLitude]	See page 259
				[:AMPLitude]?	See page 259
			RAMP	[:AMPLitude]	See page 262
				[:AMPLitude]?	See page 262
				:STEP	See page 265
				:STEP?	See page 265
			SCAN	[:AMPLitude]	See page 268
				[:AMPLitude]?	See page 268
				:STEP	See page 271
				:STEP?	See page 271
				DWELling	See page 273
				DWELling?	See page 273

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[SOURce:]	SQUare	[:LEVel]	[:IMMediate]	:AMPLitude	See page 274
				:AMPLitude?	See page 274
				:FREQuency	See page 275
				:FREQuency?	See page 275
				:DCYCle	See page 276
				:DCYCle?	See page 276
				:PWIDth	See page 278
				:PWIDth?	See page 278
	PROTection	[:STATe]			See page 280
		[:STATe]?			See page 280
STATus	:OPERation	:CONDition?			See page 284
		:ENABle			See page 285
		:ENABle?			See page 285
		[:EVENt]?			See page 287
	:PRESet				See page 288
	:QUEStionable	:CONDition?			See page 289
		:ENABle			See page 290
		:ENABle?			See page 290
		[:EVENt]?			See page 292
SYSTem	:BEEPer	[:IMMediate]			See page 294
		:STATe			See page 295
		:STATe?			See page 295
	:DEFault				See page 297
	:ERRor?				See page 298
	:LOCal				See page 300
	:PRESet				See page 301

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	:RWLock				See page 302
	:SMOoth	[:STATe]			See page 303
		[:STATe]?			See page 303
		:FLUCtuation			See page 305
		:FLUCtuation?			See page 305
		:POINts			See page 307
		:POINts?			See page 307
	:VERSion?				See page 308
TRIGger	:SOURce				See page 310
	:SOURce?				See page 310
ABORt					See page 314
FETCh?					See page 315
READ?					See page 316
*CLS					See page 320
*ESE					See page 321
*ESE?					See page 321
*ESR?					See page 323
*IDN?					See page 324
*OPC					See page 325
*OPC?					See page 325
*PSC					See page 326
*PSC?					See page 326
*RCL					See page 327
*RST					See page 328
*SAV					See page 329
*SRE					See page 330

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*SRE?					See page 330
*STB?					See page 332
*TRG					See page 333
*TST					See page 334
*WAI					See page 335

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