[SENSe:]FREQuency:NULL[:STATe]

[SENSe:]FREQuency:NULL:VALue

[SENSe:]FREQuency:RANGe:LOWer

[SENSe:]FREQuency:VOLTage:RANGe:AUTO

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

[SENSe:]PERiod:APERture

[SENSe:]PERiod:NULL[:STATe]

[SENSe:]PERiod:NULL:VALue

[SENSe:]PERiod:RANGe:LOWer

[SENSe:]PERiod:VOLTage:RANGe:AUTO

[SENSe:]PERiod:VOLTage:RANGe[:UPPer]

[SENSe:]FRESistance:APERture

[SENSe:]FRESistance:APERture:ENABled

[SENSe:]FRESistance:NPLC

[SENSe:]FRESistance:NULL[:STATe]

[SENSe:]FRESistance:NULL:VALue

[SENSe:]FRESistance:OCOMpensated

[SENSe:]FRESistance:RANGe:AUTO

[SENSe:]FRESistance:RANGe[:UPPer]

[SENSe:]FRESistance:RESolution

[SENSe:]RESistance:APERture

[SENSe:]RESistance:APERture:ENABled

[SENSe:]RESistance:NPLC

[SENSe:]RESistance:NULL[:STATe]

[SENSe:]RESistance:NULL:VALue

[SENSe:]RESistance:OCOMpensated

[SENSe:]RESistance:RANGe:AUTO

[SENSe:]RESistance:RANGe[:UPPer]

[SENSe:]RESistance:RESolution

[SENSe:]RESistance:ZERO:AUTO

[SENSe:]TEMPerature:APERture

[SENSe:]TEMPerature:APERture:ENABled

[SENSe:]TEMPerature:NPLC

[SENSe:]TEMPerature:NULL[:STATe]

[SENSe:]TEMPerature:NULL:VALue

[SENSe:]TEMPerature:TRANsducer:TYPE

[SENSe:]TEMPerature:ZERO:AUTO

[SENSe:]TEMPerature:TRANsducer:FRTD:OCOMpensated

[SENSe:]TEMPerature:TRANsducer:FRTD:RESistance[:REFerence]

[SENSe:]TEMPerature:TRANsducer:FRTD:TYPE

[SENSe:]TEMPerature:TRANsducer:RTD:OCOMpensated

[SENSe:]TEMPerature:TRANsducer:RTD:RESistance[:REFerence]

[SENSe:]TEMPerature:TRANsducer:RTD:TYPE

[SENSe:]TEMPerature:TRANsducer:THERmistor:TYPE

[SENSe:]TEMPerature:TRANsducer:FTHermistor:TYPE

[SENSe:]VOLTage:AC:BANDwidth

[SENSe:]VOLTage:AC:NULL[:STATe]

[SENSe:]VOLTage:AC:NULL:VALue

[SENSe:]VOLTage:AC:PEAK:STATe

[SENSe:]VOLTage:AC:RANGe:AUTO

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

[SENSe:]VOLTage[:DC]:APERture

[SENSe:]VOLTage[:DC]:APERture:ENABled

[SENSe:]VOLTage[:DC]:IMPedance:AUTO

[SENSe:]VOLTage[:DC]:NPLC

[SENSe:]VOLTage[:DC]:NULL[:STATe]

[SENSe:]VOLTage[:DC]:NULL:VALue

[SENSe:]VOLTage[:DC]:PEAK:STATe

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

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

[SENSe:]VOLTage[:DC]:RESolution

[SENSe:]VOLTage[:DC]:ZERO:AUTO

Agilent 34410A/11A/L4411A 6½ Digit Multimeter

Programmer's Reference

This Help file contains reference information to help you program the Agilent 34410A/11A/L4411A over a remote interface using the SCPI programming language.

[Introduction to the SCPI Language](#)

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Introduction to the SCPI Language

SCPI (Standard Commands for Programmable Instruments) is an ASCII-based instrument command language designed for test and measurement instruments. SCPI commands are based on a hierarchical structure, also known as a *tree system*. In this system, associated commands are grouped together under a common node or root, thus forming *subsystems*. A portion of the SENSe subsystem is shown below to illustrate the tree system.

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

    RESistance:
        OCOMpensated {OFF|0|ON|1}
        OCOMpensated?
```

SENSe is the root keyword of the command, **VOLTage** and **RESistance** are second-level keywords, and **DC** and **OCOMpensated** are third-level keywords. A colon (**:**) separates a command keyword from a lower-level keyword.

Syntax Conventions

The format used to show commands is illustrated below:

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

The command syntax shows most commands (and some parameters) as a mixture of upper- and lower-case letters. The upper-case letters indicate the abbreviated spelling for the command. 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, VOLT and VOLTAGE are both acceptable forms. You can use upper- or lower-case letters. Therefore, VOLTAGE, volt, and Volt are all acceptable. Other forms, such as VOL and VOLTAG, are not valid and will generate an error.

- Braces (**{ }**) enclose the parameter choices for a given command string. The braces are not sent with the command string.

- A vertical bar (**|**) separates multiple parameter choices for a given command string. For example, {*<range>*|MIN|MAX|DEF} in the above command indicates that you can specify a numeric range parameter, or "MIN", "MAX", or "DEF". The bar is not sent with the command string.

- Triangle brackets (**< >**) indicate that you must specify a value for the enclosed parameter. For example, the above syntax statement shows the *<range>* parameter enclosed in triangle brackets. The brackets are not sent with the command string. You must specify a value for the parameter (for example "VOLT:DC:RANG 10") unless you select one of the other options shown in the syntax (for example "VOLT:DC:RANG MIN").

- Some parameters are enclosed in square brackets (**[ ]**). This indicates that the parameter is optional and can be omitted. The brackets are not sent with the command string. If you do not specify a value for an optional parameter, the instrument chooses a default value.

Command Separators

A colon (**:**) is used to separate a command keyword from a lower-level keyword. You must insert a blank space to separate a parameter from a command keyword. If a command requires more than one parameter, you must separate adjacent parameters using a comma as shown below:

```
CONF:VOLT:DC 10,0.003
```

A semicolon (**;**) is used to separate commands within the same subsystem, and can also minimize typing. For example, sending the following command string:

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

... is the same as sending the following two commands:

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

Use a colon <u>and</u> a semicolon to link commands from different subsystems. For example, in the following command string, an error is generated if you do not use both the colon <u>and</u> semicolon:

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

Using the MIN, MAX, and DEF Parameters

For many commands, you can substitute "MIN" or "MAX" in place of a parameter. In some cases you may also substitute "DEF". For example, consider the following command:

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

Instead of selecting a specific value for the *<range>* parameter, you can substitute MIN to set the range to its minimum value, MAX to set the range to its maximum value, or DEF to set the range to its default value.

Querying Parameter Settings

You can query the current value of most parameters by adding a question mark (**?**) to the command. For example, the following command sets the trigger count to 10 readings:

```
TRIG:COUN 10
```

You can then query the count value by sending:

```
TRIG:COUN?
```

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

```
TRIG:COUN? MIN
TRIG:COUN? MAX
```

SCPI Command Terminators

A command string sent to the instrument must terminate with a <new line> (<NL>) character. The IEEE-488 EOI (End-Or-Identify) message is interpreted as a <NL> character and can be used to terminate a command string in place of a <NL> character. A <carriage return> followed by a <NL> is also accepted. Command string termination will always reset the current SCPI command path to the root level.

NOTE

For every SCPI message that includes a query and is sent to the instrument, the instrument terminates the returned response with a <NL> or line-feed character (EOI). For example, if R? is sent, the response is terminated with a <NL> after the block of data that is returned. If a SCPI message includes multiple queries separated by semicolons (for example "ROUTe:TERMinals?;R?"), the returned response is again terminated by a <NL> after the response to the last query. In either case, the program must read this <NL> in the response before another command is sent to the instrument, or an error will occur.

IEEE-488.2 Common Commands

The IEEE-488.2 standard defines a set of common commands that perform functions such as reset, self-test, and status operations. Common commands always begin with an asterisk (*****), are three characters in length, and may include one or more parameters. The command keyword is separated from the first parameter by a blank space. Use a semicolon (**;**) to separate multiple commands as shown below:

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

SCPI Parameter Types

The SCPI language defines several data formats to be used in program messages and response messages.

Numeric Parameters

Commands that require numeric parameters will accept all commonly used decimal representations of numbers including optional signs, decimal points, and scientific notation. Special values for numeric parameters such as MIN, MAX, and DEF are also accepted. You can also send engineering unit suffixes with numeric parameters (e.g., M, k, m, or u). If a command accepts only certain specific values, the instrument will automatically round the input numeric parameters to the accepted values. The following command requires a numeric parameter for the range value:

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

NOTE
Because the SCPI parser is case-insensitive, there is some confusion over the letter "M" (or "m"). For your convenience, the instrument interprets "mV" (or "MV") as millivolts, but "MHZ" (or "mhz") as megahertz. Likewise "MΩ" (or "mΩ") is interpreted as megohms. You can use the prefix "MA" for mega. For example, "MAV" is interpreted as megavolts.

Discrete Parameters

Discrete parameters are used to program settings that have a limited number of values (like IMMediate, EXTernal, or BUS). They have a short form and a long form just like command keywords. You can mix upper- and lower-case letters. Query responses will always return the short form in all upper-case letters. The following command requires a discrete parameters for the temperature units:

UNIT:TEMPerature {C|F|K}

Boolean Parameters

Boolean parameters represent a single binary condition that is either true or false. For a false condition, the instrument will accept "OFF" or "0". For a true

condition, the instrument will accept "ON" or "1". When you query a boolean setting, the instrument will always return "0" or "1". The following command requires a boolean parameter:

VOLTage:DC:IMPedance:AUTO {OFF|0|ON|1}

ASCII String Parameters

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. The following command uses a string parameter:

DISPlay:TEXT *<quoted string>*

For example, the following command displays the message "WAITING..." on the instrument's front panel (the quotes are not displayed).

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

You can also display the same message using the following command with single quotes.

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

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. 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:

- If a measurement is in progress, it is aborted.
- The instrument returns to the trigger "idle" state.
- The instrument's input and output buffers are cleared.
- The instrument is prepared to accept a new command string.
- An overlapped command, if any, will be terminated with no "Operation Complete" indication (applies to the INIT command).

| NOTE | The ABORt command is the recommended method to terminate a measurement. |

Commands by Subsystem

ABORt

Syntax

ABORt

Description

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 (for example, 100 plc), 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 *RST command will abort a measurement and set all measurement parameters to their factory settings. The Instrument Preset (SYSTem:PRESet command) does the same.

Example

The following command aborts the measurement in progress.

```
ABOR
```

See Also

[*RST](#)

[SYSTem:PRESet](#)

INITiate[:IMMediate]

Syntax

```
INITiate[:IMMediate]
```

Description

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 command. Note that the INITiate command also clears the previous set of readings from memory.

Remarks

- Storing readings in memory using the INITiate command is faster than sending readings to the output buffer using the READ? command. The INITiate command is also an "overlapped" command. This means that after executing the INITiate command, you can send other commands that do not affect the measurements.

- The 34410A provides volatile reading memory for up to 50,000 readings. The 34411A/L4411A provides volatile reading memory for up to 1,000,000 readings. If memory overflows, the new readings will overwrite the first (oldest) readings stored; the most recent readings are always preserved. In addition, bit 14 (Mem Ovfl) is set in the Questionable Data Register's condition register (see Status System Introduction).

- To retrieve the readings from memory, use the FETCh? command. Use DATA:REMove? to remove data points. Or use the R? command to read and remove all of the available data.

- The ABORt command may be used to return to idle.

Example

The following program segment shows how to use the INITiate command with the CONFigure and FETCh? commands. The INITiate command places the instrument in the "wait-for-trigger" state, triggers a measurement when the rear-panel *Ext Trig Input*line is pulsed (low by default), and then sends the readings to memory. The FETCh? command transfers the readings from memory to the instrument's output buffer.

```
CONF:VOLT:DC 10,0.003
TRIG:SOUR EXT
INIT
FETC?
```

Typical Response: +4.27150000E-03

See Also

[FETCh?](#)

[READ?](#)

[ABORt](#)

OUTPut:TRIGger:SLOPe

Syntax

OUTPut:TRIGger:SLOPe *<slope>*

OUTPut:TRIGger:SLOPe?

Description

This command selects the slope of the *voltmeter complete* output signal on the rear-panel *VM Comp* BNC connector. The default is NEG.

Parameters

Name	Type	Range of Values	Default Value
<slope>	Discrete	{POSitive|NEGative}	NEG

Remarks

- See VM Comp Output for further information.

- The instrument selects a negative slope after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns either "POS" or "NEG".

Examples

The following command sets the VM Comp slope to negative.

```
OUTP:TRIG:SLOP NEG
```

The following query returns currently selected slope.

```
OUTP:TRIG:SLOP?
```

Typical Response: NEG

See Also

[VM Comp Output](#)

R?

Syntax

R? [*<max_count>*]

Description

This command reads and erases readings from volatile memory up to the specified <max_count>. The readings are erased from memory starting with the oldest (<u>not</u> the most recent) reading first. The purpose of this command is to allow you to periodically remove readings from memory that would normally cause reading memory to overflow.

Parameters

Name	Type	Range of Values	Default Value
<max_count>	Numeric	Maximum number of readings to be read and erased from memory.	Read and erase all stored readings

Remarks

- This command differs from the DATA:REMove? command in that R? will read and erase whatever readings are available in memory, up to the specified *<max_count>*. On the other hand, DATA:REMove will error if the requested number of readings are not in memory when the command is sent. You can read memory at any time using the R? command, even during a measurement.

- The 34410A provides volatile reading memory for up to 50,000 readings. The 34411A/L4411A provides volatile reading memory for up to 1,000,000 readings. If memory overflows, the new readings will overwrite the first (oldest) readings stored; the most recent readings are always preserved. In addition, bit 14 (Mem Ovfl) is set in the Questionable Data Register's condition register (see Status System Introduction).

- The instrument clears all readings from volatile memory after a Factory Reset (*RST command), after an Instrument Preset (SYSTem:PRESet command), when mainframe power is cycled, when the configuration is changed (see CONFigure), or on an INITiate command.

Return Format

The command returns a series of readings in [Definite-Length Block](#) format. The syntax is a pound sign (#) followed by a non-zero digit representing the number of digits in the decimal integer to follow. This digit is followed by a decimal integer indicating the number of 8-bit data bytes to follow. This is followed by a block of data containing the specified number of bytes. The reading format is determined by the [FORMat Subsystem](#) commands.

Example

This command reads the two oldest readings and erases them from memory.

```
R? 2
```

Typical Response: #231+2.87536000E-04,+3.18131400E-03

See Also

[DATA:REMove?](#)

[FETCh?](#)

[FORMat:BORDer](#)

[FORMat[:DATA]](#)

READ?

Syntax | Description | Parameters | Remarks | Return Format | Examples

Syntax

READ?

Description

This command changes the instrument's 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 volatile memory and the instrument's output buffer.

Remarks

- Sending the READ? command is similar to sending the INITiate command followed immediately by the FETCh? command.

- The 34410A provides volatile reading memory for up to 50,000 readings. The 34411A/L4411A provides volatile reading memory for up to 1,000,000 readings. If memory overflows, the new readings will overwrite the first (oldest) readings stored; the most recent readings are always preserved. In addition, bit 14 is set in the Questionable Data Register's condition register (see Status System Introduction).

- The instrument clears all readings from volatile memory after a Factory Reset (*RST command), after an Instrument Preset (SYSTem:PRESet command), when the power is cycled, when the configuration is changed (see CONFigure), or on an INITiate command.

Return Format

The command sends readings directly to reading memory and the instrument's output buffer. The readings are returned in ASCII format.

Examples

The following program segment shows how to use the READ? command with the CONFigure command. The READ? command places the instrument in the "wait-for-trigger" state, triggers a measurement when the rear-panel *Ext Trig Input*line is pulsed (low by default), sends the readings to memory, and then transfers the readings to the instrument output buffer.

```
CONF:VOLT:DC 10,0.003
TRIG:SOUR EXT
READ?
```

Typical Response: +4.27150000E-03

The following program segment shows how to use the READ? command to make a dc voltage measurement. The CONFigure command configures the meter for a dc voltage measurement and sets the trigger source to IMMediate. The READ? command places the meter in the "wait-for-trigger" state, initiates a trigger, and then sends the reading to memory.

```
CONF:VOLT:DC
READ?
```

Typical Response: +1.26360000E-02

See Also

FETCh?

FORMat:BORDer

FORMat[:DATA]

INITiate[:IMMediate]

ROUTe:TERMinals?

Syntax

ROUTe:TERMinals?

Description

This command queries the 34410A/34411A multimeter to determine whether the front or rear input terminals are selected (via the front/rear switch on the front panel).

WARNING **The front/rear switch should not be toggled with active signals on the terminals. This switch is not intended to be used in this way, and may be damaged by high voltages or currents, possibly compromising the instrument's safety features.**

Remarks

- The front/rear switch is *not* programmable. This query reports the position of the switch, but cannot change it.

Return Format

The query returns the current state of the front/rear switch: "FRON" or "REAR", indicating which set of terminals are in use.

Example

The following query returns the current state of the 34410A/34411A front/rear switch (the set of input terminals selected).

```
ROUT:TERM?
```

Typical Response: "FRON"

UNIT:TEMPerature

Syntax

UNIT:TEMPerature *<units>*

UNIT:TEMPerature?

Description

This command selects the units (°C, °F, or Kelvins) to be used for temperature measurements. The 34410A/11A/L4411A uses the selected unit for temperature measurements regardless of the transducer selection (thermistor, or 2-wire or 4-wire RTD).

Parameters

Name	Type	Range of Values	Default Value
<units>	Discrete	{C|F|K}	Required parameter.

Remarks

- The command also accepts "CEL" or "FAR" for the *units* parameter, but the query returns "C" or "F".

- The temperature unit selection is stored in *volatile* memory. The selection is set to °C after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns "C", "F", or "K".

Examples

The following command sets the temperature units to °F.

```
UNIT:TEMP F
```

The following query returns the temperature unit selected.

```
UNIT:TEMP?
```

Typical Response: F

See Also

[CONFigure:TEMPerature](#)

[MEASure:TEMPerature?](#)

CALCulate Subsystem Introduction

The Agilent 34410A, 34411A, and L4411A can store readings in memory and perform several mathematical, statistical, and limit calculation functions using the CALCulate commands.

Command Summary

Select and Enable Functions

[CALCulate:FUNCtion](#)

[CALCulate:FUNCtion](#)" href="Limits/CALCulate_LIMit_LOWer.htm">?

[CALCulate:STATe](#)

[CALCulate:STATe?](#)

Limit Functions

[CALCulate:LIMit:LOWer](#)

[CALCulate:LIMit:LOWer?](#)

[CALCulate:LIMit:UPPer](#)

[CALCulate:LIMit:UPPer?](#)

Mathematical Functions

[CALCulate:DB:REFerence](#)

[CALCulate:DB:REFerence?](#)

[CALCulate:DBM:REFerence](#)

[CALCulate:DBM:REFerence?](#)

[CALCulate:NULL:OFFSet](#)

[CALCulate:NULL:OFFSet?](#)

Statistical Functions

[CALCulate:AVERage:AVERage?](#)

[CALCulate:AVERage:CLEar](#)

[CALCulate:AVERage:COUNt?](#)

[CALCulate:AVERage:MAXimum?](#)

[CALCulate:AVERage:MINimum?](#)

[CALCulate:AVERage:PTPeak?](#)

CALCulate:AVERage:SDEViation?

CALCulate:FUNCtion

Syntax

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

CALCulate:FUNCtion?

Description

This command selects the calculation function to be used. The default function is NULL.

NOTE The null function provided in this command is for compatibility with the 34401A 6½ Digit Multimeter. For the 34410A, 34411A,L4411A it is recommended that you use the individual (null per function) null commands found in the [SENSe:] subsystem, rather than the null function provided by the CALCulate:NULL:OFFSet command. Avoid using both types of nulls, as unexpected results may occur (they are additive).

Remarks

- Send CALCulate:FUNCtion AVERage to enable statistics. When statistics are enabled, the average (mean), minimum, maximum, peak-to-peak, count, and standard deviation values are calculated and carried in the statistical data registers, available to be read with the statistics (CALCulate:AVERage) commands such as CALCulate:AVERage:AVERage? and CALCulate:AVERage:SDEViation?.

- The CALCulate subsystem (math operations) must be enabled using the CALCulate:STATe command.

- The instrument clears the calculation function selection, reverting to the default after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query returns the currently selected function: NULL, DB, DBM, AVER, or LIM.

Examples

The following command sets the function to be calculated to DBM.

```
CALC:FUNC DBM
```

The following query returns the currently enabled calculation function.

```
CALC:FUNC?
```

Typical Response: DBM

See Also

[CALCulate:STATe](#)

CALCulate:STATe

Syntax

CALCulate[:STATe] {OFF | ON}

CALCulate:STATe?

Description

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

Remarks

- The calculation function to be used is selected using the CALCulate:FUNCtion command.

- CALCulate:STATe is set to OFF when the measurement function is changed.

- When CALCulate:STATe:ON is sent the math registers for limits, statistics, dB relative value, and the value set by CALCulate:NULL:OFFSet are cleared. This also occurs when CALCulate:FUNCtion is sent with CALCulate:STATe previously set to ON. Note that 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.

Return Format

The query returns the current calculation state: "0" (OFF) or "1" (ON).

Example

The following command sets the calculation state to "ON".

```
CALC:STAT ON
```

The following query returns the current calculation state.

```
CALC:STAT?
```

Typical Response: "1"

See Also

CALCulate:FUNCtion

CALCulate:LIMit:LOWer

Syntax

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

CALCulate:LIMit:LOWer? {MINimum | MAXimum}

Description

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

Parameters

The *<value>* parameter can take any value between -120% and +120% of the *highest* (maximum) range for the currently selected function The *<value>* is entered in the *fundamental units* for the function (that is volts, ohms, farads, and so forth). MIN = -120% and MAX = +120%. Default = 0.

For example, if dc voltage is the selected measurement, the highest range is 1000 volts, and the MAX value is 120% of that: 1200 volts.

Remarks

- You must select the limit math function (CALC:FUNC LIM) and turn on math operations (CALC:STAT ON) before you set a limit value.

- You can assign a lower limit, an upper limit (see CALCulate:LIMit:UPPer command), 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 STATus Subsystem Introduction for further information.

- The instrument clears all limits after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command), or when the math function or measurement function is changed.

Return Format

The query command returns the lower limit in the form "-1.00000000E+03".

Examples

The following command sets the lower limit to -0.25.

```
CALC:LIM:LOW -0.25
```

The following query returns the lower limit setting.

```
CALC:LIM:LOW?
```

Typical Response: -2.50000000E-01

See Also

[CALCulate:FUNCtion](#)

[CALCulate:LIMit:UPPer](#)

[CALCulate:STATe](#)

[STATus Subsystem Introduction](#)

CALCulate:LIMit:UPPer

Syntax

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

CALCulate:LIMit:UPPer? {MINimum | MAXimum}

Description

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

Parameters

The *<value>* parameter can take any value between -120% and +120% of the *highest* (maximum) range for the currently selected function The *<value>* is entered in the *fundamental units* for the function (that is volts, ohms, farads, and so forth). MIN = -120% and MAX = +120%. Default = 0.

For example, if dc voltage is the selected measurement, the highest range is 1000 volts, and the MAX value is 120% of that: 1200 volts.

Remarks

- You must select the limit math function (CALC:FUNC LIM) and turn on math operations (CALC:STAT ON) before you set a limit value.

- You can assign a lower limit, an upper limit (see CALCulate:LIMit:UPPer command), 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 greater than the specified upper 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 STATus Subsystem Introduction for further information.

- The instrument clears all limits after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command), or when the math function or measurement function is changed.

Return Format

The query command returns the upper limit in the form "+1.00000000E+03".

Examples

The following command sets the upper limit to 10.25.

```
CALC:LIM:UPP 10.25
```

The following query returns the limit settings.

```
CALC:LIM:UPP?
```

Typical Response: +1.02500000E+01

See Also

[CALCulate:FUNCtion](#)

[CALCulate:LIMit:LOWer](#)

[CALCulate:STATe](#)

[STATus Subsystem Introduction](#)

CALCulate:DB:REFerence

Syntax

CALCulate:DB:REFerence {*<value>* | MINimum | MAXimum}

CALCulate:DB:REFerence? {MINimum | MAXimum}

Description

This command stores a relative value in the meter's dB Relative Register, which is used for the dB function in the CALCulate:FUNCtion command.

Parameters

The *<value>* (relative value) parameter can take any value in the range ±200 dBm.
MIN = -200.00 dBm. MAX = +200.00 dBm. The default value is 0 dBm.

Remarks

- You must select (CALCulate:FUNCtion) and turn on (CALCulate:STATe) math operations before writing to the dB Relative Register.

- The dB relative value parameter is relative to the dBm reference set with the CALCulate:DBM:REFerence command.

- The instrument resets the dB relative value to the default after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command), or when the math function or measurement function is changed.

Return Format

The query command returns the relative value in the form
"+1.00000000E+02".

Examples

The following command sets the dB relative value to -10.0 dBm.

```
CALC:DB:REF -10.0
```

The following query returns the dB relative value.

```
CALC:DB:REF?
```

Typical Response: -1.00000000E+01

See Also

[CALCulate:DBM:REFerence](#)

[CALCulate:FUNCtion](#)

[CALCulate:STATe](#)

CALCulate:DBM:REFerence

Syntax

CALCulate:DBM:REFerence {*<value>* | MINimum | MAXimum}

CALCulate:DBM:REFerence? {MINimum | MAXimum}

Description

This command selects the dBm reference resistance. The default is **600** ohms. This reference value affects both the dBm and dB functions in the [CALCulate:FUNCtion](#) command.

Parameters

The *<value>* (dBm reference value) parameter can only take on certain discrete values. Choose from: 50, 75, 93, 110, 124, 125, 135, 150, 250, 300, 500, **600**, 800, 900, 1000, 1200, or 8000 ohms. MIN = 50 ohms. MAX = 8000 ohms. The default value is 600 ohms.

Remarks

- The dBm reference resistance is not reset when math functions are enabled by the CALCulate:STATe command, nor when a CALCulate:FUNCtion command is sent with CALCulate:STATe set to ON.

- The dBm reference resistance value is stored in *non-volatile* memory. It is not affected by a power-on cycle, Factory Reset (*RST command), Instrument Preset (SYSTem:PRESet command), or function change.

- **Return Format**

The query command returns the dBm reference resistance.

Examples

The following command sets the dBm reference resistance to 300 ohms.

```
CALC:DBM:REF 300
```

The following query returns the dBm reference resistance.

```
CALC:DBM:REF?
```

Typical Response: +3.00000000E+02

See Also

[CALCulate:DB:REFerence](#)

[CALCulate:FUNCtion](#)

[CALCulate:STATe](#)

CALCulate:NULL:OFFSet

Syntax

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

CALCulate:NULL:OFFSet? {MINimum | MAXimum}

Description

This command stores a null value in the multimeter's Null Register.

| NOTE | This command is provided for compatibility with the 34401A 6½ Digit Multimeter. For the 34410A, 34411A, or L4411A it is recommended that you use the individual (null per function) null commands found in the [SENSe:] subsystem, rather than the null function provided by the CALCulate:NULL:OFFSet command. Avoid using both types of nulls, as unexpected results may occur (they are additive). |

Parameters

The *<value>* parameter can take any value between -120% and +120% of the *highest* range for the *present measurement function*. MIN = -120% of the highest range. MAX = +120% of the highest range. The default value is 0.

Remarks

- If you use the individual (null per function) null commands found in the [SENSe:] subsystem, it is recommended that you *not* use this function, and that you *not* turn on the null state with the CALC:FUNC command. If you do, the measurement function null, set with the [SENSe:] command, and the null set with the CALC:NULL:OFFS command, are additive.

- You must select (CALCulate:FUNCtion) and turn on (CALCulate:STATe) math operations before you set a null value.

- If a null offset value is not specified with the CALC:NULL:OFFS command, the first measurement taken is used as the null value.

- The instrument clears the null value after a Factory Reset (*RST command), after an Instrument Preset (SYSTem:PRESet command), when the math function or measurement function is changed, or when CALCulate:STATe ON is sent.

Return Format

The query command returns the null value in the form "`+1.00000000E-02`".

Examples

The following command sets the null value to -0.25.

```
CALC:NULL:OFFS -0.25
```

The following query returns the null value.

```
CALC:NULL:OFFS?
```

Typical Response: `-2.50000000E-01`

See Also

CALCulate:STATe

CALCulate:AVERage:AVERage?

Syntax

CALCulate:AVERage:AVERage?

Description

This command returns the mathematical average (mean) of all readings taken since statistics were enabled.

Remarks

- You can read the statistical values at any time.

- The instrument clears the stored statistical data when statistics are enabled, when the CALCulate:FUNCtion command is sent while CALCulate:STATe is ON, when the power has been off, when the CALCulate:AVERage:CLEar command is executed, after a Factory Reset (*RST command), after an Instrument Preset (SYSTem:PRESet command), or after a function change.

Return Format

The command returns the average of the readings taken, or "0" if no data is available.

Example

The following query returns the average of the readings taken.

```
CALC:AVER:AVER?
```

Typical Response: +2.61920000E+01

See Also

[CALCulate:AVERage:CLEar](#)

[CALCulate:AVERage:COUNt?](#)

[CALCulate:FUNCtion](#)

[CALCulate:STATe](#)

CALCulate:AVERage:CLEar

Syntax | Description | Parameters | Remarks | Return Format | Example

Syntax

CALCulate:AVERage:CLEar

Description

This command clears all values from the statistics register.

Remarks

- This command clears the minimum, maximum, average, count, and standard deviation values (but no readings are cleared from memory).

- The instrument also clears the stored statistical data when statistics are enabled, when the CALCulate:FUNCtion command is sent while CALCulate:STATe is ON, when the power has been off, when the CALCulate:AVERage:CLEar command is executed, after a Factory Reset (*RST command), after an Instrument Preset (SYSTem:PRESet command), or after a function change.

Return Format

This command has no query form.

Example

The following command clears the stored statistical data.

```
CALC:AVER:CLE
```

See Also

CALCulate:AVERage:AVERage?

CALCulate:AVERage:COUNt?

CALCulate:AVERage:MAXimum?

CALCulate:AVERage:MINimum?

CALCulate:AVERage:PTPeak?

CALCulate:AVERage:SDEViation?

CALCulate:STATe

CALCulate:AVERage:COUNt?

Syntax

CALCulate:AVERage:COUNt?

Description

This command returns the number of readings taken since statistics were enabled.

Remarks

- You can read the statistical values at any time.

- The instrument clears the stored statistical data when statistics are enabled, when an INITiate command is sent, when the CALCulate:FUNCtion command is sent while CALCulate:STATe is ON, when the power has been off, when the CALCulate:AVERage:CLEar command is executed, after a Factory Reset (*RST command), after an Instrument Preset (SYSTem:PRESet command), or after a function change.

Return Format

The command returns the count since statistics were enabled. If no data is available , "0" is returned.

Example

The following query returns the number of readings taken since statistics were enabled.

```
CALC:AVER:COUN?
```

Typical Response: +2.0000000E+01

See Also

[CALCulate:AVERage:CLEar](#)

[CALCulate:FUNCtion](#)

[CALCulate:STATe](#)

CALCulate:AVERage:MAXimum?

Syntax

CALCulate:AVERage:MAXimum?

Description

This command returns the maximum value found since statistics were enabled.

Remarks

- You can read the statistical values at any time.

- The instrument clears the stored statistical data when statistics are enabled, when the CALCulate:FUNCtion command is sent while CALCulate:STATe is ON, when the power has been off, when the CALCulate:AVERage:CLEar command is executed, after a Factory Reset (*RST command), after an Instrument Preset (SYSTem:PRESet command), or after a function change.

Return Format

The command returns the maximum of the readings taken, or "0" if no data is available.

Example

The following query returns the maximum value found.

```
CALC:AVER:MAX?
```

Typical Response: +1.37370000E+03

See Also

[CALCulate:AVERage:CLEar](#)

[CALCulate:AVERage:COUNt?](#)

[CALCulate:FUNCtion](#)

[CALCulate:STATe](#)

CALCulate:AVERage:MINimum?

Syntax

CALCulate:AVERage:MINimum?

Description

This command returns the minimum value found since statistics were enabled.

Remarks

- You can read the statistical values at any time.

- The instrument clears the stored statistical data when statistics are enabled, when the CALCulate:FUNCtion command is sent while CALCulate:STATe is ON, when the power has been off, when the CALCulate:AVERage:CLEar command is executed, after a Factory Reset (*RST command), after an Instrument Preset (SYSTem:PRESet command), or after a function change.

Return Format

The command returns the minimum value found, or "0" if no data is available.

Example

The following query returns the minimum value found.

```
CALC:AVER:MIN?
```

Typical Response: +4.27150000E-03

See Also

CALCulate:AVERage:CLEar

CALCulate:AVERage:COUNt?

CALCulate:FUNCtion

CALCulate:STATe

CALCulate:AVERage:PTPeak?

Syntax

CALCulate:AVERage:PTPeak?

Description

This command returns the peak-to-peak value of all readings taken since statistics were enabled.

Remarks

- You can read the statistical values at any time.

- This function returns the statistical peak-to-peak value for a collection of readings (since statistics were enabled). This is different than the 2nd Display peak-to-peak measurement, which measures high and low peaks over a single measurement aperture.

- The instrument clears the stored statistical data when statistics are enabled, when the CALCulate:FUNCtion command is sent while CALCulate:STATe is ON, when the power has been off, when the CALCulate:AVERage:CLEar command is executed, after a Factory Reset (*RST command), after an Instrument Preset (SYSTem:PRESet command), or after a function change.

Return Format

The command returns the peak-to-peak value of all readings taken since statistics were enabled. If no data is available, "0" is returned.

Example

The following query returns the peak-to-peak value of the readings taken.

```
CALC:AVER:PTP?
```

Typical Response: +1.34560000E+00

See Also

[CALCulate:AVERage:CLEar](#)

[CALCulate:AVERage:COUNt?](#)

[CALCulate:FUNCtion](#)

[CALCulate:STATe](#)

CALCulate:AVERage:SDEViation?

Syntax

CALCulate:AVERage:SDEViation?

Description

This command returns the standard deviation of all readings taken since statistics were enabled.

Remarks

- You can read the statistical values at any time.

- The instrument clears the stored statistical data when statistics are enabled, when the CALCulate:FUNCtion command is sent while CALCulate:STATe is ON, when the power has been off, when the CALCulate:AVERage:CLEar command is executed, after a Factory Reset (*RST command), after an Instrument Preset (SYSTem:PRESet command), or after a function change.

Return Format

The command returns the standard deviation of the readings taken, or "0" if no data is available.

Example

The following query returns the standard deviation of the readings taken.

```
CALC:AVER:SDEV?
```

Typical Response: +2.61920000E+01

See Also

CALCulate:AVERage:CLEar

CALCulate:AVERage:COUNt?

CALCulate:FUNCtion

CALCulate:STATe

CALibration Subsystem Introduction

The CALibration commands are used to calibrate the Agilent 34410A, 34411A, and L4411A. Please note that the use of these commands requires a detailed knowledge of the appropriate calibration procedures, which are described in the *Agilent 34410A/11A/L4411A 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.

Command Summary

[CALibration[:ALL]?](#)

[CALibration:ADC?](#)

[CALibration:COUNt?](#)

[CALibration:LFRequency](#)

[CALibration:LFRequency?](#)

[CALibration:LFRequency:ACTual?](#)

[CALibration:SECure:CODE](#)

[CALibration:SECure:STATe](#)

[CALibration:SECure:STATe?](#)

[CALibration:STRing](#)

[CALibration:STRing?](#)

[CALibration:STORe](#)

[CALibration:VALue](#)

[CALibration:VALue?](#)

CALibration:ADC?

Syntax

CALibration:ADC?

Description

This command performs a low-level calibration of the ADC (analog-to-digital converter) circuitry.

NOTE

> For a more detailed discussion of the calibration procedures, see the *Agilent 34410A/11A/L4411A Service Guide*. Please refer to the *Service Guide* before attempting to calibrate the instrument. Improper use of the CALibration commands can adversely affect the accuracy and reliability of the instrument.

Remarks

- This is the first step in a re-calibration sequence, and must be done before doing the offset calibration.

Return Format

The command returns "0" if successful, "1" if not successful.

Example

The following command calibrates the ADC.

```
CAL:ADC?
```

Typical Response: 0

See Also

[CALibration?](#)

[CALibration:SECure:STATe](#)

CALibration[:ALL]?

Syntax

CALibration[:ALL]?

Description

This command performs a calibration of the multimeter using the specified calibration value (CALibration:VALue command). Before you can calibrate the instrument, you must unsecure it by entering the correct security code.

> **NOTE**
>
> For a more detailed discussion of the calibration procedures, see the *Agilent 34410A/11A/L4411A Service Guide*. Please refer to the *Service Guide* before attempting to calibrate the instrument. Improper use of the CALibration commands can adversely affect the accuracy and reliability of the instrument.

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 SCPI Error Messages.

- This command increments the calibration count on the 34410A, 34411A, or L4411A (see CALibration:COUNt? command).

Return Format

The command returns "+0" (calibration passed) or "+1" (calibration failed).

Example

The following command performs a calibration and returns a pass/fail indication.

```
CAL?
```

Typical Response: +0

See Also

[CALibration:SECure:STATe](#)

[CALibration:VALue](#)

CALibration:COUNt?

Syntax

CALibration:COUNt?

Description

This command queries the instrument to determine how many calibrations have been performed. 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.

NOTE

For a more detailed discussion of the calibration procedures, see the *Agilent 34410A/11A/L4411A Service Guide*. Please refer to the *Service Guide* before attempting to calibrate the instrument. Improper use of the CALibration commands can adversely affect the accuracy and reliability of the instrument.

Remarks

- The calibration counts increment up to a maximum of over four billion (2^{32} - 1) 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. However, it is unlikely that the count will ever roll over due to the high maximum.

- The calibration count is incremented by the CALibration? command. You can read the calibration count whether the instrument is secured or unsecured.

- The calibration count is stored in non-volatile memory, and does not change when power has been off, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

The command returns the calibration count indicating how many calibrations have been performed.

Example

The following command returns the calibration count.

```
CAL:COUN?
```

Typical Response: +739

See Also

CALibration?

CALibration:SECure:STATe

CALibration:LFRequency

Syntax

CALibration:LFRequency *<line_freq>*

CALibration:LFRequency?

Description

The query returns the power-line reference frequency currently used by the 34410A/11A/L4411A analog-to-digital converter (50 or 60 Hz). When you apply power to the instrument, the instrument automatically detects the power-line frequency and uses this value to determine the integration time used.

The command form allows you to override automatic detection and set either 50 or 60 Hz. However, it is recommended that you use automatic detection to ensure that the calibration is performed with the reference frequency set to the line frequency in use. In special cases, the dominant noise source in the operating environment may be at the other frequency (or harmonic thereof) and an override may be appropriate.

NOTE
For a more detailed discussion of the calibration procedures, see the *Agilent 34410A/11A/L4411A Service Guide*. Please refer to the *Service Guide* before attempting to calibrate the instrument. Improper use of the CALibration commands can adversely affect the accuracy and reliability of the instrument.

Parameters

Name	Type	Range of Values	Default Value
<line_freq>	Numeric	50 *(50 Hz or 400 Hz)* 60 *(60 Hz)*	Defaults to sensed line frequency

Remarks

- The instrument multiplies the period of the reference frequency by the specified number of power line cycles ([SENSe:]<*function*>:NPLC commands) to determine the actual integration time.

- The reference frequency setting is stored in volatile memory and will be lost when power is turned off. The instrument automatically detects the power-line frequency (50 Hz, 60 Hz, or 400 Hz) at power-on.

- If the instrument detects a 400 Hz power line frequency, the 50 Hz reference frequency value is actually used (a subharmonic of 400 Hz).

Return Format

The query returns "+50" (for 50 Hz or 400 Hz) or "+60" (for 60 Hz) indicating the present reference frequency setting.

Example

The following command sets the reference frequency to 60 Hz (overriding automatic detection).

```
CAL:LFR 60
```

The following command returns the reference frequency setting.

```
CAL:LFR?
```

Typical Response: `+60`

See Also

[SENSe:]*<function>*:NPLC

CALibration:LFRequency:ACTual

Syntax

CALibration:LFRequency:ACTual?

Description

This command returns the actual power-line frequency.

> **NOTE**
> For a more detailed discussion of the calibration procedures, see the *Agilent 34410A/11A/L4411A Service Guide*. Please refer to the *Service Guide* before attempting to calibrate the instrument. Improper use of the CALibration commands can adversely affect the accuracy and reliability of the instrument.

Remarks

- The reference frequency used by the 34410A/11A/L4411A analog-to-digital converter is based on the power line frequency measured at power on. But, the reference frequency is set to either 50 Hz (for a power line frequency of 50 Hz or 400 Hz), or 60 Hz (for a 60 Hz power line frequency). The CALibration:LFRequency? command returns the reference frequency (+50 or +60). The CALibration:LFRequency:ACTual? command measures and returns the actual power line frequency.

- This command does the same thing as the SYSTem:LFRequency:ACTual? command.

Return Format

The command returns the actual power line frequency measured at power up in the format "+5.99982241E+01".

Example

The following command returns the reference frequency setting.

```
CAL:LFR:ACT?
```

Typical Response: +5.99982241E+01

See Also

CALibration:LFRequency

SYSTem:LFRequency:ACTual?

CALibration:SECure:CODE

Syntax

CALibration:SECure:CODE *<new_code>*

Description

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.

NOTE For a more detailed discussion of the calibration procedures, see the *Agilent 34410A/11A/L4411A Service Guide*. Please refer to the *Service Guide* before attempting to calibrate the instrument. Improper use of the CALibration commands can adversely affect the accuracy and reliability of the instrument.

Parameters

Name	Type	Range of Values	Default Value
<new_code>	Unquoted ASCII String	A string of up to 12 characters. You do not have to use all 12 characters but the first character must always be a letter (A-Z). The remaining 11 characters can be letters, numbers (0-9), or the underscore character ("_"). Blank spaces are not allowed.	This is a required parameter

Remarks

- The security codes for the 34410A/11A/L4411A are set to "**AT34410**", "**AT34411**", and "**ATL4411**" respectively when the instruments are shipped from the factory.

- If you forget your security code, you can override the security feature. See the Agilent 34410A/11A/L4411A *Service Guide* for more information.

| NOTE | The security code is stored in non-volatile 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

The following command sets a new calibration security code (calibration memory must be unsecured).

```
CAL:SEC:CODE T3ST_DUT165
```

See Also

[CALibration:SECure:STATe](#)

CALibration:SECure:STATe

Syntax

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

CALibration:SECure:STATe?

Description

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.

NOTE

For a more detailed discussion of the calibration procedures, see the *Agilent 34410A/11A/L4411A Service Guide*. Please refer to the *Service Guide* before attempting to calibrate the instrument. Improper use of the CALibration commands can adversely affect the accuracy and reliability of the instrument.

Parameters

Name	Type	Range of Values	Default Value
<mode>	Boolean	{OFF|0|ON|1}	This is a required parameter.
<code>	Unquoted ASCII String	A string of up to 12 characters. You do not have to use all 12 characters but the first character must always be a letter (A-Z). The remaining 11 characters can be letters, numbers (0-9), or the underscore character ("_"). Blank spaces are not allowed.	This parameter is required to disable security, but is optional to enable security (but must be correct if provided).

Remarks

- When you first receive your instrument, it is secured. The security code is set to "**AT34410**", "**AT34411**", or "**ATL4411**" 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 34410A, 34411A, or L4411A use the CALibration:VALue and CALibration? commands.

NOTE

The calibration security setting is stored in non-volatile memory, and does not change when power has been off, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns "0" (OFF) or "1" (ON) indicating the current calibration security setting.

Examples

The following command unsecures the instrument using the *factory default* security code.

```
CAL:SEC:STAT OFF,AT34410
```

The following query returns the current calibration security setting.

```
CAL:SEC:STAT?
```

Typical Response: 0

See Also

[CALibration:SECure:CODE](#)

CALibration:STRing

Syntax

CALibration:STRing "*<string>*"

CALibration:STRing?

Description

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.

NOTE

For a more detailed discussion of the calibration procedures, see the *Agilent 34410A/11A/L4411A Service Guide*. Please refer to the *Service Guide* before attempting to calibrate the instrument. Improper use of the CALibration commands can adversely affect the accuracy and reliability of the instrument.

Parameters

Name	Type	Range of Values	Default Value
<string>	Quoted ASCII String	A string of up to 40 characters enclosed in quotes. You can use letters (A-Z), numbers (0-9), and special characters like "@", "%", "*", etc.	This is a required parameter

Remarks

- You can record a calibration message *only* from the remote interface and *only* when the instrument is unsecured (see CALibration:SECure:STATe OFF command). You can read the message from either the front-panel or over the remote interface. You can read the calibration message whether the instrument is secured or unsecured.

- The calibration message may contain up to 40 characters. From the front panel, you can view only 18 characters of the message at a time. Press [>] to scroll through the text of the message. Press [>] again to increase the scrolling speed.

- From the front panel, commas, periods, and semicolons share a display space with the preceding character, and are not considered individual characters.

- Storing a calibration message will overwrite any message previously stored in memory.

- The calibration message is stored in non-volatile calibration memory, and does not change when power has been off, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

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

Examples

The following commands store a message in calibration memory.

```
CAL:STR "CAL: 21 Nov 2005"   or   CAL:STR 'CAL: 21 Nov 2005'
```

The following query returns the message currently stored in calibration memory (the quotes are also returned).

```
CAL:STR?
```

Typical Response: `"CAL: 21 Nov 2005"`

See Also

[CALibration:SECure:STATe](#)

CALibration:STORe

Syntax

CALibration:STORe

Description

This command stores the calibration constants in *non-volatile* memory.

NOTE

For a more detailed discussion of the calibration procedures, see the *Agilent 34410A/11A/L4411A Service Guide*. Please refer to the *Service Guide* before attempting to calibrate the instrument. Improper use of the CALibration commands can adversely affect the accuracy and reliability of the instrument.

Remarks

- The CALibration:ADC? and CALibration[:ALL]? commands modify the *volatile* versions of the calibration constants. You must use the CALibration:STORe command to save these constants in *non-volatile* memory at the end of your calibration, or the changes will be lost.

- Once the calibration constants are stored in non-volatile calibration memory, they will not change when power has been off, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Examples

The following command stores the calibration constants in non-volatile calibration memory.

```
CAL:STOR
```

See Also

CALibration:ADC?

CALibration[:ALL]?

CALibration:SECure:STATe

CALibration:VALue

Syntax

CALibration:VALue *<value>*

CALibration:VALue?

Description

This command specifies the value of the known calibration signal as outlined in the calibration procedures in the *Agilent 34410A/11A/L4411A Service Guide*.

NOTE   For a more detailed discussion of the calibration procedures, see the *Agilent 34410A*/11A/L4411A *Service Guide*. Please refer to the *Service Guide* before attempting to calibrate the instrument. Improper use of the CALibration commands can adversely affect the accuracy and reliability of the instrument.

Parameters

Name	Type	Range of Values	Default Value
<value>	Numeric	Desired calibration signal in the units specified by the present measurement function.	This is a required parameter

Remarks

- Refer to the *Agilent 34410A/11A/L4411A Service Guide* for detailed procedures, including how to connect a calibration source, recommended equipment, the specified calibration points, and so forth.

Return Format

The query command returns the calibration value in the form
"+1.00000000E-01".

Examples

The following command sets calibration value to +10.001010 volts.

```
CAL:VAL 10.001010
```

The following query returns the present calibration value.

```
CAL:VAL?
```

Typical Response: +1.00010100E+01

See Also

[CALibration[:ALL]?](#)

CONFigure Subsystem Introduction

The CONFigure command provides the most concise way to program the instrument for measurements. When you execute this command, the instrument uses default values for the requested measurement configuration (like the MEASure? command). However, the measurement *is not* automatically started and you can change some measurement attributes before actually initiating the measurement. This allows you to incrementally change the instrument's configuration from the default conditions.

NOTE   Use the INITiate or READ? command to initiate the measurement.

Command Summary

CONFigure:CAPacitance

CONFigure:CONTinuity

CONFigure:CURRent:AC

CONFigure:CURRent[:DC]

CONFigure:DIODe

CONFigure:FREQuency

CONFigure:FRESistance

CONFigure:PERiod

CONFigure:RESistance

CONFigure:TEMPerature

CONFigure[:VOLTage]:AC

CONFigure[:VOLTage][:DC]

CONFigure?

Default Settings for the CONFigure Command

With the CONFigure command, you can select the function, range, and resolution all in one command. All other measurement parameters are set to their default values as shown below.

Measurement Parameter:	CONFigure Setting:
AC Filter	20 Hz (medium filter)
Autozero	OFF if resolution setting results in NPLC < 1 ON if resolution setting results in NPLC ≥ 1
Input Impedance	OFF (fixed at 10 MΩ for all dc voltage ranges)
Offset Compensation	OFF (for 2-wire and 4-wire resistance measurements)
Samples per Trigger	1 sample
Sample Source	AUTO
Trigger Count	1 trigger
Trigger Delay	Automatic delay
Trigger Source	Immediate
Trig Slope	NEG
Math Functions	OFF
Null State	OFF

The AC Filter, Autozero, and Null State parameters can be set individually for each applicable measurement function. However, in each case, the defaults are as listed in the table above. Input Impedance applies only to dc voltage measurements.

Using the CONFigure Command

The following program segment shows how to use the CONFigure command with the READ? command to make an externally-triggered measurement. The CONFigure command configures the instrument for dc voltage measurements. Note that the CONFigure command does *not* place the instrument in the "wait-for-trigger" state.

The READ? command places the instrument in the "wait-for-trigger" state, initiates a measurement when the rear-panel *Ext Trig Input* line is pulsed (low by default), stores the reading in memory, and then transfers the reading to the instrument's output buffer. The default range (autorange) and resolution (1 PLC) are used for the measurement.

```
CONF:VOLT:DC TRIG:SOUR EXT
READ?
```

  Typical Response: +4.27150000E-00

The following program segment is similar to the previous example but it uses the INITiate command to place the instrument in the "wait-for-trigger" state. The INITiate command places the instrument in the "wait-for-trigger" state, initiates a measurement when the rear-panel *Ext Trig Input* line is pulsed (low by default), and sends the reading to reading memory. The FETCh? command transfers the reading from reading memory to the instrument's output buffer.

```
CONF:VOLT:DC
TRIG:SOUR EXT
INIT
FETC?
```

  Typical Response: +5.34250000E-00

Storing readings in memory using the INITiate command is faster than sending readings to the output buffer using the READ? command (provided you do not send the FETCh? command until done). The INITiate command is also an "overlapped" command. This means that after executing the INITiate command, you can send other commands that do not affect the measurements. *This allows you to check for data availability before initiating a read attempt that might otherwise time out.* Note that the FETCh? command will wait until all measurements are complete to terminate. The 34410A can store up to 50,000 readings in internal reading memory. The 34411A/L4411A can store up to 1,000,000 readings in internal reading memory.

The following program segment configures the instrument for 2-wire resistance measurements, triggers the meter to make one measurement using the INITiate, and then stores the reading in memory. The 10 kΩ range is selected with 100Ω resolution.

```
CONF:RES 10000,100
INIT
FETC?
```

Typical Response: +5.95850000E+03

CONFigure:CAPacitance

Syntax

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

Description

First, this command resets all capacitance measurement parameters and trigger parameters to their default values. Then, it configures the meter for capacitance measurements but *does not* initiate the measurement.

The CONFigure command does *not* place the instrument in the "wait-for-trigger" state. Use the INITiate or READ? command in conjunction with CONFigure to place the instrument in the "wait-for-trigger" state.

Parameters

Name	Type	Range of Values	Default Value
<range>	Numeric	Desired range in F (farads): 1 nF (MIN) 10 nF 100 nF 1 µF 10 µF (MAX) AUTO (autorange) (DEF)	AUTO
<resolution>	Numeric	Desired resolution in F (farads).	Fixed at 4½ digits.

Remarks

- The *<resolution>* parameter is optional, and is in fact ignored. The resolution is actually fixed at 4½ digits.

- 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 fastest measurments, use manual ranging on each measurement (some additional time may be required for autoranging since the instrument has to make a range selection).

- If you select autoranging (by specifying "AUTO" or "DEF"), an error will be generated if you specify a discrete value for the <resolution> parameter. When autoranging is combined with a discrete resolution, the instrument cannot accurately resolve the integration time (especially if the input is continuously changing). If your application requires autoranging, be sure to specify "DEF" for the <resolution> parameter or omit the parameter from the command.

- 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*: "OVLD" from the front panel or "+9.9E+37" from the remote interface.

Examples

The following program segment configures the instrument for capacitance measurements. The READ? command places the instrument in the "wait-for-trigger" state, triggers a measurement, and then sends the reading to memory and the instrument output buffer. The default range (AUTO) and resolution (4½ digits) are used for the measurement.

```
CONF:CAP
READ?
```

Typical Response: +0.04530000E-06

See Also

[CONFigure?](#)

[FETCh?](#)

[INITiate[:IMMediate]](#)

[READ?](#)

CONFigure:CONTinuity

Syntax

CONFigure:CONTinuity

Description

First, this command resets all continuity measurement parameters and trigger parameters to their default values. Then, it configures the meter for continuity measurements but *does not* initiate a measurement. Continuity is a special type of fixed-range 2-wire resistance measurement.

This command presets the meter to a fixed range and resolution, and then configures for continuity tests. However, it *does not* initiate the test.

The CONFigure command does *not* place the instrument in the "wait-for-trigger" state. Use the INITiate or READ? command in conjunction with CONFigure to place the instrument in the "wait-for-trigger" state.

Remarks

- The range and resolution are *fixed* for continuity tests. The range is 1 kΩ (a 2-wire resistance measurement).

- The meter beeps (even if beep is disabled) for each measurement that is less than or equal to the *continuity threshold* (≤10 Ω), and the actual resistance reading is displayed on the front panel.

- From 10 Ω to 1.2 kΩ the meter displays the actual resistance reading with no beep.

- If the reading exceeds 1.2 kΩ, the meter displays "OPEN" on the front panel (no beep).

- The FETCh?, READ?, and MEASure:CONTinuity? commands return the measured resistance, regardless of its value.

Examples

The following program segment configures the instrument for continuity measurements. The READ? command places the instrument in the "wait-for-trigger" state, triggers a measurement, and then sends the reading to memory and the instrument output buffer.

```
CONF:CONT
READ?
```

Typical Response: +1.32130000E-02

See Also

[CONFigure?](#)

[FETCh?](#)

[INITiate[:IMMediate]](#)

[READ?](#)

CONFigure:CURRent:AC

Syntax

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

Description

First, this command resets all ac current measurement parameters and trigger parameters to their default values. Then, it configures the meter for ac current measurements but *does not* initiate a measurement.

The CONFigure command does *not* place the instrument in the "wait-for-trigger" state. Use the INITiate or READ? command in conjunction with CONFigure to place the instrument in the "wait-for-trigger" state.

Parameters

Name	Type	Range of Values	Default Value
<range>	Numeric	Desired range in amps: 100 µA (MIN) 1 mA 10 mA 100 mA 1 A 3 A (MAX) AUTO (autorange)	AUTO (autorange)
<resolution>	Numeric	Desired resolution in amps.	Fixed at 6½ digits.

Remarks

- The *<resolution>* parameter is optional, and is in fact ignored. The resolution is actually fixed at 6½ digits.

- 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).

- If you select autoranging (by specifying "AUTO" or "DEF"), an error will be generated if you specify a discrete value for the <resolution> parameter. When autoranging is combined with a discrete resolution, the instrument cannot accurately resolve the integration time (especially if the input signal is continuously changing). If your application requires autoranging, be sure to specify "DEF" for the <resolution> parameter or omit the parameter from the command.

- 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*: "OVLD" from the front panel or "9.9E+37" from the remote interface.

- For ac measurements, the resolution is fixed at 6½ digits. To control the reading rate for ac measurements, change the trigger delay, change the ac filter bandwidth, or use the SAMPle:SOURce command and set the source to TIMer.

Examples

The following program segment configures the instrument for ac current measurements. The READ? command places the instrument in the "wait-for-trigger" state, triggers a measurement, and then sends the reading to memory and the instrument output buffer. The default range (autorange) and resolution (fixed at 6½ digits) are used for the measurement.

```
CONF:CURR:AC
READ?
```

Typical Response: +8.54530000E-02

See Also

[CONFigure?](#)

[FETCh?](#)

[INITiate[:IMMediate]](#)

[READ?](#)

[[SENSe:]CURRent:AC:BANDwidth](#)

CONFigure:CURRent[:DC]

Syntax

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

Description

First, this command resets all dc current measurement parameters and trigger parameters to their [default values](). Then, it configures the meter for dc current measurements but *does not* initiate the measurement.

The CONFigure command does *not* place the instrument in the "wait-for-trigger" state. Use the [INITiate]() or [READ?]() command in conjunction with CONFigure to place the instrument in the "wait-for-trigger" state.

Parameters

Name	Type	Range of Values	Default Value
<range>	Numeric	Desired range in amps: 100 µA (MIN) 1 mA 10 mA 100 mA 1 A 3 A (MAX) AUTO (autorange)	AUTO (autorange)
<resolution>	Numeric	Desired resolution in amps (see Resolution Table or Range, Resolution, and NPLC for more information).	0.3 ppm x *<range>* (1 PLC)

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).

- If you select autoranging (by specifying "AUTO" or "DEF"), an error will be generated if you specify a discrete value for the <resolution> parameter. When autoranging is combined with a discrete resolution, the instrument cannot accurately determine the integration time (especially if the input signal is continuously changing). If your application requires autoranging, be sure to specify "DEF" for the <resolution> parameter or omit the parameter from the command.

- 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*: "±OVLD" from the front panel or "±9.9E+37" from the remote interface.

Examples

The following program segment configures the instrument for dc current measurements. The READ? command places the instrument in the "wait-for-trigger" state, triggers a measurement, and then sends the reading to memory and the instrument output buffer. The default range (autorange) and resolution (1 PLC) are used for the measurement.

```
CONF:CURR:DC
READ?
```

Typical Response: +8.54530000E-03

The following program segment configures the instrument for dc current measurements. The INITiate command places the instrument in the "wait-for-trigger" state, triggers a measurement, and stores the reading in memory. The [FETCh?](#) command transfers the reading from reading memory to the instrument output buffer. The 1 A range is selected with 1 mA resolution.

```
MEAS:CURR:DC? 1,0.001
INIT
FETC?
```

Typical Response: +4.27150000E-02

See Also

[CONFigure?](#)

[FETCh?](#)

[INITiate[:IMMediate]](#)

[READ?](#)

[[SENSe:]CURRent[:DC]:ZERO:AUTO](#)

CONFigure:DIODe

Syntax

CONFigure:DIODe

Description

First, this command resets all diode test parameters and trigger parameters to their default values. Then it configures the meter for diode tests, but does *not* initiate the test.

The CONFigure command does *not* place the instrument in the "wait-for-trigger" state. Use the INITiate or READ? command in conjunction with CONFigure 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 current source output).

- The voltage is displayed on the front panel if it is in the 0 to 1.2 volt range. The meter beeps when the signal transitions to the 0.3 to 0.8 volt threshold (unless beep is disabled). If the signal is greater than 1.2 volts, "OPEN" is displayed on the front panel.

- The FETCh?, READ?, and MEASure:DIODe? commands return the measured voltage, regardless of its value.

Examples

The following program segment configures the instrument for diode tests. The READ? command places the instrument in the "wait-for-trigger" state, triggers a test, and then sends the reading to memory and the instrument output buffer.

```
CONF:DIOD
READ?
```

Typical Response: +1.32130000E-01

See Also

[CONFigure?](#)

[FETCh?](#)

[INITiate[:IMMediate]](#)

[READ?](#)

CONFigure:FREQuency

Syntax

CONFigure:FREQuency [{*<range>*|MIN|MAX|DEF} [,
{*<resolution>*|MIN|MAX|DEF}]]

Description

First, this command resets all frequency measurement parameters and trigger parameters to their [default values](). Then, it configures the meter for frequency measurements but *does not* initiate the measurement.

The CONFigure command does *not* place the instrument in the "wait-for-trigger" state. Use the [INITiate]() or [READ?]() command in conjunction with CONFigure to place the instrument in the "wait-for-trigger" state.

Parameters

Name	Type	Range of Values	Default Value
<range>	Numeric	Approximate frequency of the input signal in hertz, between 3 Hz and 300 kHz. MIN = 3 Hz DEF = 20 Hz MAX = 300 kHz	20 Hz
<resolution>	Numeric	Desired resolution in hertz. MIN = 0.1 ppm x *<range>* DEF = 1 ppm x *<range>* MAX = 100 ppm x *<range>*	1 ppm x *<range>* (for default aperture = 100 ms)

Remarks

- Frequency is measured on ac voltage signals. Thus, the proper ac voltage range should be set first using the [SENSe:]FREQuency:VOLTage:RANGe[:UPPer] command. The voltage range should be 0.1 volts or greater for more accurate frequency measurements.

- The *<range>* parameter is required only to specify the measurement resolution parameter. Therefore, it is not necessary to send a new command for each new frequency to be measured.

- If the input signal voltage is greater than can be measured on the selected voltage range (manual ranging), the instrument gives an *overload indication*: "VAC OVERLOAD" from the front panel or "+9.9E+37" from the remote interface. Autoranging can be enabled for the input voltage.

- The frequency measurement does not autorange. For frequency measurements, the *range* and *resolution* parameters affect the aperture (gate time) as follows:

Resolution	Aperture
100 ppm x *<range>*	1 ms
10 ppm x *<range>*	10 ms
1 ppm x *<range>*	100 ms (default)
0.1 ppm x *<range>*	1 s

- With no signal applied "0" is returned.

Examples

The following program segment configures the instrument for frequency measurements. The READ? command places the instrument in the "wait-for-trigger" state, triggers a measurement, and then sends the reading to memory and the instrument output buffer. The default aperture (100 ms) is used for the measurement.

```
CONF:FREQ
READ?
```

Typical Response: +1.32130000E+03

The following program segment configures the instrument for frequency measurements. The INITiate command places the instrument in the "wait-for-trigger" state, triggers a measurement, and stores the reading in memory. The [FETCh?](#) command transfers the reading from reading memory to the instrument's output buffer. The default aperture (100 ms) is used for the measurement.

```
CONF:FREQ 100
INIT
FETC?
```

Typical Response: +1.01230000E+02

See Also

[CONFigure?](#)

[FETCh?](#)

[INITiate[:IMMediate]](#)

[READ?](#)

[[SENSe:]FREQuency:RANGe:LOWer](#)

[[SENSe:]FREQuency:VOLTage:RANGe[:UPPer]](#)

CONFigure:FRESistance

Syntax

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

Description

First, this command resets all resistance measurement parameters and trigger parameters to their default values. Then, it configures the meter for 4-wire resistance measurements but *does not* initiate the measurement.

The CONFigure command does *not* place the instrument in the "wait-for-trigger" state. Use the INITiate or READ? command in conjunction with CONFigure to place the instrument in the "wait-for-trigger" state.

Parameters

Name	Type	Range of Values	Default Value
<range>	Numeric	Desired range in ohms: 100Ω (MIN) 1 kΩ 10 kΩ 100 kΩ 1 MΩ 10 MΩ 100 MΩ 1 GΩ (MAX) AUTO (autorange)	AUTO (autorange)
<resolution>	Numeric	Desired resolution in ohms (see Resolution Table or Range, Resolution, and NPLC for more information).	0.3 ppm x *<range>* (1 PLC)

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).

- If you select autoranging (by specifying "AUTO" or "DEF"), an error will be generated if you specify a discrete value for the <resolution> parameter. When autoranging is combined with a discrete resolution, the instrument cannot accurately resolve the integration time (especially if the input signal is continuously changing). If your application requires autoranging, be sure to specify "DEF" for the <resolution> parameter or omit the parameter from the command.

- 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*: "OVLD" from the front panel or "+9.9E+37" from the remote interface.

- For 4-wire measurements, the instrument always enables the autozero function.

Examples

The following program segment configures the meter for a 4-wire resistance measurement. The READ? command places the meter in the "wait-for-trigger" state, initiates a trigger, and then sends the reading to memory and the instrument output buffer. The default range (autorange) and resolution are used for the measurement.

```
CONF:FRES
READ?
```

Typical Response: +2.93830000E+03

The following program segment configures the instrument for 4-wire resistance measurements. The INITiate command places the instrument in the "wait-for-trigger" state, triggers a measurement, and stores the reading in memory. The FETCh? command transfers the reading from reading memory to the instrument output buffer. The 1 kΩ range is selected with 0.1 Ω resolution.

```
CONF:FRES 1000,0.1
INIT
FETC?
```

Typical Response: +4.27150000E+02

See Also

[CONFigure:RESistance](#)

[CONFigure?](#)

[FETCh?](#)

[INITiate[:IMMediate]](#)

[READ?](#)

[[SENSe:]FRESistance:OCOMpensated](#)

CONFigure:PERiod

Syntax

CONFigure:PERiod [{*<range>*|MIN|MAX|DEF} [, {*<resolution>*|MIN|MAX|DEF}]]

Description

First, this command resets all period measurement parameters and trigger parameters to their default values. Then, it configures the meter for period measurements but *does not* initiate the measurement.

The CONFigure command does *not* place the instrument in the "wait-for-trigger" state. Use the INITiate or READ? command in conjunction with CONFigure to place the instrument in the "wait-for-trigger" state.

Parameters

Name	Type	Range of Values	Default Value
<range>	Numeric	Approximate period of the input signal in seconds, between 3.336 μs and 333.33 ms. MIN = 3.336 μs DEF = 50 ms MAX = 333.33 ms	50 ms
<resolution>	Numeric	Desired resolution in seconds. MIN = 0.1 ppm x *<range>* DEF = 1 ppm x *<range>* MAX = 100 ppm x *<range>*	1 ppm x *<range>* (for default aperture = 100 ms)

Remarks

- Period is measured on ac voltage signals. Thus, the proper ac voltage range should be set first using the [SENSe:]PERiod:VOLTage:RANGe[:UPPer] command. The voltage range should be 0.1 volts or greater for more accurate period measurements.

- The *<range>* parameter is required only to specify the measurement resolution parameter. Therefore, it is not necessary to send a new command for each new period to be measured.

- If the input signal voltage is greater than can be measured on the selected voltage range (manual ranging), the instrument gives an *overload indication*: "VAC OVERLOAD" from the front panel or "+9.9E+37" from the remote interface. Autoranging can be enabled for the input voltage.

- The period measurement does not autorange. For period measurements, the range and resolution parameters affect the aperture (gate time) as follows:

Resolution	Aperture
100 ppm x *<range>*	1 ms
10 ppm x *<range>*	10 ms
1 ppm x *<range>*	100 ms (default)
0.1 ppm x *<range>*	1 s

- With no signal applied, "0" is returned.

Examples

The following program segment configures the instrument for period measurements. The READ? command places the instrument in the "wait-for-trigger" state, triggers a measurement, and then sends the reading to memory and the instrument output buffer. The default aperture (100 ms) is used for the measurement.

```
CONF:PER
READ?
```

Typical Response: +1.32130000E-03

The following program segment configures the instrument for period measurements. The INITiate command places the instrument in the "wait-for-trigger" state, triggers a measurement, and stores the reading in memory. The FETCh? command transfers the readings from reading memory to the instrument's output buffer.

```
CONF:PER 0.001,0.0000001
INIT
FETC?
```

Typical Response: +4.27150000E-04

See Also

[CONFigure?](#)

[FETCh?](#)

[INITiate[:IMMediate]](#)

[READ?](#)

[[SENSe:]PERiod:VOLTage:RANGe[:UPPer]](#)

CONFigure:RESistance

Syntax

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

Description

First, this command resets all resistance measurement parameters and trigger parameters to their default values. Then, it configures the meter for 2-wire resistance measurements but *does not* initiate the measurement.

The CONFigure command does *not* place the instrument in the "wait-for-trigger" state. Use the INITiate or READ? command in conjunction with CONFigure to place the instrument in the "wait-for-trigger" state.

Parameters

Name	Type	Range of Values	Default Value
<range>	Numeric	Desired range in ohms: 100Ω (MIN) 1 kΩ 10 kΩ 100 kΩ 1 MΩ 10 MΩ 100 MΩ 1 GΩ (MAX) AUTO (autorange)	AUTO (autorange)
<resolution>	Numeric	Desired resolution in ohms (see Resolution Table or Range, Resolution, and NPLC for more information).	0.3 ppm x *<range>* (1 PLC)

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).

- If you select autoranging (by specifying "AUTO" or "DEF"), an error will be generated if you specify a discrete value for the <resolution> parameter. When autoranging is combined with a discrete resolution, the instrument cannot accurately resolve the integration time (especially if the input signal is continuously changing). If your application requires autoranging, be sure to specify "DEF" for the <resolution> parameter or omit the parameter from the command.

- 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*: "OVLD" from the front panel or "+9.9E+37" from the remote interface.

Examples

The following program segment configures the instrument for 2-wire resistance measurements. The READ? command places the instrument in the "wait-for-trigger" state, triggers a measurement, and then sends the reading to memory and the instrument output buffer. The default range (autorange) and resolution (1 PLC) are used for the measurement.

```
CONF:RES
READ?
```

Typical Response: +1.32130000E+04

The following program segment configures the instrument for 2-wire resistance measurements. The INITiate command places the instrument in the "wait-for-trigger" state, triggers a measurement, and stores the reading in memory. The FETCh? command transfers the reading from reading memory to the instrument output buffer. The 1 kΩ range is selected with 0.1 Ω resolution.

```
CONF:RES 1000,0.1
INIT
FETC?
```

Typical Response: +4.27150000E+02

See Also

[CONFigure:FRESistance](#)

[CONFigure?](#)

[FETCh?](#)

[INITiate[:IMMediate]](#)

[READ?](#)

[[SENSe:]RESistance:OCOMpensated](#)

[[SENSe:]RESistance:ZERO:AUTO](#)

CONFigure:TEMPerature

Syntax

CONFigure:TEMPerature [{*<probe_type>*|DEF}[,{*<type>*|DEF} [,1 [, {*<resolution>*|MIN|MAX|DEF}]]]]

Description

First, this command resets all temperature measurement parameters and trigger parameters to their default values. Then, it configures the meter for temperature measurements but *does not* initiate the measurement.

The CONFigure command does *not* place the instrument in the "wait-for-trigger" state. Use the INITiate or READ? command in conjunction with CONFigure to place the instrument in the "wait-for-trigger" state.

Parameters

Name	Type	Range of Values		Default Value
<probe_type>	Discrete	{FRTD|RTD|FTHermistor|THERmistor}		Required parameter DEF sets FRTD
<type>	Discrete	For THER:	{2252|5000|10000}	Required parameter DEF sets 5000 (2-wire)
		For FTH:	{2252|5000|10000}	Required parameter DEF sets 5000 (4-wire)
		For RTD:	{85}	Required parameter DEF sets 85 (2-wire)
		For FRTD:	{85}	Required parameter DEF sets 85 (4-wire)
<resolution>	Numeric	Desired resolution in the currently selected units (°C, °F, or K). See Resolution Table.		0.3 ppm *<range>* (1 PLC)

Remarks

- For temperature measurements, the instrument internally selects the range—you cannot select the range to be used. The range ("1" is the only allowed value) is used only in conjunction with resolution to determine NPLC.

- The range ("1") and *<resolution>* parameters are optional. However, if you specify *<resolution>*, you *must* also specify "1" as the *implied* range parameter (see syntax above). For example:

  CONF:TEMP THER,5000,1,0.1

  specifies range = 1 and resolution = 0.1 degrees (°C, °F, or K, whichever is currently selected).

- To change temperature units, use the UNIT:TEMPerature command.

- For thermistor and RTD measurements, the instrument autoranges to the correct range for the transducer resistance measurement.

- For 4-wire RTD or thermistor measurements, the instrument always enables the autozero function.

Examples

The following program segment configures the instrument for 5 kΩ, 2-wire thermistor measurements. The INITiate command places the instrument in the "wait-for-trigger" state, triggers a measurement, and stores the reading in memory. The FETCh? command transfers the reading from reading memory to the instrument output buffer. This 2-wire measurement is made with 0.1 °C resolution (assumes default temperature units).

```
CONF:TEMP THER,5000,1,0.1
INIT
FETC?
```

Typical Response: +2.47150000E+01

The following program segment configures the meter for a 2-wire RTD measurement. The READ? command places the meter in the "wait-for-trigger" state, initiates a trigger, and then sends the reading to memory and the instrument output buffer. The default resolution is used for the measurement (assumes default temperature units).

```
CONF:TEMP RTD,85
READ?
```

Typical Response: +2.12320000E+01

See Also

CONFigure?

FETCh?

INITiate[:IMMediate]

READ?

[SENSe:]TEMPerature:TRANsducer:TYPE

[SENSe:]TEMPerature:ZERO:AUTO

UNIT:TEMPerature

CONFigure[:VOLTage]:AC

Syntax

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

Description

First, this command resets all ac voltage measurement parameters and trigger parameters to their default values. Then, it configures the meter for ac voltage measurements but *does not* initiate the measurement.

> **WARNING**
>
> **The maximum range parameter is 1000 V, which is set by MAX. However, the SAFETY LIMIT on the front and rear HI/LO input terminals is 750 VAC (rms). The rms voltage is waveform dependent. A sine wave is limited to 750 VAC (rms), but a 1000 Vpk square wave is safe. Connections to AC MAINS are further limited to CAT II (300V). See the "Safety Information" section in the *Agilent 34410A/11A/L4411A User's Guide* for a complete discussion of the safety features, and the safe operation of this instrument.**

The CONFigure command does *not* place the instrument in the "wait-for-trigger" state. Use the INITiate or READ? command in conjunction with CONFigure to place the instrument in the "wait-for-trigger" state.

Parameters

Name	Type	Range of Values	Default Value
<range>	Numeric	Desired range in volts: 100 mV (MIN) 1 V 10 V 100 V 1000 V (MAX) AUTO (autorange)	AUTO (autorange)
<resolution>	Numeric	Desired resolution in volts.	Fixed at 6½ digits.

Remarks

- The *<resolution>* parameter is optional, and is in fact ignored. The resolution is actually fixed at 6½ digits.

- All ranges use the digital ac measurement technique.

- 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).

- If you select autoranging (by specifying "AUTO" or "DEF"), an error will be generated if you specify a discrete value for the <resolution> parameter. When autoranging is combined with a discrete resolution, the instrument cannot accurately resolve the integration time (especially if the input signal is continuously changing). If your application requires autoranging, be sure to specify "DEF" for the <resolution> parameter or omit the parameter from the command.

- 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*: "OVLD" from the front panel or "+9.9E+37" from the remote interface.

- For ac measurements, the resolution is fixed at 6½ digits. To control the reading rate for ac measurements, change the trigger delay, change the [ac filter](#) bandwidth, or use the [SAMPle:SOURce](#) command and set the source to TIMer.

Examples

The following program segment configures the instrument for ac voltage measurements. The READ? command places the instrument in the "wait-for-trigger" state, triggers a measurement, and then sends the reading to memory and the instrument output buffer. The default range (autorange) and resolution (fixed at 6½ digits) are used for the measurement.

```
CONF:VOLT:AC
READ?
```

Typical Response: +1.86850000E+023

The following program segment configures the instrument for ac voltage measurements. The INITiate command places the instrument in the "wait-for-trigger" state, triggers a measurement, and stores the reading in memory. The FETCh? command transfers the reading from reading memory to the instrument output buffer. The 1 V range is selected.

```
CONF:VOLT:AC 1
INIT
FETC?
```

Typical Response: +4.27150000E-01

See Also

[CONFigure?](#)

[FETCh?](#)

[INITiate[:IMMediate]](#)

[READ?](#)

[[SENSe:]VOLTage:AC:BANDwidth](#)

CONFigure[:VOLTage][:DC]

Syntax

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

Description

First, this command resets all dc voltage measurement parameters and trigger parameters to their default values. Then, it configures the meter for dc voltage measurements but *does not* initiate the measurement.

The CONFigure command does *not* place the instrument in the "wait-for-trigger" state. Use the INITiate or READ? command in conjunction with CONFigure to place the instrument in the "wait-for-trigger" state.

Parameters

Name	Type	Range of Values	Default Value
<range>	Numeric	Desired range in volts: 100 mV (MIN) 1 V 10 V 100 V 1000 V (MAX) AUTO (autorange)	AUTO (autorange)
<resolution>	Numeric	Desired resolution in volts (see Resolution Table or Range, Resolution, and NPLC for more information).	0.3 ppm x *<range>* (1 PLC)

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).

- If you select autoranging (by specifying "AUTO" or "DEF"), an error will be generated if you specify a discrete value for the <resolution> parameter. When autoranging is combined with a discrete resolution, the instrument cannot accurately resolve the integration time (especially if the input signal is continuously changing). If your application requires autoranging, be sure to specify "DEF" for the <resolution> parameter or omit the parameter from the command.

- 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*: "±OVLD" from the front panel or "±9.9E+37" from the remote interface.

Examples

The following program segment configures the instrument for dc voltage measurements. The READ? command places the instrument in the "wait-for-trigger" state, triggers a measurement, and then sends the reading to memory and the instrument output buffer. The default range (autorange) and resolution (1 PLC) are used for the measurement.

```
CONF:VOLT:DC
READ?
```

Typical Response: +1.86850000E-03

The following program segment configures the instrument for dc voltage measurements. The INITiate command places the instrument in the "wait-for-trigger" state, triggers a measurement, and stores the reading in memory. The FETCh? command transfers the reading from reading memory to the instrument output buffer. The 1 V range is selected with 0.1 mV resolution.

```
CONF:VOLT:DC 1,0.0001
INIT
FETC?
```

Typical Response: +4.27150000E-01

See Also

CONFigure?

FETCh?

[INITiate[:IMMediate]](INITiate[:IMMediate])

READ?

[SENSe:]VOLTage[:DC]:ZERO:AUTO

CONFigure?

Syntax

CONFigure?

Description

This command returns the present instrument configuration as a quoted string.

Remarks

- Either the *RST command or the Instrument Preset (the SYSTem:PRESet command) will set all measurement parameters to their factory settings, clear reading memory, and clear all stored statistical data.

Return Format

The command returns a series of comma-separated fields indicating the present function, range, and resolution. The short form of the function name is always returned (e.g., "CURR:AC", "FREQ", etc.).

Example

The following query returns the present configuration of the meter (the quotes are also returned).

```
CONF?
```

Typical Response: `"VOLT +1.000000E+01,+3.000000E-06"`

See Also

CONFigure

DATA Subsystem Introduction

The DATA commands allow you to access data points in reading memory, to determine how many points are stored, and to remove data.

Command Summary

DATA:COPY

DATA:DATA?

DATA:DELete

DATA:LAST?

DATA:POINts:EVENt:THReshold

DATA:POINts:EVENt:THReshold?

DATA:POINts?

DATA:REMove?

DATA:COPY

Syntax

DATA:COPY NVMEM, RDG_STORE

Description

This command copies the readings in reading memory (RDG_STORE) into [non-volatile](#) memory (NVMEM). Non-volatile memory is not erased by a power-down cycle.

Remarks

- RDG_STORE is volatile, and the readings are lost on power-down unless the readings have been copied into non-volatile memory.

- For the 34410A, RDG_STORE can hold up to 50,000 readings, all of which are copied into non-volatile memory.

- The 34411A/L4411A increases RDG_STORE ([volatile](#) memory) space to 1,000,000 readings. However, non-volatile memory space remains fixed at 50,000 readings. For the 34411A/L4411A the DATA:COPY NVMEM, RDG_STORE command copies only the *first* 50,000 readings from RDG_STORE into non-volatile memory.

Examples

The following command copies all readings (up to the first 50,000 for the 34411A/L4411A) from RDG_STORE into non-volatile memory.

```
DATA:COPY NVMEM, RDG_STORE
```

See Also

[DATA:DATA?](#)

[DATA:DELete](#)

DATA:DATA?

Syntax

DATA:DATA? NVMEM

Description

This command returns all readings in [non-volatle](#) memory (NVMEM).

Remarks

- The 34410A, 34411A, and L4411A non-volatile memory can store up to 50,000 readings.

- All readings are retrieved from non-volatile memory and sent to the instrument output buffer.

Examples

The following command returns all readings from non-volatile memory (NVMEM).

```
DATA:DATA? NVMEM
```

See Also

DATA:COPY

DATA:DELete

DATA:DELete

Syntax

DATA:DELete NVMEM

Description

This command deletes all readings from *non-volatile* memory (NVMEM).

Remarks

- Non-volatile memory is not erased by a power-down cycle. If data has been copied into non-volatile memory (using the DATA:COPY command), use DATA:DELete to erase the readings.

Examples

The following command deletes all readings from non-volatile memory.

```
DATA:DEL NVMEM
```

See Also

[DATA:COPY](#)

[DATA:DATA?](#)

DATA:LAST?

Syntax

DATA:LAST?

Description

This command returns the last measurement taken. You can execute this command at any time, even during a series of measurements.

Remarks

- The instrument clears all readings from memory after a Factory Reset (*RST command), after an Instrument Preset (SYSTem:PRESet command), or when mainframe power is cycled.

Return Format

The command returns one reading with units. If no data is available, "9.91000000E+37" is returned.

Examples

The following query returns the last reading taken by the meter.

```
DATA:LAST?
```

Typical Response: +1.73730000E-03 VDC

See Also

[DATA:POINts?](#)

[DATA:REMove?](#)

DATA:POINts:EVENt:THReshold

Syntax

DATA:POINts:EVENt:THReshold *<num_readings>*

DATA:POINts:EVENt:THReshold?

Description

This command sets a bit in the *Standard Operation Register* group event register when the specified number of readings have been stored in reading memory. When the specified number of readings have been stored in memory, the "Memory Threshold" bit (bit 9) is set to a "1" in the event register.

NOTE	For more information on the SCPI Status System for the Agilent 34410A, 34411A, and L4411A see Status System Introduction.

Parameters

Name	Type	Range of Values	Default Value
<num_readings>	Numeric	Any value between 1 reading and 50,000 readings for the 34410A (1,000,000 readings for the 34411A/L4411A).	This is a required parameter

Remarks

- To report any subsequent events, the reading count must first drop below the programmed threshold before reaching the threshold again.

- To enable the "Memory Threshold" bit (bit 9 in the Standard Operation Event register) to be reported to the Status Byte, use the STATus:OPERation:ENABle command.

- Once the "Memory Threshold" bit (bit 9 in the Standard Operation Event register) is set, it will remain set until cleared by the STATus:OPERation[:EVENt]? command or *CLS (clear status) command. (The Standard Operation Condition register will show the current condition. See STATus Subsystem Introduction for further information.)

Return Format

The query command returns the number of readings currently specified as the memory threshold.

Examples

The following command sets the memory threshold to 125 readings.

```
DATA:POIN:EVEN:THR 125
```

The following query reads the memory threshold setting.

```
DATA:POIN:EVEN:THR?
```

Typical Response: +125

See Also

[DATA:POINts?](#)

DATA:POINts?

Syntax

DATA:POINts? [{RDG_STORE|NVMEM}]

Description

This command returns the total number of readings currently stored in reading memory (RDG_STORE, the default) or [non-volatile](#) memory (NVMEM).

Remarks

- You can read the count at any time, even during a series of measurements.

- Reading memory (RDG_STORE) can store up to 50,000 readings for the 34410A, or up to 1,000,000 readings for the 34411A/L4411A.

- Non-volatile memory (NVMEM) can store up to 50,000 readings for the 34410A, 34411A, or L4411A.

- The instrument clears all readings from memory after a Factory Reset (*RST command), after an Instrument Preset (SYSTem:PRESet command), or when mainframe power is cycled.

Return Format

If "RDG_STORE" (the default) is queried, a value is returned between 0 and 50,000 readings for the 34410A, or between 0 and 1,000,000 readings for the 34411A/L4411A. The query returns a value between 0 and 50,000 readings if "NVMEM" is specified for any instrument.

Example

The following query returns the number of readings in reading memory.

```
DATA:POIN?
```

Typical Response: +215

See Also

[DATA:POINts:EVENt:THReshold](#)

DATA:REMove?

Syntax

DATA:REMove? *<num_readings>*

Description

This command reads and erases the specified number of readings from memory. The readings are erased from memory starting with the *oldest reading* first. The purpose of this command is to allow you to periodically remove readings from memory during a series of measurements to avoid a reading memory overflow.

Parameters

Name	Type	Range of Values	Default Value
<num_readings>	Numeric	Specific number of readings to be read and erased from memory.	This is a required parameter

Remarks

- You can erase readings from memory at any time, even during a series of measurements

- You can store up to 50,000 readings in memory for the 34410A (1,000,000 readings for the 34411A/L4411A). If memory overflows, the new readings will overwrite the first (oldest) readings stored; the most recent readings are always preserved. In addition, bit 14 is set in the Questionable Data Register's condition register (see Status System Introduction).

- If fewer than the specified number of readings are currently in memory, an error will be generated. You can use the DATA:POINts? command to determine the total number of readings currently in memory.

- The instrument clears all readings from memory after a Factory Reset (*RST command), after an Instrument Preset (SYSTem:PRESet command), or when mainframe power is cycled.

Return Format

The command returns the specified number of readings and then erases them from memory. The format of the readings is affected by the [FORMat Subsystem](#) commands.

Example

The following query returns 3 readings (starting with the oldest reading first) and erases them from memory.

```
DATA:REM? 3
```

Typical Response: +4.27150000E+02,+1.32130000E+03,+3.65300000E+03

See Also

[DATA:POINts?](#)

[FORMat[:DATA]](#)

[R?](#)

DISPlay Subsystem Introduction

The DISPlay subsystem commands apply to the 34410A and 34411A only.

Command Summary

[DISPlay[:WINDow[1|2][:STATe]]](#)

[DISPlay[:WINDow[1|2][:STATe]]?](#)

[DISPlay[:WINDow[1|2]]:TEXT:CLEar](#)

[DISPlay[:WINDow[1|2]]:TEXT[:DATA]](#)

[DISPlay[:WINDow[1|2]]:TEXT[:DATA]?](#)

[DISPlay:WINDow2:TEXT:FEED](#)

[DISPlay:WINDow2:TEXT:FEED?](#)

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

Syntax

DISPlay[:WINDow[1|2][:STATe]] *<mode>*

DISPlay[:WINDow[1|2][:STATe]]?

Description

This command disables or enables the instrument's front-panel display. For security reasons or for a slight increase in measurement rates, you may want to turn off the front-panel display. When disabled, the entire front-panel display goes dark and all display annunciators except **Remote** and **ERROR** are disabled.

Parameters

Name	Type	Range of Values	Default Value
<mode>	Boolean	{OFF|0|ON|1}	This is a required parameter

Remarks

- You can disable the front-panel display from the remote interface only.

- Although you can specify "WINDow1" or "WINDow2" in the command, the entire front panel display (both display lines and all annunciators except **Remote** and **ERROR**) is disabled or enabled by this command. you cannot disable the display lines separately.

- A return to local mode by pressing the **Local** key (**Shift**, when in remote mode) will turn the display back on.

- Sending a text message to the display (see DISPlay[:WINDow[1|2]]:TEXT[:DATA] command) overrides the display state; this means that you can display a message even if the display is turned off.

- The display setting is *not* stored as part of the instrument state by the *SAV command.

- The front-panel display is automatically enabled when power is cycled, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

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

Examples

The following command disables the front-panel display.

```
DISP OFF
```

The following query returns the front-panel display setting.

```
DISP?
```

Typical Response: 0

See Also

DISPlay:WINDow2:TEXT:FEED

DISPlay[:WINDow[1|2]]:TEXT:CLEar

DISPlay[:WINDow[1|2]]:TEXT[:DATA]

DISPlay[:WINDow[1|2]]:TEXT:CLEar

Syntax

DISPlay[:WINDow[{1|2}]]:TEXT:CLEar

Description

This command clears the text message displayed on the top line
("WINDow1", the default) or bottom line ("WINDow2") of the instrument's
front-panel display (see DISPlay[:WINDow[1|2]]:TEXT[:DATA] command).

Remarks

- Clearing the text message does not override the display state (see DISPlay[:WINDow[1|2][:STATe]] command); if the display was disabled prior to clearing the text message, the display will remain disabled.

- If the text message was displayed by overriding a displayed measurement or math function, that function will reappear when the text message is cleared. In the case of the second display line ("WINDow2"), the *<feed>* selected by DISPlay:WINDow2:TEXT:FEED will reappear.

- The front-panel display is automatically cleared when power is cycled, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Example

The following command clears the text message on the top line (the default) of the front panel.

```
DISP:TEXT:CLEar
```

The following command clears the text message on the bottom line of the front panel.

```
DISP:WIND2:TEXT:CLEar
```

See Also

[DISPlay:WINDow2:TEXT:FEED](#)

[DISPlay[:WINDow[1|2]]:TEXT[:DATA]](#)

[DISPlay[:WINDow[1|2][:STATe]]](#)

DISPlay[:WINDow[1|2]]:TEXT[:DATA]

Syntax

DISPlay[:WINDow[{1|2}]]:TEXT[:DATA] "*<string>*"

DISPlay[:WINDow[{1|2}]]:TEXT[:DATA]?

Description

This command displays a text message on the top line ("WINDow1") or bottom line ("WINDow2") of the instrument's front-panel display. The top line ("WINDow1") is the default. The instrument can display up to 12 (top line) or 18 (bottom line) characters on the front panel; any additional characters are truncated (no error is generated).

Parameters

Name	Type	Range of Values	Default Value
<string>	Quoted ASCII String	A string of up to 12 (top line) or 18 (bottom line) characters enclosed in quotes. You can use letters (A-Z), numbers (0-9), and special characters like "@", "%", "*", etc. Use "#" character to display a degree symbol (°).	This is a required parameter

Remarks

- Commas, periods, and semicolons share a display space with the preceding character (unless it is also a comma, period, or semicolon), and are not considered individual characters.

- While a message is displayed, readings are suppressed on the front-panel display line in which the message is displayed (DISPlay:WINDow1:TEXT suppresses readings in the top line, while DISPlay:WINDow2:TEXT suppresses readings in the bottom line).

- DISPlay:WINDow2:TEXT[:DATA] overrides any *<feed>* set with the DISPlay:WINDow2:TEXT:FEED command. That is, the text string is displayed, overriding the measurement or math function in the second display. The DISPlay:WINDow2:TEXT:CLEar command clears the data and allows the *<feed>* to reappear.

- If you send a null string ("") with the DISPlay:WINDow2:TEXT[:DATA] command, it has the same effect as sending the DISPlay:WINDow2:TEXT:CLEar command.

- Sending a text message to the display overrides the display state (see DISPlay[:WINDow[1|2][:STATe]] command); this means that you can display a message even if the display is turned off.

- Pressing the **Local** key on the front-panel clears the text message. To prevent this, use the SYSTem:LOCK:REQuest? command to lock the front panel keypad.

- The front-panel display is automatically cleared when power is cycled, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command reads the message currently displayed on the front panel in the specified window, and returns an ASCII string enclosed in double quotes. If no message is displayed, a null string ("") is returned.

Examples

The following commands display a message on the top line ("WINDow1", the default) of the front panel (the quotes are not displayed).

```
DISP:TEXT "MEASURING..."    or    DISP:TEXT 'MEASURING...'
```

The following command displays a message on the bottom line ("WINDow2") of the front panel (the quotes are not displayed).

```
DISP:WIND2:TEXT "WAITING FOR DATA..."
```

The following query returns the message currently displayed on the bottom line of the front panel (the quotes are also returned).

```
DISP:WIND2:TEXT?
```

Typical Response: `"WAITING FOR DATA..."`

See Also

[DISPlay[:WINDow[1|2]]:TEXT:CLEar](#)

[DISPlay:WINDow2:TEXT:FEED](#)

DISPlay:WINDow2:TEXT:FEED

Syntax

DISPlay:WINDow2:TEXT:FEED "*<feed>*"

DISPlay:WINDow2:TEXT:FEED?

Description

This command selects the measurement or math function to be displayed on the second display line ("WINDow2"). The *<feed>* parameter is a quoted string designating the function to display in "WINDow2".

Parameters

Name	Type	Range of Values	Default Value
<feed>	Quoted ASCII String	CALCulate:AVERage[:AVERage] CALCulate:AVERage:MINimum CALCulate:AVERage:MAXimum CALCulate:AVERage:SDEViation CALCulate:AVERage:COUNt VOLTage:PEAK:MAXimum VOLTage:PEAK:MINimum VOLTage:PTPeak VOLTage:AC:PTPeak CURRent:PEAK:MAXimum CURRent:PEAK:MINimum CURRent:PTPeak CURRent:AC:PTPeak VOLTage:AC RESistance FRESistance	This is a required parameter

Remarks

- This command applies only to "WINDow2" (or "WIND2"), the second display line, not "WINDow1".

- This command determines the measurement or math function to be displayed on the second display ("WINDow2"), provided no message (which has higher priority) is being displayed.

- Second display measurement or math functions are dependent on the primary measurement being made, and on certain conditions being enabled. The following table shows the required conditions for each *<feed>* selection. If two conditions are shown, both must be met before this command is sent.

<feed> Selection	Setup Requirements	
CALCulate:AVERage[:AVERage]	CALC ON	CALC:FUNC AVER
CALCulate:AVERage:MINimum	CALC ON	CALC:FUNC AVER
CALCulate:AVERage:MAXimum	CALC ON	CALC:FUNC AVER
CALCulate:AVERage:SDEViation	CALC ON	CALC:FUNC AVER
CALCulate:AVERage:COUNt	CALC ON	CALC:FUNC AVER
VOLTage:PEAK:MAXimum	FUNC "VOLT:DC"	VOLT:PEAK:STAT ON
VOLTage:PEAK:MINimum	FUNC "VOLT:DC"	VOLT:PEAK:STAT ON
VOLTage:PTPeak	FUNC "VOLT:DC"	VOLT:PEAK:STAT ON
VOLTage:AC:PTPeak	FUNC "VOLT:AC"	VOLT:AC:PEAK:STAT ON
CURRent:PEAK:MAXimum	FUNC "CURR:DC"	CURR:PEAK:STAT ON
CURRent:PEAK:MINimum	FUNC "CURR:DC"	CURR:PEAK:STAT ON
CURRent:PTPeak	FUNC	CURR:PEAK:STAT ON

	"CURR:DC"	
CURRent:AC:PTPeak	FUNC "CURR:AC"	CURR:AC:PEAK:STAT ON
VOLTage:AC	FUNC "FREQ" *or* FUNC "PER"	
RESistance	FUNC "TEMP"	TEMP:TRAN:TYPE:THER *or* TEMP:TRAN:TYPE:RTD
FRESistance	FUNC "TEMP"	TEMP:TRAN:TYPE:FTH *or* TEMP:TRAN:TYPE:FRTD

- If the DISPlay:WINDow2:TEXT:FEED command is sent and the setup requirements are not met, a settings conflict error is generated. (The requirements must be met *before* this command is sent.)

- The DISPlay:WINDow2:TEXT[:DATA] command overrides any *<feed>* set with the DISPlay:WINDow2:TEXT:FEED command. That is, the text string is displayed, overriding the measurement or math function in the second display. The DISPlay:WINDow2:TEXT:CLEar command clears the data and allows the *<feed>* to reappear.

- If any setup requirement is changed, it will reset the *<feed>* selection to the null string (""). For example, CALC OFF will reset a *<feed>* of CALC:AVER. to "".

- The *<feed>* selection is not saved as part of the instrument state. It is cleared to "" when power is cycled, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

The query returns the currently selected <feed> parameter as a quoted ASCII string.

Examples

The following command displays ac voltage on the second display ("WINDow2"), provided either frequency or period is the current primary measurement function.

```
DISP:WIND2:TEXT:FEED "VOLT:AC"
```

The following query returns the current *<feed>* selection.

```
DISP:WIND2:TEXT:FEED?
```

Typical Response: "VOLT:AC"

See Also

DISPlay[:WINDow[1|2]]:TEXT[:DATA]

DISPlay[:WINDow[1|2]]:TEXT:CLEar

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

FETCh Subsystem Introduction

Command Summary

FETCh?

FETCh:CURRent:AC:PTPeak?

FETCh:CURRent[:DC]:PEAK:MAXimum?

FETCh:CURRent[:DC]:PEAK:MINmum?

FETCh:CURRent[:DC]:PTPeak?

FETCh:VOLTage:AC:PTPeak?

FETCh:VOLTage[:DC]:PEAK:MAXimum?

FETCh:VOLTage[:DC]:PEAK:MINmum?

FETCh:VOLTage[:DC]:PTPeak?

FETCh?

Syntax

FETCh?

Description

This command transfers readings to the instrument's output buffer where you can read them into your computer. The readings are not erased from memory when you read them. You can send the command multiple times to retrieve the same data in reading memory.

Remarks

- The FETCh? command will wait until the measurement is complete to terminate.

- The 34410A provides volatile reading memory for up to 50,000 readings. The 34411A/L4411A provides volatile reading memory for up to 1,000,000 readings. If memory overflows, a status register bit is set and new readings will overwrite the first (oldest) readings stored. The most recent readings are always preserved.

- You can use the R? command to obtain whatever readings are present (with no wait), but the readings will be erased as you read them. The DATA commands allow you to access a specific reading.

- The instrument clears all readings from volatile memory after a Factory Reset (*RST command), after an Instrument Preset (SYSTem:PRESet command), when mainframe power is cycled, when the configuration is changed (see CONFigure), or on an INITiate command.

Return Format

The command transfers all readings from memory but does not erase them. The readings are returned in ASCII format.

Example

The following program segment shows how to use the FETCh? command with the CONFigure and INITiate commands. The INITiate command places the instrument in the "wait-for-trigger" state, triggers a measurement when the rear-panel *Ext Trig Input* line is pulsed (low by default), and then sends the readings to memory. The FETCh? command transfers the readings from memory to the instrument's output buffer.

```
CONF:VOLT:DC 10,0.003
TRIG:SOUR EXT
INIT
FETC?
```

Typical Response: +4.27150000E-03

See Also

[INITiate[:IMMediate]](#)

FETCh:CURRent:AC:PTPeak?

Syntax

FETCh:CURRent:AC:PTPeak?

Description

This command returns the difference between the highest and lowest transient current levels detected in the most recent ac current measurement.

Remarks

- To obtain a stable measurement, send the [FETCh?](#) command first to ensure the measurement is complete.

- You must enable ac current measurements before you can use this command.

- Before sending this command, turn on the peak measurement state with the [\[SENSe:\]CURRent:AC:PEAK:STATe](#) command.

- This command will return "not a number" (`+9.91000000E+37`) if no valid measurement is available and there is no valid measurement in progress.

Return Format

The command returns the peak-to-peak current level detected in the form:
`+4.27150000E-03`.

Example

In the example below, the first command enables peak measurements, and the second returns the peak-to-peak value:

```
CURR:AC:PEAK:STAT ON FETC:CURR:AC:PTP?
```

Typical Response: +4.27150000E-03

See Also

[SENSe:]CURRent:AC:PEAK:STATe

FETCh:CURRent[:DC]:PEAK:MAXimum?

Syntax

FETCh:CURRent[:DC]:PEAK:MAXimum?

Description

This command returns the highest transient current level detected in the most recent dc current measurement.

Remarks

- To obtain a stable measurement, send the FETCh? command first to ensure the measurement is complete.

- You must enable dc current measurements before you can use this command.

- Before sending this command, turn on the peak measurement state with the [SENSe:]CURRent[:DC]:PEAK:STATe command.

- This command will return "not a number" (+9.91000000E+37) if no valid measurement is available and there is no valid measurement in progress.

Return Format

The command returns the maximum transient current level detected in the form: `+4.27150000E-03`.

Example

In the example below, the first command enables peak measurements, and the second returns the maximum:

```
CURR[:DC]:PEAK:STAT ON  FETC:CURR:DC:PEAK:MAX?
```

Typical Response: +4.27150000E-03

See Also

FETCh:CURRent[:DC]:PEAK:MINmum?

FETCh:CURRent[:DC]:PTPeak?

[SENSe:]CURRent[:DC]:PEAK:STATe

FETCh:CURRent[:DC]:PEAK:MINimum?

Syntax

FETCh:CURRent[:DC]:PEAK:MINimum?

Description

This command returns the lowest transient current level detected in the most recent dc current measurement.

Remarks

- To obtain a stable measurement, send the [FETCh?](#) command first to ensure the measurement is complete.

- You must enable dc current measurements before you can use this command.

- Before sending this command, turn on the peak measurement state with the [[SENSe:]CURRent[:DC]:PEAK:STATe](#) command.

- This command will return "not a number" (+9.91000000E+37) if no valid measurement is available and there is no valid measurement in progress.

Return Format

The command returns the minimum transient current level detected in the form: `+4.27150000E-03`.

Example

In the example below, the first command enables peak measurements, and the second returns the minimum:

```
CURR[:DC]:PEAK:STAT ON FETC:CURR:DC:PEAK:MIN?
```

Typical Response: +4.27150000E-03

See Also

FETCh:CURRent[:DC]:PEAK:MAXimum?

FETCh:CURRent[:DC]:PTPeak?

[SENSe:]CURRent[:DC]:PEAK:STATe

FETCh:CURRent[:DC]:PTPeak?

Syntax

FETCh:CURRent[:DC]:PTPeak?

Description

This command returns the difference between the highest and lowest transient current levels detected in the most recent dc current measurement.

Remarks

- To obtain a stable measurement, send the [FETCh?](#) command first to ensure the measurement is complete.

- You must enable dc current measurements before you can use this command.

- Before sending this command, turn on the peak measurement state with the [\[SENSe:\]CURRent\[:DC\]:PEAK:STATe](#) command.

- This command will return "not a number" (+9.91000000E+37) if no valid measurement is available and there is no valid measurement in progress.

Return Format

The command returns the peak-to-peak current level detected in the form:
`+4.27150000E-03.`

Example

In the example below, the first command enables peak measurements, and the second returns the peak-to-peak value:

```
CURR[:DC]:PEAK:STAT ON FETC:CURR:DC:PTP?
```

Typical Response: +4.27150000E-03

See Also

[FETCh:CURRent[:DC]:PEAK:MAXimum?](#)

[FETCh:CURRent[:DC]:PEAK:MINmum?](#)

[[SENSe:]CURRent[:DC]:PEAK:STATe](#)

FETCh:VOLTage:AC:PTPeak?

FETCh:VOLTage:AC:PTPeak?

Syntax

FETCh:VOLTage:AC:PTPeak?

Description

This command returns the difference between the highest and lowest transient voltage levels detected in the most recent ac voltage measurement.

Remarks

- To obtain a stable measurement, send the [FETCh?](#) command first to ensure the measurement is complete.

- You must enable ac voltage measurements before you can use this command.

- Before sending this command, turn on the peak measurement state with the [[SENSe:]VOLTage:AC:PEAK:STATe](#) command.

- This command will return "not a number" (`+9.91000000E+37`) if no valid measurement is available and there is no valid measurement in progress.

Return Format

The command returns the peak-to-peak voltage level detected in the form:
`+4.27150000E-03.`

Example

In the example below, the first command enables peak measurements, and the second returns the peak-to-peak value:

```
VOLT:AC:PEAK:STAT ON FETC:VOLT:AC:PTP?
```

Typical Response: +4.27150000E-03

See Also

[SENSe:]VOLTage:AC:PEAK:STATe

FETCh:VOLTage[:DC]:PEAK:MAXimum?

Syntax

FETCh:VOLTage[:DC]:PEAK:MAXimum?

Description

This command returns the highest transient voltage level detected in the most recent dc voltage measurement.

Remarks

- To obtain a stable measurement, send the [FETCh?](#) command first to ensure the measurement is complete.

- You must enable dc voltage measurements before you can use this command.

- Before sending this command, turn on the peak measurement state with the [\[SENSe:\]VOLTage\[:DC\]:PEAK:STATe](#) command.

- This command will return "not a number" (`+9.91000000E+37`) if no valid measurement is available and there is no valid measurement in progress.

Return Format

The command returns the maximum transient voltage level detected in the form: `+4.27150000E-03`.

Example

In the example below, the first command enables peak measurements, and the second returns the maximum:

```
VOLT:DC]:PEAK:STAT ON FETC:VOLT:DC:PEAK:MAX?
```

Typical Response: +4.27150000E-03

See Also

FETCh:VOLTage[:DC]:PEAK:MINmum?

FETCh:VOLTage[:DC]:PTPeak?

[SENSe:]VOLTage[:DC]:PEAK:STATe

FETCh:VOLTage[:DC]:PEAK:MINimum?

Syntax

FETCh:VOLTage[:DC]:PEAK:MINimum?

Description

This command returns the lowest transient voltage level detected in the most recent dc voltage measurement.

Remarks

- To obtain a stable measurement, send the FETCh? command first to ensure the measurement is complete.

- You must enable dc voltage measurements before you can use this command.

- Before sending this command, turn on the peak measurement state with the [SENSe:]VOLTage[:DC]:PEAK:STATe command.

- This command will return "not a number" (+9.91000000E+37) if no valid measurement is available and there is no valid measurement in progress.

Return Format

The command returns the minimum transient voltage level detected in the form: `+4.27150000E-03`.

Example

In the example below, the first command enables peak measurements, and the second returns the minimum:

```
VOLT[:DC]:PEAK:STAT ON FETC:VOLT:DC:PEAK:MIN?
```

Typical Response: +4.27150000E-03

See Also

[FETCh:VOLTage[:DC]:PEAK:MAXimum?](#)

[FETCh:VOLTage[:DC]:PTPeak?](#)

[[SENSe:]VOLTage[:DC]:PEAK:STATe](#)

FETCh:VOLTage[:DC]:PTPeak?

Syntax

FETCh:VOLTage[:DC]:PTPeak?

Description

This command returns the difference between the highest and lowest transient voltage levels detected in the most recent dc voltage measurement.

Remarks

- To obtain a stable measurement, send the [FETCh?](#) command first to ensure the measurement is complete.

- You must enable dc voltage measurements before you can use this command.

- Before sending this command, turn on the peak measurement state with the [[SENSe:]VOLTage[:DC]:PEAK:STATe](#) command.

- This command will return "not a number" (`+9.91000000E+37`) if no valid measurement is available and there is no valid measurement in progress.

Return Format

The command returns the peak-to-peak voltage level detected in the form:
`+4.27150000E-03.`

Example

In the example below, the first command enables peak measurements, and the second returns the peak-to-peak value:

```
VOLT[:DC]:PEAK:STAT ON  FETC:VOLT:DC:PTP?
```

Typical Response: +4.27150000E-03

See Also

FETCh:VOLTage[:DC]:PEAK:MAXimum?

FETCh:VOLTage[:DC]:PEAK:MINmum?

[SENSe:]VOLTage[:DC]:PEAK:STATe

FORMat Subsystem Introduction

Command Summary

FORMat:BORDer

FORMat:BORDer?

FORMat[:DATA]

FORMat[:DATA]?

FORMat:BORDer

Syntax

FORMat:BORDer {NORMal|SWAPped}

FORMat:BORDer?

Description

Used for binary block transfers only. This command selects the byte order for binary block transfers using the DATA:REMove? and [R?](R?) commands.

Remarks

- In the *NORMal* byte order (default) the most-significant byte (MSB) of each data point is assumed first.

- In the *SWAPped* byte order the least-significant byte (LSB) of each data point is assumed first. Most PCs use the "swapped" byte order.

- The byte order setting is stored in non-volatile memory and does not change when power has been off. The default value will be restored after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns "NORM" or "SWAP".

Examples

The following command enables the "swapped" byte order mode.

```
FORM:BORD SWAP
```

The following query returns the current byte order setting.

```
FORM:BORD?
```

Typical Response: `SWAP`

See Also

[DATA:REMove?](#)

[R?](#)

FORMat[:DATA]

Syntax

FORMat[:DATA] {ASCii | REAL} [, *<length>*]

FORMat[:DATA]?

Description

Specifies the data format to be either ASCII or REAL. This command only affects the data format of the DATA:REMove? and R? commands.

Parameters

Name	Type	Range of Values	Default Value
<length>	Numeric	ASCii: "9" REAL: "32" or "64"	ASCii: "9" REAL: "64"

Remarks

- If ASCii is specified, numeric data is transferred as ASCii characters. The numbers are separated by commas as specified in IEEE 488.2. The *<length>* parameter is optional, but "9" is the default and only allowed value, and the instrument returns 9 significant digits (for example: +4.57553816E-05).

- If REAL is specified, numeric data is transferred as REAL binary data in IEEE 488.2 definite-length block format. The *<length>* parameter is optional, but "64" is the default and "32" is also valid. The byte order is controlled by the FORMat:BORDer command.

Return Format

The query command returns "ASC,9", "REAL,32", or "REAL,64".

Examples

Either of the following commands specifies the data format to be 64-bit REAL.

```
FORM:DATA REAL,64
```

or

```
FORM:DATA REAL
```

The following query returns the data format.

```
FORM:DATA?
```

Typical Response: `"REAL,64"`

See Also

[DATA:REMove?](#)

[FORMat:BORDer](#)

[R?](#)

IEEE-488 Common Commands Introduction

Command Summary

[*CLS](#)

[*ESE](#)

[*ESE?](#)

[*ESR?](#)

[*IDN?](#)

[*LRN?](#)

[*OPC](#)

[*OPC?](#)

[*PSC](#)

[*PSC?](#)

[*RCL](#)

[*RST](#)

[*SAV](#)

[*SRE](#)

[*SRE?](#)

[*STB?](#)

[*TRG](#)

[*TST?](#)

[*WAI](#)

*CLS

Syntax

*CLS

Description

This command clears the event registers in all register groups. This command also clears the Error queue.

Example

The following command clears the event register bits.

```
*CLS
```

See Also

[*ESR?](#)

*ESE

Syntax

*ESE *\<enable_value>*

*ESE?

Description

This command 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.

NOTE	For more information on the SCPI Status System for the Agilent 34410A/11A/L4411A, see [Status System Introduction](#).

Parameters

Name	Type	Range of Values	Default Value
<enable_value>	Numeric	A decimal value which corresponds to the binary-weighted sum of the bits in the register (see table below).	This is a required parameter

Remarks

- The following table lists the bit definitions for the 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	The instrument tried to read the output buffer but it was empty. Or, a new command line was received before a previous query has been read. Or, both the input and output buffers are full.
3 Device-Specific Error	8	A device-specific error, including a self-test error or calibration error, occurred (an error in the -300 range or any positive error has been generated). For a complete listing of the error messages, see SCPI Error Messages.
4 Execution Error	16	An execution error occurred (an error in the -200 range has been generated).
5 Command Error	32	A command syntax error occurred (an error in the -100 range has been generated).
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.

- Use the <enable_value> parameter to specify which bits will be enabled. The decimal value specified corresponds to the binary-weighted sum of the bits you wish to enable in the register. For example, to enable bit 2 (decimal value = 4), bit 3 (decimal value = 8), and bit 7 (decimal value = 128), the corresponding decimal value would be 140 (4 + 8 + 128).

- You can use the *PSC command to control whether the Standard Event enable register is cleared at power on.

- 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 does not clear the bits in the Status Byte enable register.

Return Format

The query 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 3 (decimal value = 8) and bit 7 (decimal value = 128) are enabled, the query command will return "`+136`".

Examples

The following 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 high).

```
*ESE 16
```

The following query returns which bits are enabled in the register.

```
*ESE?
```

Typical Response: +16

See Also

[*ESR?](#)

[*PSC](#)

*ESR?

Syntax

*ESR?

Description

This command queries the [event register](#) for the *Standard Event Register* group. This is a read-only register and the bits are not cleared when you read the register.

| NOTE | For more information on the SCPI Status System for the Agilent 34410A/11A/L4411A, see [Status System Introduction](#). |

Remarks

- The following table lists the bit definitions for the 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	The instrument tried to read the output buffer but it was empty. Or, a new command line was received before a previous query has been read. Or, both the input and output buffers are full.
3 Device-Specific Error	8	A device-specific error, including a self-test error or calibration error, occurred (an error in the -300 range or any positive error has been generated). For a complete listing of the error messages, see SCPI Error Messages.
4 Execution Error	16	An execution error occurred (an error in the -200 range has been generated).
5 Command Error	32	A command syntax error occurred (an error in the -100 range has been generated).
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.

- In order to be reported to the Standard Event Register, the corresponding bits in the event register must be enabled using the *ESE command.

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

Return Format

The command reads the event register and returns a decimal value which corresponds to the binary-weighted sum of all bits set in the register (see table above). For example, if bit 2 (decimal value = 4) and bit 4 (decimal value = 16) are set (and the corresponding bits are enabled), this command will return "+20".

Example

The following command reads the event register (bits 3 and 4 are set).

```
*ESR?
```

Typical Response: +24

See Also

[*ESE](#)

[*CLS](#)

*IDN?

Syntax

*IDN?

Description

This command reads the instrument's (mainframe) identification string which contains four comma-separated fields. The first field is the manufacturer's name, the second field is the instrument model number, the third field is the serial number, and the fourth field is a revision code which contains four numbers separated by dashes.

Return Format

The command returns a string with the following format:

AGILENT TECHNOLOGIES,34410A,<Serial Number>,**f.ff-b.bb-aa-p**

AGILENT TECHNOLOGIES,34411A,<Serial Number>,**f.ff-b.bb-aa-p**

AGILENT TECHNOLOGIES,L4411A,<Serial Number>,**f.ff-b.bb-aa-p**

f.ff = Firmware revision number

b.bb = Boot kernel revision number

aa = ASIC revision number

p = Printed circuit board revision number

Example

The following query returns the instrument's identification string.

```
*IDN?
```

Typical Response: AGILENT TECHNOLOGIES,34410A,MY12345678,1.00-1.00-01-1

See Also

[*TST?](#)

*LRN?

Syntax

*LRN?

Description

This command returns the *learn string,* which is an ASCII string of SCPI commands. This string includes all of the commands required to put the instrument into its current state.

Return Format

The command returns an ASCII string of SCPI commands, delimited with semicolons (";") between the commands.

Example

The following query returns the learn string.

```
*LRN?
```

Typical Response: A *very long string of SCPI commands.*

See Also

*RCL

*SAV

*OPC

Syntax

*OPC

Description

This command sets the "Operation Complete" bit (bit 0) in the Standard Event register at the completion of the current operation.

> **NOTE** For more information on the SCPI Status System for the Agilent 34410A/11A/L4411A, see Status System Introduction.

Remarks

- The purpose of this command is to synchronize your application with the instrument.

- Note the difference between the *OPC command and the [*OPC?](*OPC?) query command. The latter returns "1" to the output buffer at the completion of the current operation.

Example

The following command sets the "Operation Complete" bit.

```
*OPC
```

See Also

[*OPC?](#)

*OPC?

Syntax

*OPC?

Description

This command returns "1" to the output buffer at the completion of the current operation.

| NOTE | For more information on the SCPI Status System for the Agilent 34410A/11A/L4411A, see [Status System Introduction](#). |

Remarks

- The purpose of this command is to synchronize your application with the instrument.

- Note the difference between the *OPC? command and the [*OPC](#) command. The latter sets the "Operation Complete" bit (bit 0) in the Standard Event register at the completion of the current operation.

Return Format

The command returns "1" to the output buffer.

Example

The following command sends "1" to the output buffer.

```
*OPC?
```

See Also

[*OPC](#)

*PSC

Syntax

*PSC {0|1}

*PSC?

Description

Power-On Status Clear. This 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. With *PSC 1 specified, these registers are cleared at power on. The following registers are affected:

- Questionable Data Register:

  STATus:QUEStionable:ENABle

- Standard Operation Register:

  STATus:OPERation:ENABle

- Status Byte Register:

  *SRE (Service Request Enable)

- Standard Event Register:

  *ESE (Event Status Enable)

> **NOTE**
>
> The *PSC command does not affect the clearing of the condition or event registers, just the enable registers. For more information on the SCPI Status System for the Agilent 34410A/11A/L4411A, see Status System Introduction.

Return Format

The query command returns "0" (do not clear at power on) or "1" (clear at power on).

Examples

The following command disables the power-on clearing of the affected registers.

```
*PSC 0
```

The following query returns the power-on status clear setting.

```
*PSC?
```

Typical Response: 0

See Also

[*SRE](#)

[*STB?](#)

*RCL

Syntax

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

Description

This command recalls the instrument state stored in the specified storage location. You cannot recall the instrument state from a storage location that is empty or was deleted. When shipped from the factory, storage locations 1 through 4 are empty (location 0 has the power-on state).

Use the *SAV command to store the current instrument state.

Remarks

- The instrument has five storage locations in non-volatile 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 or specifically deleted.

Example

The following command recalls the instrument state previously stored in location 1.

```
*RCL 1
```

See Also

[*SAV](#)

[MEMory:STATe:DELete](#)

*RST

Syntax

*RST

Description

This command resets the multimeter to the Factory configuration. See [Factory Reset State](#) for a complete listing of the instrument's Factory configuration.

Remarks

- This command does not affect any previously-stored instrument states (see [*SAV](#) command).

Example

The following command resets the instrument.

```
*RST
```

See Also

[SYSTem:PRESet](#)

*SAV

Syntax

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

Description

This command stores (saves) the current instrument state in the specified storage location. Any state previously stored in the same location is overwritten (no error is generated).

Use the *RCL command to recall a stored instrument state.

Remarks

- The instrument has five storage locations in non-volatile memory to store instrument states. The instrument uses location 0 to automatically hold the state of the instrument at power down. You can store the instrument state in location 1, 2, 3, or 4, but you can only recall a state from a location that contains a previously stored state. You can use location 0 to store a fifth instrument state, but keep in mind that location 0 is automatically overwritten when power is cycled.

- When shipped from the factory, storage locations 1 through 4 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.

- You can assign a user-defined name to each of locations 0 through 4. See the MEMory:NAME command for details.

- A Factory Reset (*RST command) does not affect the configurations stored in memory. Once a state is stored, it remains until it is overwritten or specifically deleted.

Example

The following command stores the current instrument state in location 1.

```
*SAV 1
```

See Also

[*RCL](#)

[MEMory:STATe:DELete](#)

*SRE

Syntax

*SRE *<enable_value>*

*SRE?

Description

This 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.

> **NOTE** For more information on the SCPI Status System for the Agilent 34410A/11A/L4411A, see [Status System Introduction](#).

Parameters

Name	Type	Range of Values	Default Value
<enable_value>	Numeric	A decimal value which corresponds to the binary-weighted sum of the bits in the register (see table below).	This is a required parameter

Remarks

- The following table lists the bit definitions for the Status Byte Register.

Bit Number	Decimal Value	Definition
0 Not Used	1	Always zero.
1 Not Used	2	Always zero.
2 Error Queue	4	One or more errors have been stored in the Error Queue. Use the SYSTem:ERRor? command 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, see STATus:QUEStionable:ENABle command).
4 Message Available	16	Data is available in the instrument's output buffer.
5 Standard Event Summary	32	One or more bits are set in the Standard Event Register (bits must be enabled, see *ESE command).
6 Master 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 Standard Operation Summary	128	One or more bits are set in the Standard Operation Register (bits must be enabled, see STATus:OPERation:ENABle command).

- Use the <enable_value> parameter to specify which bits will be enabled. The decimal value specified corresponds to the binary-weighted sum of the bits you wish to enable in the register. For example, to enable bit 3 (decimal value = 8) and bit 5 (decimal value = 32), the corresponding decimal value would be 40 (8 + 32).

- 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.

Return Format

The query 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 3 (decimal value = 8) and bit 5 (decimal value = 32) are enabled, the query command will return "+40".

Examples

The following command enables bit 4 (decimal value = 16) in the enable register.

```
*SRE 16
```

The following query returns which bits are enabled in the register.

```
*SRE?
```

Typical Response: +16

See Also

[*STB?](#)

*STB?

Syntax

*STB?

Description

This command queries 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. This is a read-only register and the bits are not cleared when you read the register.

| NOTE | For more information on the SCPI Status System for the Agilent 34410A/11A/L4411A, see [Status System Introduction](#). |

Remarks

- The following table lists the bit definitions for the Status Byte Register.

Bit Number	Decimal Value	Definition
0 Not used	1	Always zero.
1 Not Used	2	Always zero.
2 Error Queue	4	One or more errors have been stored in the Error Queue. Use the SYSTem:ERRor? command 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, see STATus:QUEStionable:ENABle command).
4 Message Available	16	Data is available in the instrument's output buffer.
5 Standard Event Summary	32	One or more bits are set in the Standard Event Register (bits must be enabled, see *ESE command).
6 Master 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 Standard Operation Summary	128	One or more bits are set in the Standard Operation Register (bits must be enabled, see STATus:OPERation:ENABle command).

- This command returns the same results as a Serial Poll but the "Master Summary" bit (bit 6) is *not* cleared if a Serial Poll has occurred.

- A Factory Reset (*RST command) or power-on cycle will clear all bits in the condition register.

Return Format

The command reads the condition register and returns a decimal value which corresponds to the binary-weighted sum of all bits set in the register (see table above). For example, if bit 3 (decimal value = 8 and bit 5 (decimal value = 32) are set (and the corresponding bits are enabled), this command will return "+40".

Example

The following command reads the condition register (bits 3 and 5 are set).

```
*STB?
```

Typical Response: +40

See Also

*PSC

*SRE

*TRG

Syntax

*TRG

Description

This command 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 command. The *TRG command will not be accepted unless the multimeter is in the "wait-for-trigger" state.

Example

The following command triggers the instrument.

```
TRIG:SOUR BUS INIT
*TRG
```

See Also

TRIGger:SOURce

*TST?

Syntax

*TST?

Description

This command performs a complete self-test of the instrument and returns a pass/fail indication. The self-test runs a series of tests and will take several seconds to complete. If all tests pass, you can have a high confidence that the instrument is operational.

Remarks

- The 34410A/11A/L4411A self-test takes over five seconds to complete. When sending the *TST? command from the Agilent Connection Expert 'Interactive IO' window or from the Web-based 'SCPI Command Interface' window, it may be necessary to increase the timeout period to allow the command to complete without error.

- 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 SCPI Error Messages.

- If one or more tests fail, see the *Agilent 34410A/11A/L4411A Service Guide* for instructions on obtaining service.

- Following the *TST? command, the instrument issues a Factory Reset (*RST command).

Return Format

The command returns "+0" (all tests passed) or "+1" (one or more tests failed).

Example

The following command performs a self-test and returns a pass/fail indication.

```
*TST?
```

Typical Response: +0

See Also

[*IDN?](#)

*WAI

Syntax

```
*WAI
```

Description

This command configures the instrument's output buffer to wait for all pending operations to complete before executing any additional commands over the interface.

Remarks

Function and range changes are considered pending operations. Therefore, *WAI will cause these changes to occur and complete.

Example

The following command waits until all pending operations complete.

```
*WAI
```

See Also

[*OPC](#)

MEASure Subsystem Introduction

The MEASure? command provides the easiest way to program the instrument for measurements. However, this command does not offer much flexibility. When you execute this command, the instrument uses default values for the requested measurement configuration and immediately performs the measurement. You cannot change any measurement attributes (other than function, range, and resolution) before the measurement is taken. The results are sent directly to the instrument's output buffer.

NOTE Sending MEASure? is functionally the same as sending CONFigure followed immediately by a READ? command.

Command Summary

[MEASure:CAPacitance?](#)

[MEASure:CONTinuity?](#)

[MEASure:CURRent:AC?](#)

[MEASure:CURRent[:DC]?](#)

[MEASure:DIODe?](#)

[MEASure:FREQuency?](#)

[MEASure:FRESistance?](#)

[MEASure:PERiod?](#)

[MEASure:RESistance?](#)

[MEASure:TEMPerature?](#)

[MEASure[:VOLTage]:AC?](#)

[MEASure[:VOLTage][:DC]?](#)

Default Settings for the MEASure? Command

With the MEASure? command, you can select the function, range, and resolution all in one command. All other measurement parameters are set to their default values as shown below.

Measurement Parameter:	CONFigure Setting:
AC Filter	20 Hz (medium filter)
Autozero	OFF if resolution setting results in NPLC < 1 ON if resolution setting results in NPLC ≥ 1
Input Impedance	OFF (fixed at 10 MΩ for all dc voltage ranges)
Offset Compensation	OFF (for 2-wire and 4-wire resistance measurements)
Samples per Trigger	1 sample
Sample Source	AUTO
Trigger Count	1 trigger
Trigger Delay	Automatic delay
Trigger Source	Immediate
Trig Slope	NEG
Math Functions	OFF
Null State	OFF

NOTE
The AC Filter, Autozero, and Null State parameters can be set individually for each applicable measurement function. However, in each case, the defaults are as listed in the table above. Input Impedance applies only to dc voltage measurements.

Using the MEASure? Command

The following command shows how to use the MEASure? command to make a measurement. This example configures the instrument for dc voltage measurements, internally triggers the instrument to take a reading, and then transfers the reading to the instrument output buffer. The default range (autorange) and resolution (1 PLC) are used for the measurement.

```
MEAS:VOLT:DC?
```

Typical Response: +4.23450000E-03

The following command configures the instrument for 2-wire resistance measurements, triggers the meter to take a reading, and then transfers the reading to the instrument output buffer. The 1 kΩ range is selected with 0.1 Ω resolution.

```
MEAS:RES? 1000,0.1
```

Typical Response: +3.27150000E+02

MEASure:CAPacitance?

Syntax

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

Description

First, this command resets all capacitance measurement parameters and trigger parameters to their [default values](). Then, it configures the meter for capacitance measurements and immediately triggers a measurement. The results are sent directly to the instrument output buffer.

Parameters

Name	Type	Range of Values	Default Value
<range>	Numeric	Desired range in F (farads): 1 nF (MIN) 10 nF 100 nF 1 µF 10 µF (MAX) AUTO (autorange)	AUTO
<resolution>	Numeric	Desired resolution in F (farads).	Fixed at 4½ digits.

Remarks

- The *<resolution>* parameter is optional, and is in fact ignored. The resolution is actually fixed at 4½ digits.

- 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. For fastest measurements, use manual ranging on each measurement (some additional time is required for autoranging since the instrument has to make a range selection).

- If you select autoranging (by specifying "AUTO" or "DEF"), an error will be generated if you specify a discrete value for the <resolution> parameter. When autoranging is combined with a discrete resolution, the instrument cannot accurately resolve the integration time (especially if the input signal is continuously changing). If your application requires autoranging, be sure to specify "DEF" for the <resolution> parameter or omit the parameter from the command.

- 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*: "OVLD" from the front panel or "+9.9E+37" from the remote interface.

Return Format

The command returns a single reading.

Examples

The following command configures the instrument for capacitance measurements, triggers the meter to take a reading, and then transfers the reading to the instrument output buffer. The default range (AUTO) and resolution (4½ digits) are used for the measurement.

```
MEAS:CAP?
```

Typical Response: +0.04530000E-06

See Also

[CONFigure?](#)

[FETCh?](#)

[READ?](#)

MEASure:CONTinuity?

Syntax

MEASure:CONTinuity?

Description

First, this command resets all continuity measurement parameters and trigger parameters to their [default values](). Then it configures the meter for continuity tests, and immediately triggers the test. Continuity is a special type of fixed-range 2-wire resistance measurement. The results are sent directly to the instrument output buffer.

Remarks

- The range and resolution are *fixed* for continuity tests. The range is 1 kΩ (a 2-wire resistance measurement).

- The meter beeps (even if beep is disabled) for each measurement that is less than or equal to the *continuity threshold* (≤10 Ω), and the actual resistance reading is displayed on the front panel.

- From 10 Ω to 1.2 kΩ the meter displays the actual resistance reading with no beep.

- If the reading exceeds 1.2 kΩ, the meter displays "OPEN" on the front panel (no beep).

- The MEASure:CONTinuity? command returns the measured resistance, regardless of its value.

- Either the *RST command or the Instrument Preset (the SYSTem:PRESet command) will set all measurement parameters to their factory settings, clear reading memory, and clear all stored statistical data.

Return Format

The command returns a single reading.

Examples

The following command configures the instrument for continuity measurements, places the instrument in the "wait-for-trigger" state, triggers a measurement, and then sends the reading to memory and the instrument output buffer.

```
MEAS:CONT?
```

Typical Response: +1.32130000E-02

See Also

[CONFigure?](#)

[FETCh?](#)

[READ?](#)

MEASure:CURRent:AC?

Syntax

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

Description

First, this command resets all ac current measurement parameters and trigger parameters to their [default values](). Then, it configures the meter for ac current measurements and immediately triggers a measurement. The results are sent directly to the instrument output buffer.

Parameters

Name	Type	Range of Values	Default Value
<range>	Numeric	Desired range in amps: 100 µA (MIN) 1 mA 10 mA 100 mA 1 A 3 A (MAX) AUTO (autorange)	AUTO (autorange)
<resolution>	Numeric	Desired resolution in amps.	Fixed at 6½ digits.

Remarks

- The *<resolution>* parameter is optional, and is in fact ignored. The resolution is actually fixed at 6½ digits.

- 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 fastest measurements, use manual ranging on each measurement (some additional time is required for autoranging since the instrument has to make a range selection).

- If you select autoranging (by specifying "AUTO" or "DEF"), an error will be generated if you specify a discrete value for the <resolution> parameter. When autoranging is combined with a discrete resolution, the instrument cannot accurately resolve the integration time (especially if the input signal is continuously changing). If your application requires autoranging, be sure to specify "DEF" for the <resolution> parameter or omit the parameter from the command.

- 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*: "OVLD" from the front panel or "+9.9E+37" from the remote interface.

- For ac measurements, the resolution is fixed at 6½ digits. To control the reading rate for ac measurements, change the trigger delay, change the ac filter bandwidth, or use the SAMPle:SOURce command and set the source to TIMer.

Return Format

The command returns a single reading.

Examples

The following command configures the instrument for ac current measurements, triggers the meter to take a reading, and then transfers the reading to the instrument output buffer. The default range (autorange) and resolution (fixed at 6½ digits) are used for the measurement.

```
MEAS:CURR:AC?
```

Typical Response: +8.54530000E−02

See Also

[CONFigure?](#)

[FETCh?](#)

[READ?](#)

MEASure:CURRent[:DC]?

Syntax

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

Description

First, this command resets all dc current measurement parameters and trigger parameters to their [default values](). Then, it configures the meter for dc current measurements and immediately triggers a measurement. The results are sent directly to the instrument output buffer.

Parameters

Name	Type	Range of Values	Default Value
<range>	Numeric	Desired range in amps: 100 µA (MIN) 1 mA 10 mA 100 mA 1 A 3 A (MAX) AUTO (autorange)	AUTO (autorange)
<resolution>	Numeric	Desired resolution in amps (see Resolution Table or Range, Resolution, and NPLC for more information).	0.3 ppm x *<range>* (1 PLC)

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).

- If you select autoranging (by specifying "AUTO" or "DEF"), an error will be generated if you specify a discrete value for the <resolution> parameter. When autoranging is combined with a discrete resolution, the instrument cannot accurately resolve the integration time (especially if the input signal is continuously changing). If your application requires autoranging, be sure to specify "DEF" for the <resolution> parameter or omit the parameter from the command.

- 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*: "±OVLD" from the front panel or "±9.9E+37" from the remote interface.

Return Format

The command returns a single reading.

Examples

The following command configures the instrument for dc current measurements, triggers the meter to take a reading, and then transfers the reading to the instrument output buffer. The default range (autorange) and resolution (1 PLC) are used for the measurement.

```
MEAS:CURR:DC?
```

Typical Response: +8.54530000E-03

The following command configures the instrument for dc current measurements, triggers the meter to take a reading, and then transfers the reading to the instrument output buffer. The 1 A range is selected with 1 mA resolution.

```
MEAS:CURR:DC? 1,0.001
```

Typical Response: +4.27150000E-02

See Also

[CONFigure?

FETCh?

READ?

MEASure:DIODe?

Syntax

MEASure:DIODe?

Description

First, this command resets all diode test parameters and trigger parameters to their default values. Then it configures the meter for diode tests, and immediately triggers the test. The results are sent directly to the instrument output buffer.

Remarks

- The range and resolution are *fixed* for diode tests: The range is 1 Vdc (with a 1 mA current source output).

- The voltage is displayed on the front panel if it is in the 0 to 1.2 volt range. The meter beeps when the signal transitions to the 0.3 to 0.8 volt threshold (unless beep is disabled). If the signal is greater than 1.2 volts, "OPEN" is displayed on the front panel.

- The MEASure:DIODe? command returns the measured voltage, regardless of its value.

Return Format

The command returns a single reading.

Examples

The following command configures the instrument for diode tests, places the instrument in the "wait-for-trigger" state, triggers a test, and then sends the reading to memory and the instrument output buffer.

```
MEAS:DIOD?
```

Typical Response: +0.65120000E-00

See Also

[CONFigure?](#)

[FETCh?](#)

[READ?](#)

MEASure:FREQuency?

Syntax

MEASure:FREQuency? [{*<range>*|MIN|MAX|DEF} [,
{*<resolution>*|MIN|MAX|DEF}]]

Description

First, this command resets all frequency measurement parameters and trigger parameters to their [default values](). Then, it configures the meter for frequency measurements and immediately triggers a measurement. The results are sent directly to the instrument output buffer.

Parameters

Name	Type	Range of Values	Default Value
<range>	Numeric	Approximate frequency of the input signal in hertz, between 3 Hz and 300 kHz. MIN = 3 Hz DEF = 20 Hz MAX = 300 kHz	20 Hz
<resolution>	Numeric	Desired resolution in hertz. MIN = 0.1 ppm x *<range>* DEF = 1 ppm x *<range>* MAX = 100 ppm x *<range>*	1 ppm x *<range>* (for default aperture = 100 ms)

Remarks

- Frequency is measured on ac voltage signals. Thus, the proper ac voltage range should be set first using the [SENSe:]FREQuency:VOLTage:RANGe[:UPPer] command. The voltage range should be 0.1 volts or greater for more accurate frequency measurements.

- The *<range>* parameter is required only to specify the measurement resolution parameter. Therefore, it is not necessary to send a new command for each new frequency to be measured.

- If the input signal voltage is greater than can be measured on the selected voltage range (manual ranging), the instrument gives an *overload indication*: "VAC OVERLOAD" from the front panel or "+9.9E+37" from the remote interface. Autoranging can be enabled for the input voltage.

- The frequency measurement does not autorange. For frequency measurements, the *range* and *resolution* parameters affect the aperture (gate time) as follows:

Resolution	Aperture
100 ppm x *<range>*	1 ms
10 ppm x *<range>*	10 ms
1 ppm x *<range>*	100 ms (default)
0.1 ppm x *<range>*	1 s

- With no signal applied "0" is returned.

Return Format

The command returns a single reading.

Examples

The following command configures the instrument for frequency measurements, triggers the meter to take a reading, and then transfers the reading to the instrument output buffer. The default range (20 Hz) and aperture (100 ms) are used for the measurement.

```
MEAS:FREQ?
```

Typical Response: +1.32130000E+03

See Also

CONFigure?

FETCh?

READ?

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

MEASure:FRESistance?

Syntax

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

Description

First, this command resets all resistance measurement parameters and trigger parameters to their [default values](). Then, it configures the meter for 4-wire resistance measurements and immediately triggers a measurement. The results are sent directly to the instrument output buffer.

Parameters

Name	Type	Range of Values	Default Value
<range>	Numeric	Desired range in ohms: 100 Ω (MIN) 1 kΩ 10 kΩ 100 kΩ 1 MΩ 10 MΩ 100 MΩ 1 GΩ (MAX) AUTO (autorange)	AUTO (autorange)
<resolution>	Numeric	Desired resolution in ohms (see Resolution Table or Range, Resolution, and NPLC for more information).	0.3 ppm x Range (1 PLC)

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).

- If you select autoranging (by specifying "AUTO" or "DEF"), an error will be generated if you specify a discrete value for the <resolution> parameter. When autoranging is combined with a discrete resolution, the instrument cannot accurately resolve the integration time (especially if the input signal is continuously changing). If your application requires autoranging, be sure to specify "DEF" for the <resolution> parameter or omit the parameter from the command.

- 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*: "OVLD" from the front panel or "+9.9E+37" from the remote interface.

- For 4-wire measurements, the instrument automatically enables the autozero function.

Return Format

The command returns a single reading.

Examples

The following command configures the instrument for 4-wire measurements, triggers the meter to take a reading, and then transfers the reading to the instrument output buffer. The default range (autorange) and resolution (1 PLC) are used for the measurement.

```
MEAS:FRES?
```

Typical Response: +1.32130000E+03

The following command configures the instrument for 4-wire resistance measurements, triggers the meter to take a reading, and then transfers the reading to the instrument output buffer. The 1 kΩ range is selected with 0.1 Ω resolution.

```
MEAS:FRES? 1000,0.1
```

Typical Response: +4.27150000E+02

See Also

[CONFigure?](#)

[FETCh?](#)

[READ?](#)

MEASure:PERiod?

Syntax

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

Description

First, this command resets all period measurement parameters and trigger parameters to their [default values](). Then, it configures the meter for period measurements and immediately triggers a measurement. The results are sent directly to the instrument output buffer.

Parameters

Name	Type	Range of Values	Default Value
<range>	Numeric	Approximate period of the input signal in seconds, between 3.336 μs and 333.33 ms. MIN = 3.336 μs DEF = 50 ms MAX = 333.33 ms	50 ms
<resolution>	Numeric	Desired resolution in seconds. MIN = 0.1 ppm x *<range>* DEF = 1 ppm x *<range>* MAX = 100 ppm x *<range>*	1 ppm x *<range>* (for default aperture = 100 ms)

Remarks

- Period is measured on ac voltage signals. Thus, the proper ac voltage range should be set first using the [SENSe:]PERiod:VOLTage:RANGe[:UPPer] command. The voltage range should be 0.1 volts or greater for more accurate period measurements.

- The *<range>* parameter is required only to specify the measurement resolution parameter. Therefore, it is not necessary to send a new command for each new period to be measured.

- If the input signal voltage is greater than can be measured on the selected voltage range (manual ranging), the instrument gives an *overload indication*: "VAC OVERLOAD" from the front panel or "+9.9E+37" from the remote interface. Autoranging can be enabled for the input voltage.

- The period measurement does not autorange. For period measurements, the range and resolution parameters affect the aperture (gate time) as follows:

Resolution	Aperture
100 ppm x *<range>*	1 ms
10 ppm x *<range>*	10 ms
1 ppm x *<range>*	100 ms (default)
0.1 ppm x *<range>*	1 s

- With no signal applied, "0" is returned.

Return Format

The command returns a single reading.

Examples

The following command configures the instrument for period measurements, triggers the meter to take a reading, and then transfers the reading to the instrument output buffer. The default range (50 ms) and aperture (100 ms) are used for the measurement.

```
MEAS:PER?
```

Typical Response: +1.32130000E-03

The following command configures the instrument for period measurements, triggers the meter to take a reading, and then transfers the reading to the instrument's output buffer.

```
MEAS:PER? 0.001,0.0000001
```

Typical Response: +4.27150000E-04

See Also

CONFigure?

FETCh?

READ?

[SENSe:]PERiod:VOLTage:RANGe[:UPPer]

MEASure:RESistance?

Syntax

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

Description

First, this command resets all resistance measurement parameters and trigger parameters to their [default values](#). Then, it configures the meter for 2-wire resistance measurements and immediately triggers a measurement. The results are sent directly to the instrument output buffer.

Parameters

Name	Type	Range of Values	Default Value
<range>	Numeric	Desired range in ohms: 100 Ω (MIN) 1 kΩ 10 kΩ 100 kΩ 1 MΩ 10 MΩ 100 MΩ 1 GΩ (MAX) AUTO (autorange)	AUTO (autorange)
<resolution>	Numeric	Desired resolution in ohms (see Resolution Table or Range, Resolution, and NPLC for more information).	0.3 ppm x Range (1 PLC)

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).

- If you select autoranging (by specifying "AUTO" or "DEF"), an error will be generated if you specify a discrete value for the <resolution> parameter. When autoranging is combined with a discrete resolution, the instrument cannot accurately resolve the integration time (especially if the input signal is continuously changing). If your application requires autoranging, be sure to specify "DEF" for the <resolution> parameter or omit the parameter from the command.

- 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*: "OVLD" from the front panel or "+9.9E+37" from the remote interface.

Return Format

The command returns a single reading.

Examples

The following command configures the instrument for 2-wire resistance measurements, triggers the meter to take a reading, and then transfers the reading to the instrument output buffer. The default range (autorange) and resolution (1 PLC) are used for the measurement.

```
MEAS:RES?
```

Typical Response: +1.32130000E+04

The following command configures the instrument for 2-wire resistance measurements, triggers the meter to take a reading, and then transfers the reading to the instrument output buffer. The 1 kΩ range is selected with 0.1 Ω resolution.

```
MEAS:RES? 1000,0.1
```

Typical Response: +4.27150000E+02

See Also

[CONFigure?](#)

[FETCh?](#)

[READ?](#)

MEASure:TEMPerature?

Syntax

MEASure:TEMPerature? [{*<probe_type>*|DEF}[,{*<type>*|DEF} [,1 [, {*<resolution>*|MIN|MAX|DEF}]]]]

Description

First, this command resets all temperature measurement parameters and trigger parameters to their [default values](). Then, it configures the meter for temperature measurements and immediately triggers a measurement. The results are sent directly to the instrument output buffer.

Parameters

Name	Type	Range of Values		Default Value
<probe_type>	Discrete	{FRTD|RTD|FTHermistor|THERmistor}		Required parameter, DEF sets FRTD
<type>	Discrete	For THER:	{2252|5000|10000}	Required parameter, DEF sets 5000 (2-wire)
		For FTH:	{2252|5000|10000}	Required parameter, DEF sets 5000 (4-wire)
		For RTD:	{85}	Required parameter, DEF sets 85 (2-wire)
		For FRTD:	{85}	Required parameter, DEF sets 85 (4-wire)
<resolution>	Numeric	Desired resolution in the currently selected units (°C, °F, or K). See Resolution Table.		0.3 ppm *<range>* (1 PLC)

Remarks

- For temperature measurements, the instrument internally selects the range—you cannot select the range to be used. The range ("1" is the only allowed value) is used only in conjunction with resolution to determine NPLC.

- The range ("1") and *<resolution>* parameters are optional. However, if you specify *<resolution>*, you *must* also specify "1" as the *implied* range parameter (see syntax above). For example:

  MEAS:TEMP? THER,5000,1,0.1

  specifies range = 1 and resolution = 0.1 degrees (°C, °F, or K, whichever is currently selected).

- To change temperature units, use the UNIT:TEMPerature command.

- For thermistor and RTD measurements, the instrument autoranges to the correct range for the transducer resistance measurement.

- For 4-wire RTD or thermistor measurements, the instrument always enables the autozero function.

Return Format

The command returns a single reading.

Examples

The following command configures the instrument for 5 kΩ thermistor measurements, triggers the meter to take a reading, and then transfers the reading to the instrument output buffer. This 2-wire measurement is made with 0.1 °C resolution (assumes default temperature units).

```
MEAS:TEMP? THER,5000,1,0.1
```

Typical Response: +2.47150000E+01

The following command configures the meter for a 2-wire RTD measurement, triggers the meter, and then transfers the reading to the instrument output buffer. The default range and resolution are used for the measurement.

```
MEAS:TEMP? RTD,85
```

Typical Response: +2.12320000E+01

See Also

[CONFigure?](#)

[FETCh?](#)

[READ?](#)

MEASure[:VOLTage]:AC?

Syntax

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

Description

First, this command resets all ac voltage measurement parameters and trigger parameters to their [default values](#). Then, it configures the meter for ac voltage measurements and immediately triggers a measurement. The results are sent directly to the instrument output buffer.

WARNING **The maximum range parameter is 1000 V, which is set by MAX. However, the SAFETY LIMIT on the front and rear HI/LO input terminals is 750 VAC (rms). The rms voltage is waveform dependent. A sine wave is limited to 750 VAC (rms), but a 1000 Vpk square wave is safe. Connections to AC MAINS are further limited to CAT II (300V). See the "Safety Information" section in the *Agilent 34410A/11A/L4411A User's Guide* for a complete discussion of the safety features, and the safe operation of this instrument.**

Parameters

Name	Type	Range of Values	Default Value
<range>	Numeric	Desired range in volts: 100 mV (MIN) 1 V 10 V 100 V 1000 V (MAX) AUTO (autorange)	AUTO (autorange)
<resolution>	Numeric	Desired resolution in volts.	Fixed at 6½ digits.

Remarks

- The *<resolution>* parameter is optional, and is in fact ignored. The resolution is actually fixed at 6½ digits.

- 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).

- If you select autoranging (by specifying "AUTO" or "DEF"), an error will be generated if you specify a discrete value for the <resolution> parameter. When autoranging is combined with a discrete resolution, the instrument cannot accurately resolve the integration time (especially if the input signal is continuously changing). If your application requires autoranging, be sure to specify "DEF" for the <resolution> parameter or omit the parameter from the command.

- 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*: "OVLD" from the front panel or "+9.9E+37" from the remote interface.

Return Format

The command returns a single reading.

Examples

The following command configures the instrument for ac voltage measurements, triggers the meter to take a reading, and then transfers the reading to the instrument output buffer. The default range (autorange) and resolution (fixed at 6½ digits) are used for the measurement.

```
MEAS:VOLT:AC?
```

Typical Response: +1.86850000E-03

The following command configures the instrument for ac voltage measurements, triggers the meter to take a reading, and then transfers the reading to the instrument output buffer. The 1 V range is selected.

```
MEAS:VOLT:AC? 1
```

Typical Response: +4.27150000E-03

See Also

[CONFigure?](#)

[FETCh?](#)

[READ?](#)

MEASure[:VOLTage][:DC]?

Syntax

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

Description

First, this command resets all dc voltage measurement parameters and trigger parameters to their [default values](). Then, it configures the meter for dc voltage measurements and immediately triggers a measurement. The results are sent directly to the instrument output buffer.

Parameters

Name	Type	Range of Values	Default Value
<range>	Numeric	Desired range in volts: 100 mV (MIN) 1 V 10 V 100 V 1000 V (MAX) AUTO (autorange)	AUTO (autorange)
<resolution>	Numeric	Desired resolution in volts (see Resolution Table or Range, Resolution, and NPLC for more information).	0.3 ppm x *<range>* (1 PLC)

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).

- If you select autoranging (by specifying "AUTO" or "DEF"), an error will be generated if you specify a discrete value for the <resolution> parameter. When autoranging is combined with a discrete resolution, the instrument cannot accurately resolve the integration time (especially if the input signal is continuously changing). If your application requires autoranging, be sure to specify "DEF" for the <resolution> parameter or omit the parameter from the command.

- 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*: "±OVLD" from the front panel or "±9.9E+37" from the remote interface.

Return Format

The command returns a single reading.

Examples

The following command configures the instrument for dc voltage measurements, triggers the meter to take a reading, and then transfers the reading to the instrument output buffer. The default range (autorange) and resolution (1 PLC) are used for the measurement.

```
MEAS:VOLT:DC?
```

Typical Response: +1.86850000E-03

The following command configures the instrument for dc voltage measurements, triggers the meter to take a reading, and then transfers the reading to the instrument output buffer. The 1 V range is selected with 0.1 mV resolution.

```
MEAS:VOLT:DC? 1,0.0001
```

Typical Response: +4.27150000E-03

See Also

[CONFigure?](#)

[FETCh?](#)

[READ?](#)

MEMory Subsystem Introduction

Command Summary

MEMory:NSTates?

MEMory:STATe:CATalog?

MEMory:STATe:DELete

MEMory:STATe:DELete:ALL

MEMory:STATe:NAME

MEMory:STATe:NAME?

MEMory:STATe:RECall:AUTO

MEMory:STATe:RECall:AUTO?

MEMory:STATe:RECall:SELect

MEMory:STATe:RECall:SELect?

MEMory:STATe:VALid?

MEMory:NSTates?

Syntax

MEMory:NSTates?

Description

This command returns the total number of memory locations available for state storage. For the 34410A/11A/L4411A, this command always returns "+5" (memory location 0 is included).

MEMory:STATe:CATalog?

Syntax

MEMory:STATe:CATalog?

Description

This command returns the names assigned to storage locations 0 through 4. When shipped from the factory, default names are assigned to storage locations 0 through 4 ("POWER_DOWN", "STATE_1", "STATE_2", "STATE_3", and "STATE_4").

Remarks

- This command returns the factory default name for location 0 ("POWER_DOWN") unless a new name has been defined. Although you can define a name for location 0, the name is overwritten when the power is cycled and a new power-down state is stored in this location.

Return Format

This command returns a comma-separated list representing the names assigned to the storage locations.

Example

The following command returns the names assigned to storage locations 0 through 4 (the quotes are also returned for each name).

```
MEM:STAT:CAT?
```

Typical Response:
```
"POWER_DOWN","STATE_1","STATE_2","STATE_3","STATE_4"
```

See Also

MEMory:STATe:NAME

MEMory:STATe:DELete

Syntax

MEMory:STATe:DELete {0|1|2|3|4}

MEMory:STATe:DELete:ALL

Description

This command deletes the contents of the specified storage location.

Remarks

- If you have named a storage location (see [MEMory:STATe:NAME](#) command), deleting the contents of a storage location will reset the associated name to its factory default ("POWER_DOWN", "STATE_1", "STATE_2", "STATE_3", and "STATE_4").

- Although you may delete the state of location 0, it will be restored to its factory default state, and its state name ("POWER_DOWN") at the next power up.

- Note that you cannot recall the instrument state from a storage location that was deleted. An error is generated if you attempt to recall a deleted state.

Examples

The following command deletes the contents of storage location 1.

```
MEM:STAT:DEL 1
```

The following command deletes the contents of storage locations 0 through 4.

```
MEM:STAT:DEL:ALL
```

See Also

[*SAV](#)

[*RCL](#)

MEMory:STATe:NAME

Syntax

MEMory:STATe:NAME {0|1|2|3|4} [,*<name>*]

MEMory:STATe:NAME? {0|1|2|3|4}

Description

This command assigns a name to the specified storage location. You can name a location from the front panel or over the remote interface. The query allows you to determine the name assigned to a specific location (0 through 4).

Parameters

Name	Type	Range of Values	Default Value
<name>	ASCII String	A string of up to 12 characters. The first character must be a letter (A-Z), but the remaining 11 characters can be letters, numbers (0-9), or the underscore character ("_"). Blank spaces are not allowed.	If omitted, the default name is used for the specified storage location

Remarks

- Although you can assign a name to location 0, the name will be overwritten when the power is cycled and a new power-down state is stored in this location.

- When shipped from the factory, default names are assigned to storage locations 0 through 4. The default names are "POWER_DOWN", "STATE_1", "STATE_2", "STATE_3", and "STATE_4".

- If you omit the <name> parameter, the default name is assigned to the specified storage location. This provides an easy way to reset the associated name to its factory default; however, the stored state is *not* deleted.

- Deleting the contents of a storage location (see MEMory:STATe:DELete command) will reset the associated name to its factory default ("POWER_DOWN", "STATE_1", "STATE_2", "STATE_3", and "STATE_4").

- A Factory Reset (*RST command) does not affect the configurations stored in memory. Once a state is stored, it remains until it is overwritten or specifically deleted.

Return Format

The query command reads the name assigned to the specified storage location and returns an ASCII string. If the specified location has no custom assigned, the default name is returned ("POWER_DOWN", "STATE_1", "STATE_2", "STATE_3", and "STATE_4"). Although you can assign a name to location 0, the name will be overwritten when the power is cycled and the default name will be returned ("POWER_DOWN").

Examples

The following command assigns a name to storage location 1.

```
MEM:STAT:NAME 1,TEST_RACK_1
```

The following query returns the name assigned to storage location 1.

```
MEM:STAT:NAME? 1
```

Typical Response: TEST_RACK_1

See Also

[MEMory:STATe:CATalog?](#)

[*SAV](#)

[*RCL](#)

MEMory:STATe:RECall:AUTO

Syntax

MEMory:STATe:RECall:AUTO *\<mode\>*

MEMory:STATe:RECall:AUTO?

Description

This command disables or enables the automatic recall of a specific stored instrument state when power is turned on. Select "ON" to automatically recall one of the four stored states (see MEMory:STATe:RECall:SELect command) or the power-down state (location 0) when power is turned on. Select "OFF" to issue a Factory Reset (and state 0 is not automatically recalled) when power is turned on.

Parameters

Name	Type	Range of Values	Default Value
<mode>	Boolean	{OFF|0|ON|1}	This is a required parameter

Remarks

- With the *SAV command, you can use location 0 to store a fifth instrument state. However, keep in mind that location 0 is automatically overwritten with the power-down state when power is cycled.

- When shipped from the factory, storage locations 1 through 4 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) does not affect the value of *<mode>*.

Return Format

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

Examples

The following command disables automatic recall of the power-down state.

```
MEM:STAT:REC:AUTO OFF
```

The following query returns the automatic recall setting.

```
MEM:STAT:REC:AUTO?
```

Typical Response: 0

See Also

MEMory:STATe:RECall:SELect

*SAV

MEMory:STATe:RECall:SELect

Syntax

MEMory:STATe:RECall:SELect {0|1|2|3|4}

MEMory:STATe:RECall:SELect?

Description

This command selects which instrument state will be used at power on if the automatic recall mode is enabled (see MEMory:STATe:RECall:AUTO ON command). If the automatic recall mode is disabled (MEMory:STATe:RECall:AUTO OFF), then a Factory Reset is issued when power is turned on.

Remarks

- Regardless of which instrument state is specified, the power-down state is automatically stored in location 0.

- When shipped from the factory, storage locations 1 through 4 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) does not affect the configurations stored in memory. Once a state is stored, it remains until it is overwritten or specifically deleted.

Return Format

The query command returns "0", "1", "2", "3", or "4" indicating which instrument state will be used at power on.

Examples

The following command selects instrument state 2 to be used at power-on.

```
MEM:STAT:REC:SEL 2
```

The following query returns the instrument state selected.

```
MEM:STAT:REC:SEL?
```

Typical Response: 2

See Also

MEMory:STATe:RECall:AUTO

*SAV

MEMory:STATe:VALid?

Syntax

MEMory:STATe:VALid? {0|1|2|3|4}

Description

This command queries the specified storage location to determine if a valid state is currently stored in this location.

Remarks

- You can use this command before sending the *RCL command to determine if a state has been previously stored in this location.

Return Format

The command returns "0" if no state has been stored or if it has been deleted. It returns "1" if a valid state is stored in this location.

Example

The following command returns the state of storage location 3.

```
MEM:STAT:VAL? 3
```

Typical Response: 0

See Also

[*RCL](#)

[*SAV](#)

SAMPle Subsystem Introduction

The SAMPle commands are used with the TRIGger commands to set up the triggering parameters. Use the SAMPle commands to set a sample count, sample source, and delay time for triggered sampling.

It is recommended that all triggered measurements be made using an appropriate fixed manual range. That is, turn autorange off (SENSe:*<function>*:RANGe:AUTO OFF), or set a fixed range using the SENSe:*<function>*:RANGe, CONFigure, or MEASure command.

Command Summary

SAMPle:COUNt

SAMPle:COUNt?

SAMPle:COUNt:PRETrigger

SAMPle:COUNt:PRETrigger?

SAMPle:SOURce

SAMPle:SOURce?

SAMPle:TIMer

SAMPle:TIMer?

SAMPle:COUNt

Syntax

SAMPle:COUNt {<*count*>|MIN|MAX|DEF}

SAMPle:COUNt? [{MIN|MAX}]

Description

This command selects the number of readings (samples) the meter will take per trigger.

NOTE	It is recommended that all triggered measurements be made using an appropriate fixed manual range. That is, turn autorange off (SENSe:*<function>*:RANGe:AUTO OFF), or set a fixed range using the SENSe:*<function>*:RANGe, CONFigure, or MEASure command.

Parameters

Name	Type	Range of Values	Default Value
<count>	Numeric	1 to 50,000 samples (34410A) 1 to 1,000,000 samples (34411A/L4411A) MIN = 1 sample MAX = 50,000 samples (34410A) MAX = 1,000,000 samples (34411A/L4411A)	1 sample per trigger

Remarks

- The front-panel sample annunciator ("*****") turns on during each measurement at slower rates. However, the annunciator toggles at a fixed rate for fast measurements.

- The 34411A provides the pre-trigger feature for all measurement functions except CONTinuity and DIODe test.

- After setting the sample count, you must place the meter in the "wait-for-trigger" state using the INITiate or READ? command. An external trigger will be buffered until the meter is in the "wait-for-trigger" state.

- You can use the specified sample count in conjunction with a trigger count (see TRIGger:COUNt command) which sets the number of triggers to be accepted before returning to the "idle" trigger state. In this case, the total number of readings returned will be the product of the sample count and trigger count.

     Number of Readings = Sample Count x Trigger Count

  If more than 50,000 readings for the 34410A, or 1,000,000 readings for the 34411A/L4411A are to be taken, the data must be read from reading memory fast enough to avoid a memory overflow. The most recent readings are preserved. The oldest readings are overwritten in reading memory if an overflow occurs.

- You can use the SAMPle:COUNt:PRETrigger command (34411A/L4411A) to set a *pretrigger count*, which reserves memory for a specified number of pretrigger samples.

- The CONFigure and MEASure? commands automatically set the sample count to "1".

- The instrument sets the sample count to "1" after a Factory Reset (*RST command) or a Preset (SYSTem:PRESet command).

- It is recommended that all triggered measurements be made using an appropriate fixed manual range. That is, turn autorange off (SENSe:*<function>*:RANGe:AUTO OFF), or set a fixed range using the SENSe:*<function>*:RANGe, CONFigure, or MEASure command.

Return Format

The query command returns the sample count in the form "+1".

Examples

The following command sets the meter's sample count to 10. When a trigger is received from the selected trigger source, the meter will make 10 measurements.

```
SAMP:COUN 10
```

The following query returns the current sample count.

```
SAMP:COUN?
```

Typical Response: +10

See Also

[SAMPle:COUNt:PRETrigger](#)

[SAMPle:SOURce](#)

[SAMPle:TIMer](#)

[TRIGger:COUNt](#)

[TRIGger:SOURce](#)

SAMPle:COUNt:PRETrigger (34411A/L4411A)

Syntax

SAMPle:COUNt:PRETrigger {*<PTcount>*|MIN|MAX|DEF}

SAMPle:COUNt:PRETrigger? [{MIN|MAX}]

Description

The Agilent 34411A/L4411A provides a *pretrigger* feature that allows collection of the data being digitized *before* the trigger. This command reserves memory for *pretrigger* samples up to the specified number of readings (samples) to be taken before the trigger.

NOTE
It is recommended that all triggered measurements be made using an appropriate fixed manual range. That is, turn autorange off (SENSe:*<function>*:RANGe:AUTO OFF), or set a fixed range using the SENSe:*<function>*:RANGe, CONFigure, or MEASure command.

Parameters

Name	Type	Range of Values	Default Value
<PTcount>	Numeric	0 to 999,999 samples MIN = 0 sample MAX = 999,999 samples (MAX = 10,000 samples if CALC:STAT ON)	This is a required parameter. DEF = 0

Remarks

- This command is supported by the 34411A and L4411A, but not the 34410A.

- The 34411A/L4411A provides the pre-trigger feature for all measurement functions except CONTinuity and DIODe test.

- Use the SAMPle:COUNt command to set the *sample count* (the *total* number of samples to take), and then use the SAMPle:COUNt:PRETrigger command to set the *pretrigger sample count* (the number of *pretrigger* samples to take). For example, you could set the sample count to 50,000, and then set the pretrigger sample count to 20,000. In this case, up to 20,000 samples are taken before the trigger, and then 30,000 samples are taken after the trigger is detected.

    - But, of course, the sample count and pretrigger count do not affect when the trigger occurs. If the memory allocated for pretrigger samples fills up, the oldest readings are discarded. In our example, up to 20,000 pretrigger samples may be taken. This means that the 20,000 *most recent* pretrigger samples will be saved, even if more than 20,000 samples occur before the trigger.

    - On the other hand, the trigger might occur *before* the pretrigger count is satisfied. In this case, only the actual pretrigger samples taken are saved.

    - In all cases, after the trigger is received, only *sample count* minus *pretrigger count* readings are taken. In our example, the pretrigger count is set to 20,000. Even if the trigger occurs after 5 pretrigger samples have been taken, only 30,000 post-trigger samples will be taken. This is because memory was reserved for 20,000 pretrigger samples (out of the sample count = 50,000).

- If a trigger occurs *during* a measurement, that measurement is considered to be a pretrigger sample.

- After setting the sample count and pretrigger sample count, you must place the meter in the "wait-for-trigger" state using the INITiate or READ? command. An external trigger will be buffered until the meter is in the "wait-for-trigger" state.

- The pretrigger sample count must be less than the sample count set with the SAMPle:COUNt command (in fact, there must be at least one post-

trigger sample):

> Pretrigger Sample Count ≤ Sample Count - 1

- If any of the calculation functions are on (CALC:STAT ON), the pretrigger count is further limited to 10,000 samples.

- The CONFigure and MEASure? commands automatically set the pretrigger sample count to "0".

- The instrument sets the pretrigger sample count to "0" after a Factory Reset (*RST command) or a Preset (SYSTem:PRESet command).

- It is recommended that all triggered measurements be made using an appropriate fixed manual range. That is, turn autorange off (SENSe:function:RANGe:AUTO OFF), or set a fixed range using the SENSe:function:RANGe, CONFigure, or MEASure command.

Return Format

The query command returns the pretrigger sample count in the form "+1".

Examples

The following commands set the sample count to 10,000 and the pretrigger sample count to 5000 (so that 5000 samples will be taken before the trigger, and 5000 after).

```
SAMP:COUN 10000 SAMP:COUN:PRET 5000
```

The following query returns the current sample count.

```
SAMP:COUN:PRET?
```

Typical Response: +5000

See Also

[SAMPle:COUNt](#)

SAMPle:SOURce

Syntax

SAMPle:SOURce {IMMediate|TIMer}

SAMPle:SOURce?

Description

This command works in conjunction with the TRIGger:DELay command and the SAMPle:TIMer command to determine sample timing when the sample count is greater than one. In all cases, the first sample is taken one trigger delay time after the trigger (the delay being set with the TRIGger:DELay command). Beyond that, the timing mechanism depends on whether you select IMMediate or TIMer as the source:

- If you select SAMPle:SOURce IMMediate, the first sample starts one trigger delay time after the trigger, and then the trigger delay time is inserted between the first and second samples, the second and third, and so forth:
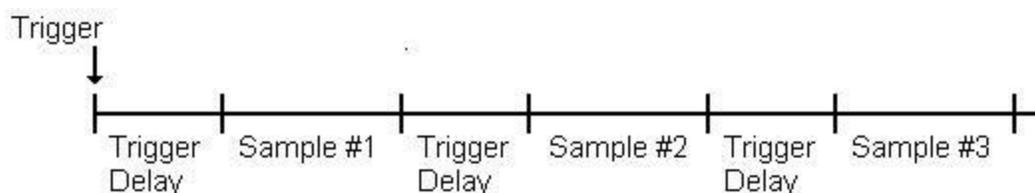
Note that the sample timing is not deterministic because the delay time (set with TRIGger:DELay) is inserted *after* each sample completes. The actual time required to take each sample depends on the integration time and autoranging time. In this case, the SAMPle:TIMer command has no effect.

- If you select SAMPle:SOURce TIMer, the first sample starts one trigger delay time after the trigger. However, the second sample starts one sample interval after the *start* of the first sample, and so forth:
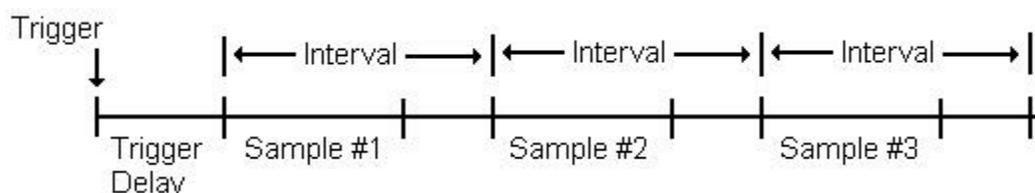
Note that the sample timing is deterministic because the *start* of each sample is determined by the sample interval, set with the SAMPle:TiMer command (TRIGger:DELay affects only the start of the first sample). Integration and autoranging affect the sampling time for each sample, but not the sample interval as long as the sample interval is longer than the sampling time.

NOTE   It is recommended that all triggered measurements be made using an appropriate fixed manual range. That is, turn autorange off

(SENSe:*<function>*:RANGe:AUTO OFF), or set a fixed range using the SENSe:*<function>*:RANGe, CONFigure, or MEASure command.

Remarks

- This command has no effect if the sample count is 1 (see SAMPle:COUNt).

- After setting the sample count, sample source, and the sample interval or trigger delay time, you must place the instrument in the "wait-for-trigger" state using the INITiate or READ? command. A trigger will not be accepted from the selected trigger source (see TRIGger:SOURce command) until the instrument is in the "wait-for-trigger" state.

- The instrument sets the sample source to "IMM" after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

- It is recommended that all triggered measurements be made using an appropriate fixed manual range. That is, turn autorange off (SENSe:*<function>*:RANGe:AUTO OFF), or set a fixed range using the SENSe:*<function>*:RANGe, CONFigure, or MEASure command.

Return Format

The query command returns "IMM" or "TIM".

Examples

The following example sets the meter's sample source to "TIM". The INIT command sets the meter to the "wait-for-trigger" state. When a trigger is received from the selected trigger source, the instrument starts taking periodic samples after the current trigger delay.

```
SAMP:SOUR TIM
SAMP:TIM 0.1
INIT
```

The following query returns the current sample source.

```
SAMP:SOUR?
```

Typical Response: TIM

See Also

TRIGger:COUNt

TRIGger:DELay

TRIGger:SOURce

SAMPle:COUNt

SAMPle:TIMer

SAMPle:TIMer

Syntax

SAMPle:TIMer {*<interval>*|MIN|MAX}

SAMPle:TIMer? [{MIN|MAX}]

Description

This command sets a sample *interval* for timed sampling when the sample count is greater than one. Use the SAMPle:SOURce command to set the TIMer option for timed sampling.

The first sample is taken one trigger delay time after the trigger (the delay being set with the TRIGger:DELay command). The second sample starts one sample *interval* after the *start* of the first sample, and so forth, as shown below:
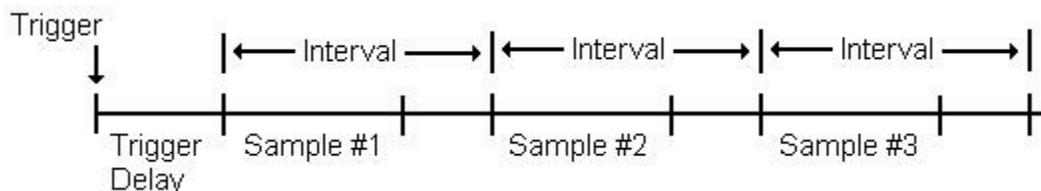
Note that the sample timing is determinant because the *start* of each sample is determined by the sample interval. Integration and autoranging affect the sampling time for each sample, but not the sample interval as long as the sample interval is longer than the sampling time. Periodic sampling continues until the sample count (set with the SAMPle:COUNt command) is satisfied.

NOTE

It is recommended that all triggered measurements be made using an appropriate fixed manual range. That is, turn autorange off (SENSe:*<function>*:RANGe:AUTO OFF), or set a fixed range using the SENSe:*<function>*:RANGe, CONFigure, or MEASure command.

Parameters

Name	Type	Range of Values	Default Value
<interval>	Numeric	MIN to ~3600 seconds (~20 µs steps).* MIN = measurement dependent, MAX = ~3600 s.	This is a required parameter
* Step size for dc measurements is approximately 20 µs. Step size depends on ac bandwidth for ac measurements.			

Remarks

- The value of MIN is measurement dependent. It depends on the integration time (resolution), whether autozero is on, whether autorange is on, and the measurement range. Basically, MIN is automatically determined so that the sample interval is always greater than the sampling time (see above illustration). *However, the* MIN *value is not enforced*, and you can specify an *<interval>* less than MIN (even zero). Execute SAMPle:TIMer? MIN to determine the current value of MIN. See additional comments under "Return Format" below.

- Due to internal quantization, the actual interval that you set may be slightly different than your specified value. The increment is approximately 20 µs. Use the query command to determine the exact interval that is set. For example, if you send "SAMP:TIM 500 ms", and then send the query "SAMP:TIM?" the actual interval is returned (for example: "+5.00000753E-01").

- After setting the sample count, source, and delay time, you must place the meter in the "wait-for-trigger" state using the INITiate or READ? command. A trigger will not be accepted from the selected trigger source (see TRIGger:SOURce command) until the instrument is in the "wait-for-trigger" state.

- The interval may be set to any value from MIN to 3600 seconds. However, the value will be rounded to the nearest step. For dc measurements, the step size is approximately 20 µs. For ac measurements, it is ac bandwidth dependent.

- The instrument sets the sample timer to 1 second after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

- It is recommended that all triggered measurements be made using an appropriate fixed manual range. That is, turn autorange off (SENSe:*<function>*:RANGe:AUTO OFF), or set a fixed range using the SENSe:*<function>*:RANGe, CONFigure, or MEASure command.

Return Format

The query command returns the sample interval in seconds. If you include MIN or MAX in the query, the returned value is the minimum or maximum *recommended interval* (for this command only) for the current measurement.

The value returned by SAMPle:TIMer? MIN is affected by operations such as autorange, offset compensation (for resistance or temperature), and 100 PLC integration times, which require additional time.

- If autorange and offset compensation are turned off, and the integration time is not 100 PLC, the value returned will be an accurate recommended minimum value for the *<interval>* parameter.

- If autorange or offset compensation are turned on, or the integration time is 100 PLC, the value returned by SAMPle:TIMer? MIN will be a "worst case" value. You may find that you can use a smaller *<interval>* than recommended, but it is not possible to predict the exact amount of additional time required. If you use an *<interval>* that is less than MIN, check the Sample Timing Violation bit (bit 2) in the Questionable Data Event Register using the STATus:QUEStionable[:EVENt]? command. If a Sample Timing Violation event has occurred, the sample timing may not be valid.

Examples

The following example sets the meter's sample interval to 0.1 seconds. The INIT command sets the meter to the "wait-for-trigger" state. When a trigger is received from the selected trigger source, the meter waits the current trigger delay, and then takes readings every 0.10 seconds until the current sample count is satisfied.

```
SAMP:SOUR TIM
SAMP:TIM 0.1
INIT
```

The following query returns the current sample count.

```
SAMP:TIM?
```

Typical Response: 0.1

See Also

[TRIGger:COUNt](#)

[TRIGger:DELay](#)

[TRIGger:SOURce](#)

[SAMPle:COUNt](#)

[SAMPle:SOURce](#)

SENSe Subsystem Introduction

Command Summary

AC Voltage

[SENSe:]VOLTage:AC:BANDwidth

[SENSe:]VOLTage:AC:BANDwidth?

[SENSe:]VOLTage:AC:NULL[:STATe]

[SENSe:]VOLTage:AC:NULL[:STATe]?

[SENSe:]VOLTage:AC:NULL:VALue

[SENSe:]VOLTage:AC:NULL:VALue?

[SENSe:]VOLTage:AC:PEAK:STATe

[SENSe:]VOLTage:AC:PEAK:STATe?

[SENSe:]VOLTage:AC:RANGe:AUTO

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

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

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

DC Voltage

[SENSe:]VOLTage[:DC]:APERture

[SENSe:]VOLTage[:DC]:APERture?

[SENSe:]VOLTage[:DC]:APERture:ENABled

[SENSe:]VOLTage[:DC]:APERture:ENABled?

[SENSe:]VOLTage[:DC]:IMPedance:AUTO

[SENSe:]VOLTage[:DC]:IMPedance:AUTO?

[SENSe:]VOLTage[:DC]:NPLC

[SENSe:]VOLTage[:DC]:NPLC?

[SENSe:]VOLTage[:DC]:NULL[:STATe]

[SENSe:]VOLTage[:DC]:NULL[:STATe]?

[SENSe:]VOLTage[:DC]:NULL:VALue

[SENSe:]VOLTage[:DC]:NULL:VALue?

[SENSe:]VOLTage[:DC]:PEAK:STATe

[SENSe:]VOLTage[:DC]:PEAK:STATe?

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

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

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

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

[SENSe:]VOLTage[:DC]:RESolution

[SENSe:]VOLTage[:DC]:RESolution?

[SENSe:]VOLTage[:DC]:ZERO:AUTO

[SENSe:]VOLTage[:DC]:ZERO:AUTO?

AC Current

[SENSe:]CURRent:AC:BANDwidth

[SENSe:]CURRent:AC:BANDwidth?

[SENSe:]CURRent:AC:NULL[:STATe]

[SENSe:]CURRent:AC:NULL[:STATe]?

[SENSe:]CURRent:AC:NULL:VALue

[SENSe:]CURRent:AC:NULL:VALue?

[SENSe:]CURRent:AC:PEAK:STATe

[SENSe:]CURRent:AC:PEAK:STATe?

[SENSe:]CURRent:AC:RANGe:AUTO

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

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

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

DC Current

[SENSe:]CURRent[:DC]:APERture

[SENSe:]CURRent[:DC]:APERture?

[SENSe:]CURRent[:DC]:APERture:ENABled

[SENSe:]CURRent[:DC]:APERture:ENABled?

[SENSe:]CURRent[:DC]:NPLC

[SENSe:]CURRent[:DC]:NPLC?

[SENSe:]CURRent[:DC]:NULL[:STATe]

[SENSe:]CURRent[:DC]:NULL[:STATe]?

[SENSe:]CURRent[:DC]:NULL:VALue

[SENSe:]CURRent[:DC]:NULL:VALue?

[SENSe:]CURRent[:DC]:PEAK:STATe

[SENSe:]CURRent[:DC]:PEAK:STATe?

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

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

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

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

[SENSe:]CURRent[:DC]:RESolution

[SENSe:]CURRent[:DC]:RESolution?

[SENSe:]CURRent[:DC]:ZERO:AUTO

[SENSe:]CURRent[:DC]:ZERO:AUTO?

2-Wire Resistance

[SENSe:]RESistance:APERture

[SENSe:]RESistance:APERture?

[SENSe:]RESistance:APERture:ENABled?

[SENSe:]RESistance:APERture:ENABled?

[SENSe:]RESistance:NPLC

[SENSe:]RESistance:NPLC?

[SENSe:]RESistance:NULL[:STATe]

[SENSe:]RESistance:NULL[:STATe]?

[SENSe:]RESistance:NULL:VALue

[SENSe:]RESistance:NULL:VALue?

[SENSe:]RESistance:OCOMpensated

[SENSe:]RESistance:OCOMpensated?

[SENSe:]RESistance:RANGe:AUTO

[SENSe:]RESistance:RANGe:AUTO?

[SENSe:]RESistance:RANGe[:UPPer]

[SENSe:]RESistance:RANGe[:UPPer]?

[SENSe:]RESistance:RESolution

[SENSe:]RESistance:RESolution?

[SENSe:]RESistance:ZERO:AUTO

[SENSe:]RESistance:ZERO:AUTO?

4-Wire Resistance

[SENSe:]FRESistance:APERture

[SENSe:]FRESistance:APERture?

[SENSe:]FRESistance:APERture:ENABled

[SENSe:]FRESistance:APERture:ENABled?

[SENSe:]FRESistance:NPLC

[SENSe:]FRESistance:NPLC?

[SENSe:]FRESistance:NULL[:STATe]

[SENSe:]FRESistance:NULL[:STATe]?

[SENSe:]FRESistance:NULL:VALue

[SENSe:]FRESistance:NULL:VALue?

[SENSe:]FRESistance:OCOMpensated

[SENSe:]FRESistance:OCOMpensated?

[SENSe:]FRESistance:RANGe:AUTO

[SENSe:]FRESistance:RANGe:AUTO?

[SENSe:]FRESistance:RANGe[:UPPer]

[SENSe:]FRESistance:RANGe[:UPPer]?

[SENSe:]FRESistance:RESolution

[SENSe:]FRESistance:RESolution?

Frequency

[SENSe:]FREQuency:APERture

[SENSe:]FREQuency:APERture?

[SENSe:]FREQuency:NULL[:STATe]

[SENSe:]FREQuency:NULL[:STATe]?

[SENSe:]FREQuency:NULL:VALue

[SENSe:]FREQuency:NULL:VALue?

[SENSe:]FREQuency:RANGe:LOWer

[SENSe:]FREQuency:RANGe:LOWer?

[SENSe:]FREQuency:VOLTage:RANGe:AUTO

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

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

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

Period

[SENSe:]PERiod:APERture

[SENSe:]PERiod:APERture?

[SENSe:]PERiod:NULL[:STATe]

[SENSe:]PERiod:NULL[:STATe]?

[SENSe:]PERiod:NULL:VALue

[SENSe:]PERiod:NULL:VALue?

[SENSe:]PERiod:RANGe:LOWer

[SENSe:]PERiod:RANGe:LOWer?

[SENSe:]PERiod:VOLTage:RANGe:AUTO

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

[SENSe:]PERiod:VOLTage:RANGe[:UPPer]

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

Temperature

[SENSe:]TEMPerature:APERture

[SENSe:]TEMPerature:APERture?

[SENSe:]TEMPerature:APERture:ENABled

[SENSe:]TEMPerature:APERture:ENABled?

[SENSe:]TEMPerature:NPLC

[SENSe:]TEMPerature:NPLC?

[SENSe:]TEMPerature:NULL[:STATe]

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

[SENSe:]TEMPerature:NULL:VALue

[SENSe:]TEMPerature:NULL:VALue?

[SENSe:]TEMPerature:TRANsducer:FRTD:OCOMpensated

[SENSe:]TEMPerature:TRANsducer:FRTD:OCOMpensated?

[SENSe:]TEMPerature:TRANsducer:FRTD:RESistance[:REFerence]

[SENSe:]TEMPerature:TRANsducer:FRTD:RESistance[:REFerence]?

[SENSe:]TEMPerature:TRANsducer:FRTD:TYPE

[SENSe:]TEMPerature:TRANsducer:FRTD:TYPE?

[SENSe:]TEMPerature:TRANsducer:RTD:OCOMpensated

[SENSe:]TEMPerature:TRANsducer:RTD:OCOMpensated?

[SENSe:]TEMPerature:TRANsducer:RTD:RESistance[:REFerence]

[SENSe:]TEMPerature:TRANsducer:RTD:RESistance[:REFerence]?

[SENSe:]TEMPerature:TRANsducer:RTD:TYPE

[SENSe:]TEMPerature:TRANsducer:RTD:TYPE?

[SENSe:]TEMPerature:TRANsducer:THERmistor:TYPE

[SENSe:]TEMPerature:TRANsducer:THERmistor:TYPE?

[SENSe:]TEMPerature:TRANsducer:TYPE

[SENSe:]TEMPerature:TRANsducer:TYPE?

[SENSe:]TEMPerature:ZERO:AUTO

[SENSe:]TEMPerature:ZERO:AUTO?

Capacitance

[SENSe:]CAPacitance:NULL[:STATe]

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

[SENSe:]CAPacitance:NULL:VALue

[SENSe:]CAPacitance:NULL:VALue?

[SENSe:]CAPacitance:RANGe:AUTO

[SENSe:]CAPacitance:RANGe:AUTO?

[SENSe:]CAPacitance:RANGe[:UPPer]

[SENSe:]CAPacitance:RANGe[:UPPer]?

Miscellaneous

[SENSe:]FUNCtion[:ON]

[SENSe:]FUNCtion[:ON]?

[SENSe:]FUNCtion[:ON]

Syntax

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

[SENSe:]FUNCtion[:ON]?

Description

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

Parameters

Name	Type	Range of Values	Default Value
<function>	Discrete	Desired function enclosed in quotes: CAPacitance CONTinuity CURRent:AC CURRent[:DC] DIODe FREQuency FRESistance PERiod RESistance TEMPerature VOLTage:AC VOLTage[:DC]	This is a required parameter

Remarks

- If you change the measurement function, all measurement attributes of the previous function (range, resolution, etc.) 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 volts after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns an [ASCII string](#) enclosed in double quotes. The short form of the function name is always returned (e.g., "CURR:AC", "FREQ", "TEMP").

Examples

The following commands select the ac voltage function (double or single quotes are allowed).

```
FUNC "VOLT:AC"      or      FUNC 'VOLT:AC'
```

The following query returns the function selected (the quotes are also returned).

```
FUNC?
```

Typical Response: `"VOLT:AC"`

See Also

[CONFigure Commands](#)

[SENSe:]CAPacitance:NULL[:STATe]

Syntax

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

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

Description

This command turns the null function on or off for capacitance measurements.

Remarks

- Use the [SENSe:]CAPacitance:NULL:VALue command to set the null value.

- The CONFigure:CAPacitance and MEASure:CAPacitance? commands turn off the null state.

- A Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command) returns the null state to off.

Return Format

The query command returns the null state, either "1" (ON), or "0" (OFF).

Examples

The following command turns the null function off.

```
CAP:NULL:STAT OFF
```

The following query returns the null state.

```
CAP:NULL:STAT?
```

Typical Response: 0

See Also

[SENSe:]CAPacitance:NULL:VALue

CONFigure:CAPacitance

MEASure:CAPacitance?

[SENSe:]CAPacitance:NULL:VALue

Syntax

[SENSe:]CAPacitance:NULL:VALue {*<value>*|MIN|MAX}

[SENSe:]CAPacitance:NULL:VALue? [{MIN|MAX}]

Description

This command stores a null value for capacitance measurements. The null value is subtracted from each sample if the null state is turned on.

Parameters

The *<value>* parameter can take any value between -120% and +120% of the highest range for the present function. MIN = -120% of the highest range. MAX = +120% of the highest range. The default value is 0.

Remarks

- To use the null value, you will also need to turn on the null state with the [SENSe:]CAPacitance:NULL[:STATe] command.

- When using this command, it is recommended that you *not* turn on the separate null state with the CALCulate:FUNCtion command. If you do, the individual ("per function") null value set with this command, and the global null value set with the CALCulate:NULL:OFFSet command will be additive.

- A Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command) clears all null values.

- The null value is stored as part of the stored state with the *SAV command.

Return Format

The query command returns the null value in the form "`+1.00000000E-02`".

Examples

The following command sets the null value to -0.25.

```
CAP:NULL:VAL -0.25
```

The following query returns the null value.

```
CAP:NULL:VAL?
```

Typical Response: -2.50000000E-01

See Also

[SENSe:]CAPacitance:NULL[:STATe]

[SENSe:]CAPacitance:RANGe:AUTO

Syntax

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

[SENSe:]CAPacitance:RANGe:AUTO?

Description

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.

Parameters

Name	Type	Range of Values	Default Value
<mode>	Boolean	{OFF|0|ON|1|ONCE}	This is a required parameter

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.

- The ONCE parameter performs an immediate autorange, and then sets autoranging to OFF. (Thus, the query returns "0".)

- Selecting a discrete range (see [SENSe:]CAPacitance:RANGe[:UPPer] command) will disable autoranging.

- The instrument enables autoranging after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

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

Examples

The following command disables autoranging.

```
CAP:RANG:AUTO OFF
```

The following query returns the autoranging settings.

```
CAP:RANG:AUTO?
```

Typical Response: 0

See Also

CONFigure:CAPacitance

[SENSe:]CAPacitance:RANGe[:UPPer]

[SENSe:]CAPacitance:RANGe[:UPPer]

Syntax

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

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

Description

This command selects the measurement range for capacitance measurements.

Parameters

Name	Type	Range of Values	Default Value
<range>	Numeric	Desired range in F (farads): 1 nF (MIN) 10 nF 100 nF 1 µF (DEF) 10 µF (MAX)	This is a required parameter DEF sets 1 µF

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*: "OVLD" from the front panel or "+9.9E+37" from the remote interface.

- The instrument selects autoranging after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns the range in the form "`+1.00000000E-01`".

Examples

The following command selects the 1 nF range.

```
CAP:RANG 1 nF      or      CAP:RANG 0.000000001      or      CAP:RANG
1.0E-9
```

The following query returns the selected range.

```
CAP:RANG?
```

Typical Response: +1.00000000E-09

See Also

[CONFigure:CAPacitance](#)

[[SENSe:]CAPacitance:RANGe:AUTO](#)

[SENSe:]CURRent:AC:BANDwidth

Syntax | Description | Parameters | Remarks | Return Format | Examples

Syntax

[SENSe:]CURRent:AC:BANDwidth {*<filter>*|MIN|MAX|DEF}

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

Description

This command sets the bandwidth for ac current measurements. The instrument uses three different ac filters for ac current measurements. The instrument selects the slow (3 Hz), medium (20 Hz), or fast (200 Hz) filter based on the frequency that you specify with this command. Set the lowest expected frequency that you expect to encounter. The default is 20 Hz (medium).

Parameters

Name	Type	Range of Values	Default Value
<filter>	Discrete	{3|20|200} MIN = 3 Hz (slow), MAX = 200 Hz (fast)	This is a required parameter DEF sets 20 Hz (medium)

Remarks

- The *<filter>* parameter takes on one of three *discrete* values: 3, 20, or 200. However, you can enter the lowest expected frequency that you intend to encounter, and the command will automatically enter the appropriate value for *<filter>*. For example, if you enter 15 Hz, the slow filter (3 Hz) is selected. If you enter 190 Hz, the medium filter (20 Hz) is selected to provide the appropriate low cutoff.

- Set the lowest frequency that you expect to encounter. However, note that lower bandwidths result in longer settling delays. The following table shows the settling delays for the three bandwidths:

Input Frequency	Default Settling Delay
3 Hz - 300 kHz (*Slow*)	1.66 seconds/reading
20 Hz - 300 kHz (*Medium*)	0.25 second/reading
200 Hz - 300 kHz (*Fast*)	0.025 second/reading

- The CONFigure and MEASure? commands automatically select the default 20 Hz (medium) filter.

- The instrument selects the default 20 Hz (medium) filter after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns "3.0000000" (slow), "2.0000000E+1" (medium), or "2.0000000E+2" (fast).

Examples

Either of the following commands selects the slow filter (3 Hz).

```
CURR:AC:BAND 3
```

Either of the following queries returns the current ac filter setting.

```
CURR:AC:BAND?
```

Typical Response: 3.0000000

See Also

CONFigure:CURRent:AC

[SENSe:]CURRent:AC:NULL[:STATe]

Syntax

[SENSe:]CURRent:AC:NULL[:STATe] {ON|OFF}

[SENSe:]CURRent:AC:NULL[:STATe]?

Description

This command turns the null function on or off for ac current measurements.

Remarks

- Use the [SENSe:]CURRent:AC:NULL:VALue command to set the null value.

- The CONFigure:CURRent:AC and MEASure:CURRent:AC? commands turn off the null state.

- A Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command) returns the null state to off.

Return Format

The query command returns the null state, either "1" (ON), or "0" (OFF).

Examples

The following command turns the null function off.

```
CURR:AC:NULL:STAT OFF
```

The following query returns the null state.

```
CURR:AC:NULL:STAT?
```

Typical Response: 0

See Also

[SENSe:]CURRent:AC:NULL:VALue

CONFigure:CURRent:AC

MEASure:CURRent:AC?

[SENSe:]CURRent:AC:NULL:VALue

Syntax

[SENSe:]CURRent:AC:NULL:VALue {*<value>*|MIN|MAX}

[SENSe:]CURRent:AC:NULL:VALue? [{MIN|MAX}]

Description

This command stores a null value for ac current measurements. The null value is subtracted from each sample if the null state is turned on.

Parameters

The *<value>* parameter can take any value between -120% and +120% of the highest range for the present function. MIN = -120% of the highest range. MAX = +120% of the highest range. The default value is 0.

Remarks

- To use the null value, you will also need to turn on the null state with the [SENSe:]CURRent:AC:NULL[:STATe] command.

- When using this command, it is recommended that you *not* turn on the separate null state with the CALCulate:FUNCtion command. If you do, the individual ("per function") null value set with this command, and the global null value set with the CALCulate:NULL:OFFSet command will be additive.

- A Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command) clears all null values.

Return Format

The query command returns the null value in the form "`+1.00000000E-02`".

Examples

The following command sets the null value to -0.25.

```
CURR:AC:NULL:VAL -0.25
```

The following query returns the null value.

```
CURR:AC:NULL:VAL?
```

Typical Response: -2.50000000E-01

See Also

[SENSe:]CURRent:AC:NULL[:STATe]

[SENSe:]CURRent:AC:PEAK:STATe

Syntax

[SENSe:]CURRent:AC:PEAK:STATe {ON|OFF}

[SENSe:]CURRent:AC:PEAK:STATe?

Description

This command (when STATe= ON) configures the ac current measurement function to also produce peak-to-peak measurements, which may be retrieved separately from the main current measurement.

Remarks

- Use the FETCh:CURRent:AC:PTPeak? commands to retrieve the peak current data.

- A Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command) returns the state to off.

Return Format

The query command returns the state, either "1" (ON), or "0" (OFF).

Examples

The following command turns the peak current function on.

```
CURR:AC:PEAK:STAT ON
```

The following query returns the state.

```
CURR:AC:PEAK:STAT?
```

Typical Response: 1

See Also

[FETCh:CURRent:AC:PTPeak?](#)

[SENSe:]CURRent:AC:RANGe:AUTO

Syntax

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

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

Description

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.

Parameters

Name	Type	Range of Values	Default Value
<mode>	Boolean	{OFF|0|ON|1|ONCE}	Autorange ON

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.

- The ONCE parameter performs an immediate autorange, and then sets autoranging to OFF. (Thus, the query returns "0".)

- Selecting a discrete range (see [SENSe:]CURRent:AC:RANGe command) will disable autoranging.

- The instrument enables autoranging after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

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

Examples

The following command disables autoranging.

```
CURR:AC:RANG:AUTO OFF
```

The following query returns the autoranging settings.

```
CURR:AC:RANG:AUTO?
```

Typical Response: 0

See Also

[CONFigure:CURRent:AC](#)

[[SENSe:]CURRent:AC:RANGe](#)

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

Syntax

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

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

Description

This command selects the measurement range for ac current measurements.

Parameters

Name	Type	Range of Values	Default Value
<range>	Discrete	Desired range in amps: 100 µA (MIN) 1 mA 10 mA 100 mA 1 A 3 A (MAX)	This is a required parameter DEF sets 1 A

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*: "OVLD" from the front panel or "+9.9E+37" from the remote interface.

- The instrument selects autoranging after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns the range in the form "+1.00000000E-01".

Examples

The following command selects the 100 mA range.

```
CURR:AC:RANG 0.1
```

The following query returns the selected range.

```
CURR:AC:RANG?
```

Typical Response: +1.00000000E-01

See Also

CONFigure:CURRent:AC

[SENSe:]CURRent:AC:RANGe:AUTO

[SENSe:]CURRent[:DC]:APERture

Syntax

[SENSe:]CURRent[:DC]:APERture {*<seconds>*|MIN|MAX|DEF}

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

Description

This command selects the integration time in seconds (called *aperture time*) for dc current measurements.

> **NOTE**
>
> You should use this command only when you want precise control of the integration time of the multimeter. Otherwise, specifying integration time using NPLC (see [SENSe:]CURRent[:DC]:NPLC command) offers better power-line noise rejection characteristics (for values of NPLC greater than 1).

Parameters

Name	Type	Range of Values*	Default Value
<seconds>	Numeric	Desired aperture time in seconds: **34410A:** ~100 µs to ~1 s (with ~20 µs resolution). MIN = ~100 µs, MAX = ~1 s **34411A:** ~20 µs to ~1 s (with ~20 µs resolution). MIN = ~20 µs, MAX = ~1 s	This is a required parameter DEF sets ~100 ms

Remarks

- Due to internal quantization, the actual aperture that you set may be slightly different than your specified value. The increment is approximately 20 μs. Use the query command to determine the exact aperture that is set. For example, if you send "CURR:DC:APER 500 ms", and then send the query "CURR:DC:APER?" the actual aperture is returned (for example: "+5.00000753E-01").

- Setting an aperture with this command changes any integration time selected with the [SENSe:]CURRent[:DC]:NPLC command.

- To obtain best normal mode (line frequency noise) rejection, set an integration time equivalent to an integral number of power line cycles with the [SENSe:]CURRent[:DC]:NPLC command.

- The instrument disables aperture and sets the integration time to 1 PLC after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns the aperture time in the form "`+1.00000000E-01`".

Examples

The following command sets the aperture time to 300 ms.

```
CURR:DC:APER 300E-03
```

The following query returns the aperture time selected.

```
CURR:DC:APER?
```

Typical Response: +3.00000000E-01

See Also

[CONFigure:CURRent[:DC]](#)

[[SENSe:]CURRent[:DC]:APERture:ENABled](#)

[SENSe:]CURRent[:DC]:APERture:ENABled

Syntax

[SENSe:]CURRent[:DC]:APERture:ENABled {ON|OFF}

[SENSe:]CURRent[:DC]:APERture:ENABled?

Description

This command queries whether the aperture time mode is enabled or disabled for dc current measurements. *If aperture time mode is disabled, the integration time is set in PLC (power-line cycles).*

Remarks

- The CONFigure:CURRent[:DC], MEASure:CURRent[:DC]?, [SENSe:]CURRent[:DC]:NPLC, and [SENSe:]CURRent[:DC]:RESolution commands disable the aperture time mode (these commands select an integration time in number of power line cycles).

Return Format

The query command returns "0" if the aperture time mode is disabled or "1" if the aperture time mode is enabled.

Example

The following command returns the state of the aperture time mode.

```
CURR:DC:APER:ENAB?
```

Typical Response: 1

See Also

[CONFigure:CURRent[:DC]](#)

[[SENSe:]CURRent[:DC]:APERture](#)

[SENSe:]CURRent[:DC]:NPLC

Syntax

[SENSe:]CURRent[:DC]:NPLC {*<PLCs>*|MIN|MAX|DEF}

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

Description

This command sets the [integration time](#) in number of power line cycles (PLCs) for dc current measurements. Integration time affects the measurement resolution (for better resolution, use a longer integration time) and measurement speed (for faster measurements, use a shorter integration time).

Parameters

Name	Type	Range of Values*	Defa Valu
<PLCs>	Discrete	**34410A:** {0.006|0.02|0.06|0.2|1|2|10|100} MIN = 0.006 PLC, MAX = 100 PLC **34411A/L4411A:** {0.001|0.002|0.006|0.02|0.06|0.2|1|2|10|100} MIN = 0.001 PLC, MAX = 100 PLC	This requ para DEF PLC
		See Range, Resolution, and NPLC for more information.	

Remarks

- Selecting an integration time with this command changes any aperture set with the [SENSe:]CURRent[:DC]:APERture command.

- Only those integration times set to an integral number of power line cycles (1, 2, 10, or 100 PLCs) provide normal mode (line frequency noise) rejection.

- Setting the integration time also sets the resolution for the measurement. The following table shows the relationship between integration time and resolution.

Integration Time (power line cycles)	Resolution
0.001 PLC *(34411A/L4411A)*	30 ppm x Range
0.002 PLC *(34411A/L4411A)*	15 ppm x Range
0.006 PLC	6.0 ppm x Range
0.02 PLC	3.0 ppm x Range
0.06 PLC	1.5 ppm x Range
0.2 PLC	0.7 ppm x Range
1 PLC (default)	0.3 ppm x Range
2 PLC	0.2 ppm x Range
10 PLC	0.1 ppm x Range
100 PLC	0.03 ppm x Range

- The instrument sets the integration time to 1 PLC after a Factory Reset

(*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns the integration time in the form
"+1.00000000E+00".

Examples

The following command set the integration time to 0.2 PLCs.

```
CURR:DC:NPLC 0.2
```

The following query returns the integration time settings.

```
CURR:DC:NPLC?
```

Typical Response: +2.00000000E-01

See Also

[CONFigure:CURRent\[:DC\]](#)

[\[SENSe:\]CURRent\[:DC\]:APERture](#)

[\[SENSe:\]CURRent\[:DC\]:RESolution](#)

[SENSe:]CURRent[:DC]:NULL[:STATe]

Syntax

[SENSe:]CURRent[:DC]:NULL[:STATe] {ON|OFF}

[SENSe:]CURRent[:DC]:NULL[:STATe]?

Description

This command turns the null function on or off for dc current measurements.

Remarks

- Use the [SENSe:]CURRent[:DC]:NULL:VALue command to set the null value.

- The CONFigure:CURRent[:DC] and MEASure:CURRent[:DC]? commands turn off the null state.

- A Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command) returns the null state to off.

Return Format

The query command returns the null state, either "1" (ON), or "0" (OFF).

Examples

The following command turns the null function off.

```
CURR:DC:NULL:STAT OFF
```

The following query returns the null state.

```
CURR:DC:NULL:STAT?
```

Typical Response: 0

See Also

[SENSe:]CURRent[:DC]:NULL:VALue

CONFigure:CURRent[:DC]

MEASure:CURRent[:DC]?

[SENSe:]CURRent[:DC]:NULL:VALue

Syntax

[SENSe:]CURRent[:DC]:NULL:VALue {*<value>*|MIN|MAX}

[SENSe:]CURRent[:DC]:NULL:VALue? [{MIN|MAX}]

Description

This command stores a null value for dc current measurements. The null value is subtracted from each sample if the null state is turned on.

Parameters

The *<value>* parameter can take any value between -120% and +120% of the highest range for the present function. MIN = -120% of the highest range. MAX = +120% of the highest range. The default value is 0.

Remarks

- To use the null value, you will also need to turn on the null state with the [SENSe:]CURRent:DC:NULL[:STATe] command.

- When using this command, it is recommended that you *not* turn on the separate null state with the CALCulate:FUNCtion command. If you do, the individual ("per function") null value set with this command, and the global null value set with the CALCulate:NULL:OFFSet command will be additive.

- A Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command) clears all null values.

Return Format

The query command returns the null value in the form "`+1.00000000E-02`".

Examples

The following command sets the null value to -0.25.

```
CURR:DC:NULL:VAL -0.25
```

The following query returns the null value.

```
CURR:DC:NULL:VAL?
```

Typical Response: `-2.50000000E-01`

See Also

[SENSe:]CURRent[:DC]:NULL[:STATe]

[SENSe:]CURRent[:DC]:PEAK:STATe

Syntax

[SENSe:]CURRent[:DC]:PEAK:STATe {ON|OFF}

[SENSe:]CURRent[:DC]:PEAK:STATe?

Description

This command (when STATe= ON) configures the dc current measurement function to also produce peak measurements, which may be retrieved separately from the main current measurement.

Remarks

- Use the FETCh:CURRent[:DC]:PEAK:MAXimum?, FETCh:CURRent[:DC]:PEAK:MINmum?, and FETCh:CURRent[:DC]:PTPeak? commands to retrieve the peak current data.

- A Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command) returns the state to off.

Return Format

The query command returns the state, either "1" (ON), or "0" (OFF).

Examples

The following command turns the peak current function on.

```
CURR:DC:PEAK:STAT ON
```

The following query returns the state.

```
CURR:DC:PEAK:STAT?
```

Typical Response:　1

See Also

FETCh:CURRent[:DC]:PEAK:MAXimum?

FETCh:CURRent[:DC]:PEAK:MINmum?

FETCh:CURRent[:DC]:PTPeak?

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

Syntax

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

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

Description

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.

Parameters

Name	Type	Range of Values	Default Value
<mode>	Boolean	{OFF|0|ON|1|ONCE}	Autorange ON

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.

- The ONCE parameter performs an immediate autorange, and then sets autoranging to OFF. (Thus, the query returns "0".)

- Selecting a discrete range (see [SENSe:]CURRent[:DC]:RANGe command) will disable autoranging.

- The instrument enables autoranging after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

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

Examples

The following command disables autoranging.

```
CURR:DC:RANG:AUTO OFF
```

The following query returns the autoranging state.

```
CURR:DC:RANG:AUTO?
```

Typical Response: 0

See Also

CONFigure:CURRent[:DC]

[SENSe:]CURRent[:DC]:RANGe

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

Syntax

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

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

Description

This command selects the measurement range for dc current measurements.

Parameters

Name	Type	Range of Values	Default Value
<range>	Discrete	Desired range in amps: 100 µA (MIN) 1 mA 10 mA 100 mA 1 A 3 A (MAX)	This is a required parameter DEF sets 1 A

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*: "±OVLD" from the front panel or "±9.9E+37" from the remote interface.

- The instrument enables autoranging after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns the range in the form "+1.00000000E-01".

Examples

The following command selects the 100 mA range.

```
CURR:DC:RANG 0.1
```

The following query returns the range selected.

```
CURR:DC:RANG?
```

Typical Response: +1.00000000E−01

See Also

[CONFigure:CURRent[:DC]](#)

[[SENSe:]CURRent[:DC]:RANGe:AUTO](#)

[SENSe:]CURRent[:DC]:RESolution

Syntax

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

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

Description

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*.

Parameters

Name	Type	Range of Values	Default Value
<resolution>	Numeric	Desired resolution in amps (see Resolution Table).	0.3 ppm x Range (1 PLC)

Remarks

- Setting the resolution with this command changes any aperture set with the [SENSe:]CURRent[:DC]:APERture command.

- 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.

- To achieve normal mode (line frequency noise) rejection, use a resolution that corresponds to an integration time that is an integral number of power line cycles (see table below). Specify a resolution of 0.3 ppm x Range (which corresponds to 1 PLC) or better to ensure normal mode rejection.

- The instrument sets the resolution to 1 PLC after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns the resolution in the form "`+1.00000000E-04`".

Examples

The following command sets the measurement resolution to 100 mA.

```
CURR:DC:RES 0.1
```

The following query returns the resolution selected.

```
CURR:DC:RES?
```

Typical Response: +1.00000000E-04

See Also

[CONFigure:CURRent[:DC]](#)

[SENSe:]CURRent[:DC]:ZERO:AUTO

Syntax

[SENSe:]CURRent[:DC]:ZERO:AUTO *<mode>*

[SENSe:]CURRent[:DC]:ZERO:AUTO?

Description

This command disables or enables the autozero mode for dc current measurements.

- When autozero is ON (default), the instrument internally disconnects the input signal following each measurement, and takes a *zero* reading. It then subtracts the zero reading from the preceding reading. This prevents offset voltages present on the instrument's input circuitry from affecting measurement accuracy.

- When autozero is OFF, the instrument uses the last measured zero reading and subtracts it from each measurement. It takes a new zero reading each time you change the function, range, or integration time.

- In the ONCE mode, the instrument takes one zero reading, and then sets autozero to off. The zero reading taken is used for all subsequent measurements until the next change to the function, range, or integration time. If the specified integration time is less than 1 PLC, the one zero reading is taken at 1 PLC to ensure best noise rejection in the zero reading, and then the subsequent measurements are taken at the specified fast integration time (for example 0.02 PLC).

Parameters

Name	Type	Range of Values	Default Value
<mode>	Discrete	{OFF|0|ON|1|ONCE}	Autozero ON

Remarks

- Autozero ONCE issues an immediate zero measurement, and then sets autozero to OFF.

- The autozero mode is set indirectly when you set the resolution and integration time using the CONfigure or MEASure commands. Autozero is automatically turned off when you select an integration time less than 1 PLC with these commands.

- The autozero mode is reset to the default (ON) at power up, or after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns "0" (OFF or ONCE) or "1" (ON).

Examples

The following command disables autozero. With autozero disabled, a new zero measurement is not issued until the next configuration change (function, range, NPLC, or aperture).

```
CURR:ZERO:AUTO OFF
```

The following query returns the autozero settings.

```
CURR:ZERO:AUTO?
```

Typical Response: 0

See Also

[CONFigure:CURRent\[:DC\]](#)

[\[SENSe:\]VOLTage\[:DC\]:ZERO:AUTO](#)

[SENSe:]FREQuency:APERture

Syntax

[SENSe:]FREQuency:APERture {*<seconds>*|MIN|MAX|DEF}

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

Description

This command selects the aperture time (also called *gate time*) for frequency measurements.

Parameters

Name	Type	Range of Values	Default Value
<seconds>	Discrete	Desired aperture in seconds: 1 ms (MIN) 10 ms 100 ms (DEF) 1 second (MAX)	This is a required parameter. DEF sets 100 ms

Remarks

- This command sets the aperture for both frequency and period measurements.

- The frequency measurement does not autorange. For frequency measurements, the *range* and *resolution* parameters affect the aperture (gate time) as follows:

Resolution	Aperture
100 ppm x *<range>*	1 ms
10 ppm x *<range>*	10 ms
1 ppm x *<range>*	100 ms (default)
0.1 ppm x *<range>*	1 s

- The instrument sets the aperture time to 100 ms after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns the aperture time in the form "+1.00000000E-01".

Examples

The following command sets the aperture to 10 ms.

```
FREQ:APER 10E-03
```

The following query returns the aperture selected.

```
FREQ:APER?
```

Typical Response: +1.00000000E-02

See Also

CONFigure:FREQuency

[SENSe:]FREQuency:NULL[:STATe]

Syntax

[SENSe:]FREQuency:NULL[:STATe] {ON|OFF}

[SENSe:]FREQuency:NULL[:STATe]?

Description

This command turns the null function on or off for frequency measurements.

Remarks

- Use the [SENSe:]FREQuency:NULL:VALue command to set the null value.

- The CONFigure:FREQuency and MEASure:FREQuency? commands turn off the null state.

- A Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command) returns the null state to off.

Return Format

The query command returns the null state, either "1" (ON), or "0" (OFF).

Examples

The following command turns the null function off.

```
FREQ:NULL:STAT OFF
```

The following query returns the null state.

```
FREQ:NULL:STAT?
```

Typical Response: 0

See Also

[SENSe:]FREQuency:NULL:VALue

CONFigure:FREQuency

MEASure:FREQuency?

[SENSe:]FREQuency:NULL:VALue

Syntax

[SENSe:]FREQuency:NULL:VALue {*<value>*|MIN|MAX}

[SENSe:]FREQuency:NULL:VALue? [{MIN|MAX}]

Description

This command stores a null value for frequency measurements. The null value is subtracted from each sample if the null state is turned on.

Parameters

The *<value>* parameter can take any value between -120% and +120% of the highest range for the present function. MIN = -120% of the highest range. MAX = +120% of the highest range. The default value is 0.

Remarks

- To use the null value, you will also need to turn on the null state with the [SENSe:]FREQuency:NULL[:STATe] command.

- When using this command, it is recommended that you *not* turn on the separate null state with the CALCulate:FUNCtion command. If you do, the individual ("per function") null value set with this command, and the global null value set with the CALCulate:NULL:OFFSet command will be additive.

- A Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command) clears all null values.

Return Format

The query command returns the null value in the form "`+1.00000000E-02`".

Examples

The following command sets the null value to -0.25.

```
FREQ:NULL:VAL -0.25
```

The following query returns the null value.

```
FREQ:NULL:VAL?
```

Typical Response: -2.50000000E-01

See Also

[SENSe:]FREQuency:NULL[:STATe]

[SENSe:]FREQuency:RANGe:LOWer

Syntax

[SENSe:]FREQuency:RANGe:LOWer {*<filter>*|MIN|MAX|DEF}

[SENSe:]FREQuency:RANGe:LOWer? [{MIN|MAX}]

Description

This command sets the ac bandwidth used to detect the signal during frequency and period measurements. The instrument uses three different ac filters. The instrument selects the slow (3 Hz), medium (20 Hz), or fast (200 Hz) filter based on the cutoff frequency that you specify with this command. Set the lowest expected frequency that you expect to encounter. The default is 20 Hz (medium).

Parameters

Name	Type	Range of Values	Default Value
<filter>	Discrete	{3|20|200} MIN = 3 Hz (slow), MAX = 200 Hz (fast)	This is a required parameter. DEF sets 20 Hz (medium)

Remarks

- Applies to frequency and period measurements, and to voltage measurements made as the second display function during frequency or period measurements.

- The *<filter>* parameter takes on one of three *discrete* values: 3, 20, or 200. However, you can enter the lowest expected frequency that you intend to encounter, and the command will automatically enter the appropriate value for *<filter>*. For example, if you enter 15 Hz, the slow filter (3 Hz) is selected. If you enter 190 Hz, the medium filter (20 Hz) is selected to provide the appropriate low cutoff.

- Set the lowest frequency that you expect to encounter. However, note that lower bandwidths result in longer settling delays. The following table shows the settling delays for the three bandwidths:

Input Frequency	Default Settling Delay
3 Hz - 300 kHz (*Slow*)	2.5 seconds/reading
20 Hz - 300 kHz (*Medium*)	0.25 second/reading
200 Hz - 300 kHz (*Fast*)	0.025 second/reading

- The CONFigure and MEASure? commands automatically select the default 20 Hz (medium) filter.

- The instrument selects the default 20 Hz (medium) filter after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns "3.0000000" (slow), "2.0000000E+1" (medium), or "2.0000000E+2" (fast).

Examples

The following command selects the slow filter (3 Hz).

```
FREQ:RANG:LOW 3
```

The following query returns the timeout setting.

```
FREQ:RANG:LOW?
```

Typical Response: 3.0000000

See Also

CONFigure:FREQuency

[SENSe:]FREQuency:VOLTage:RANGe:AUTO

Syntax

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

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

Description

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

WARNING **The maximum range parameter is 1000 V. However, the SAFETY LIMIT on the front and rear HI/LO input terminals is 750 VAC (rms). The rms voltage is waveform dependent. A sine wave is limited to 750 VAC (rms), but a 1000 Vpk square wave is safe. Connections to AC MAINS are further limited to CAT II (300V). See the "Safety Information" section in the *Agilent 34410A/11A/L4411A User's Guide* for a complete discussion of the safety features, and the safe operation of this instrument.**

Parameters

Name	Type	Range of Values	Default Value
<mode>	Boolean	{OFF|0|ON|1|ONCE}	Autorange ON

Remarks

- Autorange thresholds:

Down range at:	<10% of range (ac voltage)
Up range at:	>120% of range (ac voltage)

- With autoranging enabled, the instrument selects the appropriate voltage range based on the input signal detected.

- The ONCE parameter performs an immediate autorange, and then sets autoranging to OFF. (Thus, the query returns "0".)

- Selecting a discrete range (see [SENSe:]FREQuency:VOLTage:RANGe command) will disable autoranging.

- The instrument enables autoranging after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

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

Examples

The following command disables autoranging.

```
FREQ:VOLT:RANG:AUTO OFF
```

The following query returns the autoranging setting.

```
FREQ:VOLT:RANG:AUTO?
```

Typical Response: 0

See Also

CONFigure:FREQuency

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

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

Syntax

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

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

Description

This command selects the voltage range for frequency measurements.

WARNING **The maximum range parameter is 1000 V, which is set by MAX. However, the SAFETY LIMIT on the front and rear HI/LO input terminals is 750 VAC (rms). The rms voltage is waveform dependent. A sine wave is limited to 750 VAC (rms), but a 1000 Vpk square wave is safe. Connections to AC MAINS are further limited to CAT II (300V). See the "Safety Information" section in the *Agilent 34410A/11A/L4411A User's Guide* for a complete discussion of the safety features, and the safe operation of this instrument.**

Parameters

Name	Type	Range of Values	Default Value
<voltage_range>	Discrete	Desired range in volts: 100 mV (MIN) 1 V 10 V (DEF) 100 V 1000 V (MAX)	This is a required parameter. DEF sets 10 V

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*: "VAC Overload" from the front panel or "+9.9E+37" from the remote interface.

- The instrument enables autoranging after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns the voltage range in the form
"+1.00000000E+01".

Examples

The following command selects the 10 volt range for frequency measurements.

```
FREQ:VOLT:RANG 10
```

The following query returns the voltage range selected.

```
FREQ:VOLT:RANG?
```

Typical Response: +1.00000000E+01

See Also

[CONFigure:FREQuency](#)

[[SENSe:]FREQuency[:VOLTage]:RANGe:AUTO](#)

[SENSe:]PERiod:APERture

Syntax

[SENSe:]PERiod:APERture {*<seconds>*|MIN|MAX|DEF}

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

Description

This command selects the aperture time (also called *gate time*) for period measurements.

Parameters

Name	Type	Range of Values	Default Value
<seconds>	Discrete	Desired aperture in seconds: 1 ms (MIN) 10 ms 100 ms (DEF) 1 second (MAX)	This is a required parameter. DEF sets 100 ms

Remarks

- This command sets the aperture for both frequency and period measurements.

- The frequency measurement does not autorange. For frequency measurements, the *range* and *resolution* parameters affect the aperture (gate time) as follows:

Resolution	Aperture
100 ppm x *<range>*	1 ms
10 ppm x *<range>*	10 ms
1 ppm x *<range>*	100 ms (default)
0.1 ppm x *<range>*	1 s

- The instrument sets the aperture time to 100 ms after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns the aperture time in the form "`+1.00000000E-01`".

Examples

The following command sets the aperture to 10 ms.

```
PER:APER 10E-03
```

The following query returns the aperture selected.

```
PER:APER?
```

Typical Response: +1.00000000E-02

See Also

[CONFigure:PERiod](#)

[SENSe:]PERiod:NULL[:STATe]

Syntax

[SENSe:]PERiod:NULL[:STATe] {ON|OFF}

[SENSe:]PERiod:NULL[:STATe]?

Description

This command turns the null function on or off for period measurements.

Remarks

- Use the [SENSe:]PERiod:NULL:VALue command to set the null value.

- The CONFigure:PERiod and MEASure:PERiod? commands turn off the null state.

- A Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command) returns the null state to off.

Return Format

The query command returns the null state, either "1" (ON), or "0" (OFF).

Examples

The following command turns the null function off.

```
PER:NULL:STAT OFF
```

The following query returns the null state.

```
PER:NULL:STAT?
```

Typical Response: 0

See Also

[SENSe:]PERiod:NULL:VALue

CONFigure:PERiod

MEASure:PERiod?

[SENSe:]PERiod:NULL:VALue

Syntax

[SENSe:]PERiod:NULL:VALue {*<value>*|MIN|MAX}

[SENSe:]PERiod:NULL:VALue? [{MIN|MAX}]

Description

This command stores a null value for period measurements. The null value is subtracted from each sample if the null state is turned on.

Parameters

The *<value>* parameter can take any value between -120% and +120% of the highest range for the present function. MIN = -120% of the highest range. MAX = +120% of the highest range. The default value is 0.

Remarks

- To use the null value, you will also need to turn on the null state with the [SENSe:]PERiod:NULL[:STATe] command.

- When using this command, it is recommended that you *not* turn on the separate null state with the CALCulate:FUNCtion command. If you do, the individual ("per function") null value set with this command, and the global null value set with the CALCulate:NULL:OFFSet command will be additive.

- A Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command) clears all null values.

Return Format

The query command returns the null value in the form "`+1.00000000E-02`".

Examples

The following command sets the null value to -0.25.

```
PER:NULL:VAL -0.25
```

The following query returns the null value.

```
PER:NULL:VAL?
```

Typical Response: -2.50000000E-01

See Also

[SENSe:]PERiod:NULL[:STATe]

[SENSe:]PERiod:RANGe:LOWer

Syntax

[SENSe:]PERiod:RANGe:LOWer {*<filter>*|MIN|MAX|DEF}

[SENSe:]PERiod:RANGe:LOWer? [{MIN|MAX}]

Description

This command sets the ac bandwidth used to detect the signal during period and frequency measurements. The instrument uses three different ac filters. The instrument selects the slow (3 Hz), medium (20 Hz), or fast (200 Hz) filter based on the cutoff frequency that you specify with this command. Set the lowest expected frequency that you expect to encounter. The default is 20 Hz (medium).

Parameters

Name	Type	Range of Values	Default Value
<filter>	Discrete	{3|20|200} MIN = 3 Hz (slow), MAX = 200 Hz (fast)	This is a required parameter. DEF sets 20 Hz (medium)

Remarks

- Applies to period and frequency measurements, and to voltage measurements made as the second display function during frequency or period measurements.

- The *<filter>* parameter takes on one of three *discrete* values: 3, 20, or 200. However, you can enter the lowest expected frequency that you intend to encounter, and the command will automatically enter the appropriate value for *<filter>*. For example, if you enter 15 Hz, the slow filter (3 Hz) is selected. If you enter 190 Hz, the medium filter (20 Hz) is selected to provide the appropriate low cutoff.

- Set the lowest frequency that you expect to encounter. However, note that lower bandwidths result in longer settling delays. The following table shows the settling delays for the three bandwidths:

Input Frequency	Default Settling Delay
3 Hz - 300 kHz (*Slow*)	2.5 seconds/reading
20 Hz - 300 kHz (*Medium*)	0.25 second/reading
200 Hz - 300 kHz (*Fast*)	0.025 second/reading

- The CONFigure and MEASure? commands automatically select the default 20 Hz (medium) filter.

- The instrument selects the default 20 Hz (medium) filter after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns "3.0000000" (slow), "2.0000000E+1" (medium), or "2.0000000E+2" (fast).

Examples

The following command selects the slow filter (3 Hz).

```
PER:RANG:LOW 3
```

The following query returns the timeout setting.

```
PER:RANG:LOW?
```

Typical Response: 3.0000000

See Also

[CONFigure:PERiod](#)

[SENSe:]PERiod:VOLTage:RANGe:AUTO

Syntax

[SENSe:]PERiod:VOLTage:RANGe:AUTO *<mode>*

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

Description

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

WARNING **The maximum range parameter is 1000 V. However, the SAFETY LIMIT on the front and rear HI/LO input terminals is 750 VAC (rms). The rms voltage is waveform dependent. A sine wave is limited to 750 VAC (rms), but a 1000 Vpk square wave is safe. Connections to AC MAINS are further limited to CAT II (300V). See the "Safety Information" section in the *Agilent 34410A/11A/L4411A User's Guide* for a complete discussion of the safety features, and the safe operation of this instrument.**

Parameters

Name	Type	Range of Values	Default Value
<mode>	Boolean	{OFF|0|ON|1|ONCE}	Autorange ON

Remarks

- Autorange thresholds:

  Down range at: <10% of range (ac voltage)

  Up range at: >120% of range (ac voltage)

- With autoranging enabled, the instrument selects the appropriate voltage range based on the input signal detected.

- The ONCE parameter performs an immediate autorange, and then sets autoranging to OFF. (Thus, the query returns "0".)

- Selecting a discrete range (see [SENSe:]PERiod:VOLTage:RANGe command) will disable autoranging.

- The instrument enables autoranging after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

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

Examples

The following command disables autoranging.

```
PER:VOLT:RANG:AUTO OFF
```

The following query returns the autoranging setting.

```
PER:VOLT:RANG:AUTO?
```

Typical Response: 0

See Also

[CONFigure:PERiod](#)

[[SENSe:]PERiod[:VOLTage]:RANGe[:UPPer]](#)

[SENSe:]PERiod:VOLTage:RANGe[:UPPer]

Syntax

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

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

Description

This command selects the voltage range for period measurements.

WARNING **The maximum range parameter is 1000 V, which is set by MAX. However, the SAFETY LIMIT on the front and rear HI/LO input terminals is 750 VAC (rms). The rms voltage is waveform dependent. A sine wave is limited to 750 VAC (rms), but a 1000 Vpk square wave is safe. Connections to AC MAINS are further limited to CAT II (300V). See the "Safety Information" section in the *Agilent 34410A/11A/L4411A User's Guide* for a complete discussion of the safety features, and the safe operation of this instrument.**

Parameters

Name	Type	Range of Values	Default Value
<voltage_range>	Discrete	Desired range in volts: 100 mV (MIN) 1 V 10 V (DEF) 100 V 1000 V (MAX)	This is a required parameter. DEF sets 10 V

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*: "VAC Overload" from the front panel or "+9.9E+37" from the remote interface.

- The instrument enables autoranging after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns the voltage range in the form "+1.00000000E+01".

Examples

The following command selects the 10 volt range for period measurements.

```
PER:VOLT:RANG 10
```

The following query returns the voltage range selected.

```
PER:VOLT:RANG?
```

Typical Response: +1.00000000E+01

See Also

[CONFigure:PERiod](#)

[[SENSe:]PERiod[:VOLTage]:RANGe:AUTO](#)

[SENSe:]FRESistance:APERture

Syntax

[SENSe:]FRESistance:APERture {*<seconds>*|MIN|MAX|DEF}

[SENSe:]FRESistance:APERture? [{MIN|MAX}]

Description

This command selects the integration time in seconds (called *aperture time*) for resistance measurements.

> **NOTE**
>
> You should use this command only when you want precise control of the integration time of the multimeter. Otherwise, specifying integration time using NPLC (see [SENSe:]FRESistance:NPLC command) offers better power-line noise rejection characteristics (for values of NPLC greater than 1).

Parameters

Name	Type	Range of Values*	Default Value
<seconds>	Numeric	Desired aperture time in seconds: **34410A:** ~100 μs to ~1 s (with ~20 μs resolution). MIN = ~100 μs, MAX = ~1 s **34411A/L4411A:** ~20 μs to ~1 s (with ~20 μs resolution). MIN = ~20 μs, MAX = ~1 s	This is a required parameter DEF sets ~100 ms

Remarks

- This command affects both 2-wire and 4-wire resistance measurements. All FRES and RES commands affect the equivalent settings for **all** resistance measurements.

- Due to internal quantization, the actual aperture that you set may be slightly different than your specified value. The increment is approximately 20 μs. Use the query command to determine the exact aperture that is set. For example, if you send "FRES:APER 500 ms", and then send the query "FRES:APER?" the actual aperture is returned (for example: "+5.00000753E-01").

- Setting an aperture with this command changes any integration time selected with the [SENSe:]FRESistance:NPLC or [SENSe:]RESistance:NPLC command.

- To obtain best normal mode (line frequency noise) rejection, set an integration time equivalent to an integral number of power line cycles with the [SENSe:]FRESistance:NPLC command.

- The instrument disables aperture and sets the integration time to 1 PLC after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns the aperture time in the form "+1.00000000E-01".

Examples

The following command sets the aperture time to 300 ms.

```
FRES:APER 300E-03
```

The following query returns the aperture time selected.

```
FRES:APER?
```

Typical Response: +3.00000000E-01

See Also

[CONFigure:FRESistance](#)

[[SENSe:]FRESistance:APERture:ENABled](#)

[SENSe:]FRESistance:APERture:ENABled

Syntax

[SENSe:]FRESistance:APERture:ENABled {ON|OFF}

[SENSe:]FRESistance:APERture:ENABled?

Description

This command queries whether an aperture time is enabled or disabled for resistance measurements.

Remarks

- This query determines whether the aperture used for both 2-wire and 4-wire resistance measurements is enabled.

- The CONFigure:FRESistance, MEASure:FRESistance?, [SENSe:]FRESistance:NPLC, and [SENSe:]FRESistance:RESolution commands disable the aperture time mode (these commands select an integration time in number of power line cycles).

Return Format

The query command returns "0" if the aperture time mode is disabled or "1" if the aperture time mode is enabled.

Example

The following command returns the state of the aperture time mode.

```
FRES:APER:ENAB?
```

Typical Response: 1

See Also

CONFigure:FRESistance

[\[SENSe:\]FRESistance:APERture]([SENSe:]FRESistance:APERture)

[SENSe:]FRESistance:NPLC

Syntax

[SENSe:]FRESistance:NPLC {*<PLCs>*|MIN|MAX|DEF}

[SENSe:]FRESistance:NPLC? [{MIN|MAX}]

Description

This command sets the [integration time](#) in number of power line cycles (PLCs) for resistance measurements. Integration time affects the measurement resolution (for better resolution, use a longer integration time) and measurement speed (for faster measurements, use a shorter integration time).

Parameters

Name	Type	Range of Values*	Defa Valu
<PLCs>	Discrete	**34410A:** {0.006|0.02|0.06|0.2|1|2|10|100} MIN = 0.006 PLC, MAX = 100 PLC **34411A/L4411A:** {0.001|0.002|0.006|0.02|0.06|0.2|1|2|10|100} MIN = 0.001 PLC, MAX = 100 PLC	This requ para DEF PLC
		See Range, Resolution, and NPLC for more information.	

Remarks

- This command affects both 2-wire and 4-wire resistance measurements. All FRES and RES commands affect the equivalent settings for **all** resistance measurements.

- Selecting an integration time with this command changes any aperture set with the [SENSe:]FRESistance:APERture command.

- Only those integration times set to an integral number of power line cycles (1, 2, 10, or 100 PLCs) provide normal mode (line frequency noise) rejection.

- Setting the integration time also sets the resolution for the measurement. The following table shows the relationship between integration time and resolution.

Integration Time (power line cycles)	Resolution
0.001 PLC (34411A/L4411A)	30 ppm x Range
0.002 PLC (34411A/L4411A)	15 ppm x Range
0.006 PLC	6.0 ppm x Range
0.02 PLC	3.0 ppm x Range
0.06 PLC	1.5 ppm x Range
0.2 PLC	0.7 ppm x Range
1 PLC (default)	0.3 ppm x Range
2 PLC	0.2 ppm x Range
10 PLC	0.1 ppm x Range

100 PLC	0.03 ppm x Range

- The instrument sets the integration time to 1 PLC (and turns off aperture mode) after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns the integration time in the form
"+1.00000000E+00".

Examples

The following command set the integration time to 0.2 PLCs.

```
FRES:NPLC 0.2
```

The following query returns the integration time settings.

```
FRES:NPLC?
```

Typical Response: +2.00000000E-01

See Also

[CONFigure:FRESistance](#)

[SENSe:]FRESistance:NULL[:STATe]

Syntax

[SENSe:]FRESistance:NULL[:STATe] {ON|OFF}

[SENSe:]FRESistance:NULL[:STATe]?

Description

This command turns the null function on or off for resistance measurements.

Remarks

- This command affects both 2-wire and 4-wire resistance measurements. All FRES and RES commands affect the equivalent settings for *all* resistance measurements.

- Use the [SENSe:]FRESistance:NULL:VALue command to set the null value.

- The CONFigure:FRESistance and MEASure:FRESistance? commands turn off the null state.

- A Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command) returns the null state to off.

Return Format

The query command returns the null state, either "1" (ON), or "0" (OFF).

Examples

The following command turns the null function off.

```
FRES:NULL:STAT OFF
```

The following query returns the null state.

```
FRES:NULL:STAT?
```

Typical Response: 0

See Also

[SENSe:]FRESistance:NULL:VALue

CONFigure:FRESistance

MEASure:FRESistance?

[SENSe:]FRESistance:NULL:VALue

Syntax

[SENSe:]FRESistance:NULL:VALue {*<value>*|MIN|MAX}

[SENSe:]FRESistance:NULL:VALue? [{MIN|MAX}]

Description

This command stores a null value for resistance measurements. The null value is subtracted from each sample if the null state is turned on.

Parameters

The *<value>* parameter can take any value between -120% and +120% of the highest range for the present function. MIN = -120% of the highest range. MAX = +120% of the highest range. The default value is 0.

Remarks

- This command affects both 2-wire and 4-wire resistance measurements. All FRES and RES commands affect the equivalent settings for **all** resistance measurements.

- To use the null value, you will also need to turn on the null state with the [SENSe:]FRESistance:NULL[:STATe] command.

- When using this command, it is recommended that you *not* turn on the separate null state with the CALCulate:FUNCtion command. If you do, the individual ("per function") null value set with this command, and the global null value set with the CALCulate:NULL:OFFSet command will be additive.

- A Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command) clears all null values.

Return Format

The query command returns the null value in the form "`+1.00000000E-02`".

Examples

The following command sets the null value to -0.25.

```
FRES:NULL:VAL -0.25
```

The following query returns the null value.

```
FRES:NULL:VAL?
```

Typical Response: -2.50000000E-01

See Also

[SENSe:]FRESistance:NULL[:STATe]

[SENSe:]FRESistance:OCOMpensated

Syntax

[SENSe:]FRESistance:OCOMpensated *<mode>*

[SENSe:]FRESistance:OCOMpensated?

Description

This command enables or disables offset compensation for resistance measurements. Offset compensation removes the effects of small dc voltages in the circuit being measured. The technique involves taking the difference between two resistance measurements, one with the current source set to the normal value, and one with the current source set to a lower value.

Parameters

Name	Type	Range of Values	Default Value
<mode>	Boolean	{OFF|0|ON|1}	OFF|0

Remarks

- This command affects both 2-wire and 4-wire resistance measurements. All FRES and RES commands affect the equivalent settings for *all* resistance measurements.

- Applies only to resistance measurements on the 100Ω, 1 kΩ, and 10 kΩ ranges.

- The instrument disables offset compensation after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

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

Examples

The following command enables offset compensation.

```
FRES:OCOM ON
```

The following query returns the offset compensation setting.

```
FRES:OCOM?
```

Typical Response: 1

See Also

[CONFigure:FRESistance](#)

[SENSe:]FRESistance:RANGe:AUTO

Syntax

[SENSe:]FRESistance:RANGe:AUTO *<mode>*

[SENSe:]FRESistance:RANGe:AUTO?

Description

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

Parameters

Name	Type	Range of Values	Default Value
<mode>	Boolean	{OFF|0|ON|1|ONCE}	Autorange ON

Remarks

- This command affects both 2-wire and 4-wire resistance measurements. All FRES and RES commands affect the equivalent settings for **all** resistance measurements.

- 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.

- The ONCE parameter performs an immediate autorange, and then sets autoranging to OFF. (Thus, the query returns "0".)

- Selecting a discrete range (see [SENSe:]FRESistance:RANGe command) will disable autoranging.

- The instrument enables autoranging after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

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

Examples

The following command disables autoranging.

```
FRES:RANG:AUTO OFF
```

The following query returns the autoranging settings.

```
FRES:RANG:AUTO?
```

Typical Response: 0

See Also

[CONFigure:FRESistance](#)

[[SENSe:]FRESistance:RANGe](#)

[SENSe:]FRESistance:RANGe[:UPPer]

Syntax

[SENSe:]FRESistance:RANGe[:UPPer] {*<range>*|MIN|MAX|DEF}

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

Description

This command selects the measurement range for resistance measurements.

Parameters

Name	Type	Range of Values	Default Value
<range>	Discrete	Desired range in ohms: 100 Ω (MIN) 1 kΩ 10 kΩ 100 kΩ 1 MΩ 10 MΩ 100 MΩ 1 GΩ (MAX)	This is a required parameter. DEF sets 1 kΩ

Remarks

- This command affects both 2-wire and 4-wire resistance measurements. All FRES and RES commands affect the equivalent settings for **all** resistance measurements.

- 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*: "OVLD" from the front panel or "+9.9E+37" from the remote interface.

- The instrument enables autoranging after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns the range in the form "+1.00000000E+03".

Examples

The following command selects the 10 kΩ range.

```
FRES:RANG 10E+3
```

The following query returns the range selected.

```
FRES:RANG?
```

Typical Response: +1.00000000E+04

See Also

[CONFigure:FRESistance](#)

[[SENSe:]FRESistance:RANGe:AUTO](#)

[SENSe:]FRESistance:RESolution

Syntax

[SENSe:]FRESistance:RESolution {*<resolution>*|MIN|MAX|DEF}

[SENSe:]FRESistance:RESolution? [{MIN|MAX}]

Description

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

Parameters

Name	Type	Range of Values	Default Value
<resolution>	Numeric	Desired resolution in ohms (see Resolution Table).	0.3 ppm x Range (1 PLC)

Remarks

- This command affects both 2-wire and 4-wire resistance measurements. All FRES and RES commands affect the equivalent settings for **all** resistance measurements.

- Setting the resolution with this command changes any aperture set with the [SENSe:]FRESistance:APERture command.

- 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.

- To achieve normal mode (line frequency noise) rejection, use a resolution that corresponds to an integration time that is an integral number of power line cycles (see table below). Specify a resolution of 0.3 ppm x Range (which corresponds to 1 PLC) or better to ensure normal mode rejection.

- The instrument sets the resolution to 1 PLC after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns the resolution in the form "`+1.00000000E+02`".

Examples

The following command sets the measurement resolution to 100 Ω.

```
FRES:RES 100
```

The following query returns the resolution selected.

```
FRES:RES?
```

Typical Response: +1.00000000E+02

See Also

[CONFigure:FRESistance](#)

[SENSe:]RESistance:APERture

Syntax

[SENSe:]RESistance:APERture {*<seconds>*|MIN|MAX|DEF}

[SENSe:]RESistance:APERture? [{MIN|MAX}]

Description

This command selects the integration time in seconds (called *aperture time*) for resistance measurements.

NOTE

You should use this command only when you want precise control of the integration time of the multimeter. Otherwise, specifying integration time using NPLC (see [SENSe:]RESistance:NPLC command) offers better power-line noise rejection characteristics (for values of NPLC greater than 1).

Parameters

Name	Type	Range of Values*	Default Value
<seconds>	Numeric	Desired aperture time in seconds: **34410A:** ~100 µs to ~1 s (with ~20 µs resolution). MIN = ~100 µs, MAX = ~1 s **34411A/L4411A:** ~20 µs to ~1 s (with ~20 µs resolution). MIN = ~20 µs, MAX = ~1 s	This is a required parameter DEF sets ~100 ms

Remarks

- This command affects both 2-wire and 4-wire resistance measurements. All FRES and RES commands affect the equivalent settings for *all* resistance measurements.

- Due to internal quantization, the actual aperture that you set may be slightly different than your specified value. The increment is approximately 20 µs. Use the query command to determine the exact aperture that is set. For example, if you send "RES:APER 500 ms", and then send the query "RES:APER?" the actual aperture is returned (for example: "+5.00000753E-01").

- Setting an aperture with this command changes any integration time selected with the [SENSe:]RESistance:NPLC or [SENSe:]FRESistance:NPLC command.

- To obtain best normal mode (line frequency noise) rejection, set an integration time equivalent to an integral number of power line cycles with the [SENSe:]RESistance:NPLC command.

- The instrument disables aperture and sets the integration time to 1 PLC after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns the aperture time in the form "`+1.00000000E-01`".

Examples

The following command sets the aperture time to 300 ms.

```
RES:APER 300E-03
```

The following query returns the aperture time selected.

```
RES:APER?
```

Typical Response: +3.00000000E-01

See Also

[CONFigure:RESistance](#)

[[SENSe:]RESistance:APERture:ENABled](#)

[SENSe:]RESistance:APERture:ENABled

Syntax

[SENSe:]RESistance:APERture:ENABled {ON|OFF}

[SENSe:]RESistance:APERture:ENABled?

Description

This command queries whether an aperture time is enabled or disabled for resistance measurements.

Remarks

- This query determines whether the aperture used for both 2-wire and 4-wire resistance measurements is enabled.

- The CONFigure:RESistance, MEASure:RESistance?, [SENSe:]RESistance:NPLC, and [SENSe:]RESistance:RESolution commands disable the aperture time mode (these commands select an integration time in number of power line cycles).

Return Format

The query command returns "0" if the aperture time mode is disabled, or "1" if the aperture time mode is enabled.

Example

The following command returns the state of the aperture time mode.

```
RES:APER:ENAB?
```

Typical Response: 1

See Also

[CONFigure:RESistance](#)

[[SENSe:]RESistance:APERture](#)

[SENSe:]RESistance:NPLC

Syntax

[SENSe:]RESistance:NPLC {*<PLCs>*|MIN|MAX|DEF}

[SENSe:]RESistance:NPLC? [{MIN|MAX}]

Description

This command sets the [integration time](#) in number of power line cycles (PLCs) for resistance measurements. Integration time affects the measurement resolution (for better resolution, use a longer integration time) and measurement speed (for faster measurements, use a shorter integration time).

Parameters

Name	Type	Range of Values*	Defa... Valu...
<PLCs>	Discrete	**34410A:** {0.006|0.02|0.06|0.2|1|2|10|100} MIN = 0.006 PLC, MAX = 100 PLC **34411A/L4411A:** {0.001|0.002|0.006|0.02|0.06|0.2|1|2|10|100} MIN = 0.001 PLC, MAX = 100 PLC	This requ... para... DEF PLC
		See Range, Resolution, and NPLC for more information.	

Remarks

- This command affects both 2-wire and 4-wire resistance measurements. All FRES and RES commands affect the equivalent settings for **all** resistance measurements.

- Selecting an integration time with this command changes any aperture set with the [SENSe:]RESistance:APERture command.

- Only those integration times set to an integral number of power line cycles (1, 2, 10, or 100 PLCs) provide normal mode (line frequency noise) rejection.

- Setting the integration time also sets the resolution for the measurement. The following table shows the relationship between integration time and resolution.

Integration Time (power line cycles)	Resolution
0.001 PLC *(34411A/L4411A)*	30 ppm x Range
0.002 PLC *(34411A/L4411A)*	15 ppm x Range
0.006 PLC	6.0 ppm x Range
0.02 PLC	3.0 ppm x Range
0.06 PLC	1.5 ppm x Range
0.2 PLC	0.7 ppm x Range
1 PLC (default)	0.3 ppm x Range
2 PLC	0.2 ppm x Range
10 PLC	0.1 ppm x Range

| 100 PLC | 0.03 ppm x Range |

- The instrument sets the integration time to 1 PLC (and turns off aperture mode) after a Factory Reset ([*RST](#) command) or an Instrument Preset ([SYSTem:PRESet](#) command).

Return Format

The query command returns the integration time in the form
`"+1.00000000E+00"`.

Examples

The following command set the integration time to 0.2 PLCs.

```
RES:NPLC 0.2
```

The following query returns the integration time setting.

```
RES:NPLC?
```

Typical Response: +2.00000000E-01

See Also

[CONFigure:RESistance](#)

[SENSe:]RESistance:NULL[:STATe]

Syntax

[SENSe:]RESistance:NULL[:STATe] {ON|OFF}

[SENSe:]RESistance:NULL[:STATe]?

Description

This command turns the null function on or off for resistance measurements.

Remarks

- This command affects both 2-wire and 4-wire resistance measurements. All FRES and RES commands affect the equivalent settings for **all** resistance measurements.

- Use the [SENSe:]RESistance:NULL:VALue command to set the null value.

- The CONFigure:RESistance and MEASure:RESistance? commands turn off the null state.

- A Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command) returns the null state to off.

Return Format

The query command returns the null state, either "1" (ON), or "0" (OFF).

Examples

The following command turns the null function off.

```
RES:NULL:STAT OFF
```

The following query returns the null state.

```
RES:NULL:STAT?
```

Typical Response: 0

See Also

[SENSe:]RESistance:NULL:VALue

CONFigure:RESistance

MEASure:RESistance?

[SENSe:]RESistance:NULL:VALue

Syntax

[SENSe:]RESistance:NULL:VALue {*<value>*|MIN|MAX}

[SENSe:]RESistance:NULL:VALue? [{MIN|MAX}]

Description

This command stores a null value for resistance measurements. The null value is subtracted from each sample if the null state is turned on.

Parameters

The *<value>* parameter can take any value between -120% and +120% of the highest range for the present function. MIN = -120% of the highest range. MAX = +120% of the highest range. The default value is 0.

Remarks

- This command affects both 2-wire and 4-wire resistance measurements. All FRES and RES commands affect the equivalent settings for **all** resistance measurements.

- To use the null value, you will also need to turn on the null state with the [SENSe:]RESistance:NULL[:STATe] command.

- When using this command, it is recommended that you *not* turn on the separate null state with the CALCulate:FUNCtion command. If you do, the individual ("per function") null value set with this command, and the global null value set with the CALCulate:NULL:OFFSet command will be additive.

- A Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command) clears all null values.

Return Format

The query command returns the null value in the form "`+1.00000000E-02`".

Examples

The following command sets the null value to -0.25.

```
RES:NULL:VAL -0.25
```

The following query returns the null value.

```
RES:NULL:VAL?
```

Typical Response: -2.50000000E-01

See Also

[SENSe:]RESistance:NULL[:STATe]

[SENSe:]RESistance:OCOMpensated

Syntax

[SENSe:]RESistance:OCOMpensated *<mode>*

[SENSe:]RESistance:OCOMpensated?

Description

This command enables or disables offset compensation for resistance measurements. Offset compensation removes the effects of small dc voltages in the circuit being measured. The technique involves taking the difference between two resistance measurements, one with the current source set to the normal value, and one with the current source set to a lower value.

Parameters

Name	Type	Range of Values	Default Value
<mode>	Boolean	{OFF|0|ON|1}	OFF|0

Remarks

- This command affects both 2-wire and 4-wire resistance measurements. All FRES and RES commands affect the equivalent settings for **_all_** resistance measurements.

- Applies only to resistance measurements on the 100Ω, 1 kΩ, and 10 kΩ ranges.

- The instrument disables offset compensation after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

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

Examples

The following command enables offset compensation.

```
RES:OCOM ON
```

The following query returns the offset compensation setting.

```
RES:OCOM?
```

Typical Response: 1

See Also

[CONFigure:RESistance](#)

[SENSe:]RESistance:RANGe:AUTO

Syntax

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

[SENSe:]RESistance:RANGe:AUTO?

Description

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

Parameters

Name	Type	Range of Values	Default Value
<mode>	Boolean	{OFF|0|ON|1|ONCE}	Autorange ON

Remarks

- This command affects both 2-wire and 4-wire resistance measurements. All FRES and RES commands affect the equivalent settings for **all** resistance measurements.

- 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.

- The ONCE parameter performs an immediate autorange, and then sets autoranging to OFF. (Thus, the query returns "0".)

- Selecting a discrete range (see [SENSe:]RESistance:RANGe command) will disable autoranging.

- The instrument enables autoranging after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

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

Examples

The following command disables autoranging.

```
RES:RANG:AUTO OFF
```

The following query returns the autoranging setting.

```
RES:RANG:AUTO?
```

Typical Response: 0

See Also

[CONFigure:RESistance](#)

[[SENSe:]RESistance:RANGe](#)

[SENSe:]RESistance:RANGe[:UPPer]

Syntax

[SENSe:]RESistance:RANGe[:UPPer] {*<range>*|MIN|MAX|DEF}

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

Description

This command selects the measurement range for resistance measurements.

Parameters

Name	Type	Range of Values	Default Value
<range>	Discrete	Desired range in ohms: 100 Ω (MIN) 1 kΩ 10 kΩ 100 kΩ 1 MΩ 10 MΩ 100 MΩ 1 GΩ (MAX)	This is a required parameter. DEF sets 1 kΩ

Remarks

- This command affects both 2-wire and 4-wire resistance measurements. All FRES and RES commands affect the equivalent settings for **all** resistance measurements.

- 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*: "OVLD" from the front panel or "+9.9E+37" from the remote interface.

- The instrument enables autoranging after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns the range in the form "$+1.00000000E+03$".

Examples

The following command selects the 10 kΩ range.

```
RES:RANG 10E+3
```

The following query returns the range selected.

```
RES:RANG?
```

Typical Response: +1.00000000E+04

See Also

CONFigure:RESistance

[SENSe:]RESistance:RANGe:AUTO

[SENSe:]RESistance:RESolution

Syntax

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

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

Description

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

Parameters

Name	Type	Range of Values	Default Value
<resolution>	Numeric	Desired resolution in ohms (see Resolution Table).	0.3 ppm x Range (1 PLC)

Remarks

- This command affects both 2-wire and 4-wire resistance measurements. All FRES and RES commands affect the equivalent settings for ***all*** resistance measurements.

- Setting the resolution with this command changes any aperture set with the [SENSe:]RESistance:APERture command.

- 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.

- To achieve normal mode (line frequency noise) rejection, use a resolution that corresponds to an integration time that is an integral number of power line cycles (see table below). Specify a resolution of 0.3 ppm x Range (which corresponds to 1 PLC) or better to ensure normal mode rejection.

- The instrument sets the resolution to 1 PLC after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns the resolution in the form "`+1.00000000E+02`".

Examples

The following command sets the measurement resolution to 100Ω.

```
RES:RES 100
```

The following query returns the resolution selected.

```
RES:RES?
```

Typical Response: +1.00000000E+02

See Also

[CONFigure:RESistance](#)

[SENSe:]RESistance:ZERO:AUTO

Syntax

[SENSe:]RESistance:ZERO:AUTO *<mode>*

[SENSe:]RESistance:ZERO:AUTO?

Description

This command disables or enables the autozero mode for resistance measurements.

- When autozero is ON (default), the instrument internally disconnects the input signal following each measurement, and takes a *zero* reading. It then subtracts the zero reading from the preceding reading. This removes offset variations present on the instrument's input circuitry that might affect measurement accuracy.

- When autozero is OFF, the instrument uses the last measured zero reading and subtracts it from each measurement. It takes a new zero reading each time you change the function, range, or integration time.

- In the ONCE mode, the instrument takes one zero reading, and then sets autozero to off. The zero reading taken is used for all subsequent measurements until the next change to the function, range, or integration time. If the specified integration time is less than 1 PLC, the one zero reading is taken at 1 PLC to ensure best noise rejection in the zero reading, and then the subsequent measurements are taken at the specified fast integration time (for example 0.02 PLC).

Parameters

Name	Type	Range of Values	Default Value
<mode>	Discrete	{OFF|0|ON|1|ONCE}	Autozero ON

Remarks

- This command does not affect 4-wire resistance measurements. All 4-wire measurements are made with autozero ON, regardless of the state set or returned by this command or query.

- Autozero ONCE issues an immediate zero measurement, and then sets autozero to OFF.

- The autozero mode is set indirectly when you set the resolution and integration time using the CONfigure or MEASure commands. Autozero is automatically turned off when you select an integration time less than 1 PLC with these commands.

- The autozero mode is reset to the default (ON) at power up, or after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns "0" (OFF or ONCE) or "1" (ON).

Examples

The following command disables autozero. With autozero disabled, a new zero measurement is not issued until the next configuration change (function, range, NPLC, or aperture).

```
RES:ZERO:AUTO OFF
```

The following query returns the autozero setting.

```
RES:ZERO:AUTO?
```

Typical Response: 0

See Also

[CONFigure:RESistance](#)

[SENSe:]TEMPerature:APERture

Syntax

[SENSe:]TEMPerature:APERture {*<seconds>*|MIN|MAX|DEF}

[SENSe:]TEMPerature:APERture? [{MIN|MAX}]

Description

This command selects the integration time in seconds (called *aperture time*) for temperature measurements.

| NOTE | You should use this command only when you want precise control of the integration time of the multimeter. Otherwise, specifying integration time using NPLC (see [SENSe:]TEMPerature:NPLC command) offers better power-line noise rejection characteristics (for values of NPLC greater than 1). |

Parameters

Name	Type	Range of Values*	Default Value
<seconds>	Numeric	Desired aperture time in seconds: **34410A:** ~100 µs to ~1 s (with ~20 µs resolution). MIN = ~100 µs, MAX = ~1 s **34411A/L4411A:** ~20 µs to ~1 s (with ~20 µs resolution). MIN = ~20 µs, MAX = ~1 s	This is a required parameter DEF sets ~100 ms

Remarks

- Due to internal quantization, the actual aperture that you set may be slightly different than your specified value. The increment is approximately 20 μs. Use the query command to determine the exact aperture that is set. For example, if you send "TEMP:APER 500 ms", and then send the query "TEMP:APER?" the actual aperture is returned (for example: "+5.00000753E-01").

- Setting an aperture with this command changes any integration time selected with the [SENSe:]TEMPerature:NPLC command.

- To obtain best normal mode (line frequency noise) rejection, set an integration time equivalent to an integral number of power line cycles with the [SENSe:]TEMPerature:NPLC command.

- The instrument disables aperture and sets the integration time to 1 PLC after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns the aperture time in the form "+1.00000000E-01".

Examples

The following command sets the aperture time to 300 ms.

```
TEMP:APER 300E-03
```

The following query returns the aperture time selected.

```
TEMP:APER?
```

Typical Response: +3.00000000E-01

CONFigure:TEMPerature

[SENSe:]TEMPerature:APERture:ENABled

[SENSe:]TEMPerature:APERture:ENABled

Syntax

[SENSe:]TEMPerature:APERture:ENABled {ON|OFF}

[SENSe:]TEMPerature:APERture:ENABled?

Description

This command queries whether an aperture time is enabled or disabled for temperature measurements.

Remarks

- The CONFigure:TEMPerature, MEASure:TEMPerature?, [SENSe:]TEMPerature:NPLC, and [SENSe:]TEMPerature:RESolution commands disable the aperture time mode (these commands select an integration time in number of power line cycles).

Return Format

The query command returns "0" is the aperture time mode is disabled or "1" if the aperture time mode is enabled.

Example

The following command returns the state of the aperture time mode.

```
TEMP:APER:ENAB?
```

Typical Response: 1

See Also

[CONFigure:TEMPerature](#)

[[SENSe:]TEMPerature:APERture](#)

[SENSe:]TEMPerature:NPLC

Syntax

[SENSe:]TEMPerature:NPLC {*<PLCs>*|MIN|MAX|DEF}

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

Description

This command sets the [integration time](#) in number of power line cycles (PLCs) for temperature measurements. Integration time affects the measurement resolution (for better resolution, use a longer integration time) and measurement speed (for faster measurements, use a shorter integration time).

Parameters

Name	Type	Range of Values*	Defa Valu
\<PLCs\>	Discrete	**34410A:** {0.006|0.02|0.06|0.2|1|2|10|100} MIN = 0.006 PLC, MAX = 100 PLC **34411A/L4411A:** {0.001|0.002|0.006|0.02|0.06|0.2|1|2|10|100} MIN = 0.001 PLC, MAX = 100 PLC	This requ para DEF PLC

Remarks

- Selecting an integration time with this command changes any aperture set with the [SENSe:]TEMPerature:APERture command.

- Only those integration times set to an integral number of power line cycles (1, 2, 10, or 100 PLCs) provide normal mode (line frequency noise) rejection.

- Setting the integration time also sets the resolution for the measurement. The following table shows the relationship between integration time and resolution.

Integration Time (power line cycles)	Resolution
0.001 PLC (34411A/L4411A)	30 ppm x Range
0.002 PLC (34411A/L4411A)	15 ppm x Range
0.006 PLC	6.0 ppm x Range
0.02 PLC	3.0 ppm x Range
0.06 PLC	1.5 ppm x Range
0.2 PLC	0.7 ppm x Range
1 PLC (default)	0.3 ppm x Range
2 PLC	0.2 ppm x Range
10 PLC	0.1 ppm x Range
100 PLC	0.03 ppm x Range

- The instrument sets the integration time to 1 PLC after a Factory Reset

(*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns the integration time in the form
"+1.00000000E+00".

Examples

The following command set the integration time to 0.2 PLCs.

```
TEMP:NPLC 0.2
```

The following query returns the integration time setting.

```
TEMP:NPLC?
```

Typical Response: +2.00000000E-01

See Also

CONFigure:TEMPerature

[SENSe:]TEMPerature:NULL[:STATe]

Syntax

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

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

Description

This command turns the null function on or off for temperature measurements.

Remarks

- Use the [SENSe:]TEMPerature:NULL:VALue command to set the null value.

- The CONFigure:TEMPerature and MEASure:TEMPerature? commands turn off the null state.

- A Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command) returns the null state to off.

Return Format

The query command returns the null state, either "1" (ON), or "0" (OFF).

Examples

The following command turns the null function off.

```
FRES:NULL:STAT OFF
```

The following query returns the null state.

```
FRES:NULL:STAT?
```

Typical Response: 0

See Also

[SENSe:]TEMPerature:NULL:VALue

CONFigure:TEMPerature

MEASure:TEMPerature?

[SENSe:]TEMPerature:NULL:VALue

Syntax

[SENSe:]TEMPerature:NULL:VALue {*<value>*|MIN|MAX}

[SENSe:]TEMPerature:NULL:VALue? [{MIN|MAX}]

Description

This command stores a null value for temperature measurements. The null value is subtracted from each sample if the null state is turned on.

Parameters

The *<value>* parameter can take any value between -1.0E+15 and +1.0E+15. MIN = -1.0E+15 and MAX = +1.0E+15. The default value is 0.

Remarks

- To use the null value, you will also need to turn on the null state with the [SENSe:]TEMPerature:NULL[:STATe] command.

- When using this command, it is recommended that you *not* turn on the separate null state with the CALCulate:FUNCtion command. If you do, the individual ("per function") null value set with this command, and the global null value set with the CALCulate:NULL:OFFSet command will be additive.

- A Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command) clears all null values.

Return Format

The query command returns the null value in the form "`+1.00000000E-02`".

Examples

The following command sets the null value to -0.25.

```
FRES:NULL:VAL -0.25
```

The following query returns the null value.

```
FRES:NULL:VAL?
```

Typical Response: -2.50000000E-01

See Also

[SENSe:]TEMPerature:NULL[:STATe]

[SENSe:]TEMPerature:TRANsducer:TYPE

Syntax

[SENSe:]TEMPerature:TRANsducer:TYPE *<probe_type>*

[SENSe:]TEMPerature:TRANsducer:TYPE?

Description

This command selects the transducer probe type to use for temperature measurements.

Parameters

Name	Type	Range of Values	Default Value
<probe_type>	Discrete	{FRTD|RTD|FTHermistor|THERmistor}	FRTD

Remarks

- The instrument selects "FRTD" (4-wire RTD) as the probe type after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns "FRTD", "RTD", "FTH", or "THER".

Examples

The following command selects the RTD probe type.

```
TEMP:TRAN:TYPE RTD
```

The following query returns the probe selection.

```
TEMP:TRAN:TYPE?
```

Typical Response: RTD

See Also

[CONFigure:TEMPerature](#)

[MEASure:TEMPerature?](#)

[SENSe:]TEMPerature:ZERO:AUTO

Syntax

[SENSe:]TEMPerature:ZERO:AUTO *<mode>*

[SENSe:]TEMPerature:ZERO:AUTO?

Description

This command disables or enables the autozero mode for temperature measurements.

- When autozero is ON (default), the instrument internally disconnects the input signal following each measurement, and takes a *zero* reading. It then subtracts the zero reading from the preceding reading. This prevents offset voltages present on the instrument's input circuitry from affecting measurement accuracy.

- When autozero is OFF, the instrument uses the last measured zero reading and subtracts it from each measurement. It takes a new zero reading each time you change the function, range, or integration time.

- In the ONCE mode, the instrument takes one zero reading, and then sets autozero to off. The zero reading taken is used for all subsequent measurements until the next change to the function, range, or integration time. If the specified integration time is less than 1 PLC, the one zero reading is taken at 1 PLC to ensure best noise rejection in the zero reading, and then the subsequent measurements are taken at the specified fast integration time (for example 0.02 PLC).

Parameters

Name	Type	Range of Values	Default Value
<mode>	Discrete	{OFF|0|ON|1|ONCE}	Autozero ON

Remarks

- Autozero ONCE issues an immediate zero measurement, and then sets autozero to OFF.

- The autozero mode is set indirectly when you set the resolution and integration time using the CONfigure or MEASure commands. Autozero is automatically turned off when you select an integration time less than 1 PLC with these commands.

- The autozero mode is reset to the default (ON) at power up, or after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns "0" (OFF or ONCE) or "1" (ON).

Examples

The following command disables autozero. With autozero disabled, a new zero measurement is not issued until the next configuration change (function, range, NPLC, or aperture).

```
TEMP:ZERO:AUTO OFF
```

The following query returns the autozero setting.

```
TEMP:ZERO:AUTO?
```

Typical Response: 0

See Also

CONFigure:TEMPerature

[SENSe:]TEMPerature:TRANsducer:FRTD:OCOMpen

Syntax

[SENSe:]TEMPerature:TRANsducer:FRTD:OCOMpensated *<mode>*

[SENSe:]TEMPerature:TRANsducer:FRTD:OCOMpensated?

Description

This command enables or disables offset compensation for temperature measurements. Offset compensation removes the effects of small dc voltages in the circuit being measured.

Parameters

Name	Type	Range of Values	Default Value
<mode>	Boolean	{OFF|0|ON|1}	OFF|0

Remarks

- Affects both 2-wire and 4-wire RTD measurements.

- The instrument disables offset compensation after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

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

Examples

The following command enables offset compensation.

```
TEMP:TRAN:FRTD:OCOM ON
```

The following query returns the offset compensation setting.

```
TEMP:TRAN:FRTD:OCOM?
```

Typical Response: 1

See Also

[CONFigure:TEMPerature](#)

[SENSe:]TEMPerature:TRANsducer:FRTD:RESistance

Syntax

[SENSe:]TEMPerature:TRANsducer:FRTD:RESistance[:REFerence] {*<reference>*|MIN|MAX|DEF}

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

Description

The resistance of an RTD is nominal at 0 °C and is referred to as *Ro*. This command selects the nominal resistance (Ro) for 4-wire RTD measurements.

Parameters

Name	Type	Range of Values	Default Value
\<reference>	Numeric	Any value between 49Ω and 2.1 kΩ. MIN = 49Ω, MAX = 2.1 kΩ	This is a required parameter. DEF sets Ro = 100Ω

Remarks

- Affects both 2-wire and 4-wire RTD measurements.

- The instrument sets the nominal resistance to 100Ω after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns the nominal resistance setting in ohms.

Examples

The following command sets Ro to 1000Ω.

```
TEMP:TRAN:FRTD:RES 1000
```

The following query returns the Ro setting.

```
TEMP:TRAN:FRTD:RES?
```

Typical Response: +1.00000000E+03

See Also

[CONFigure:TEMPerature](#)

[[SENSe:]TEMPerature:TRANsducer:FRTD:TYPE](#)

[SENSe:]TEMPerature:TRANsducer:FRTD:TYPE

Syntax

[SENSe:]TEMPerature:TRANsducer:FRTD:TYPE *<type>*

[SENSe:]TEMPerature:TRANsducer:FRTD:TYPE?

Description

This command selects the RTD type for temperature measurements.

Parameters

Name	Type	Range of Values	Default Value
<type>	Discrete	{85}	85

Remarks

- Affects both 2-wire and 4-wire RTD measurements.

- Only Type 85 RTDs are suppported for RTD temperature measurements.

- The instrument supports RTDs with Alpha = 0.00385 (DIN/IEC 751) using ITS-90 software conversions.

- "PT100" is a special label that is sometimes used to refer to an RTD with Alpha = 0.00385 and [Ro](#) = 100Ω.

- The instrument sets the RTD type to "85" after a Factory Reset ([*RST](#) command) or an Instrument Preset ([SYSTem:PRESet](#) command).

Return Format

The query command returns "+85" (the only type supported).

Examples

The following command selects a Type 85 RTD.

```
TEMP:TRAN:FRTD:TYPE 85
```

The following query returns the RTD type selection.

```
TEMP:TRAN:FRTD:TYPE?
```

Typical Response: `+85`

See Also

[CONFigure:TEMPerature](#)

[MEASure:TEMPerature?](#)

[\[SENSe:\]TEMPerature:TRANsducer:FRTD:RESistance](#)

[SENSe:]TEMPerature:TRANsducer:RTD:OCOMpens

Syntax

[SENSe:]TEMPerature:TRANsducer:RTD:OCOMpensated *<mode>*

[SENSe:]TEMPerature:TRANsducer:RTD:OCOMpensated?

Description

This command enables or disables offset compensation for temperature measurements. Offset compensation removes the effects of small dc voltages in the circuit being measured.

Parameters

Name	Type	Range of Values	Default Value
<mode>	Boolean	{OFF|0|ON|1}	OFF|0

Remarks

- Affects both 2-wire and 4-wire RTD measurements.

- The instrument disables offset compensation after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

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

Examples

The following command enables offset compensation.

```
TEMP:TRAN:RTD:OCOM  ON
```

The following query returns the offset compensation setting.

```
TEMP:TRAN:RTD:OCOM?
```

Typical Response: 1

See Also

[CONFigure:TEMPerature](#)

[SENSe:]TEMPerature:TRANsducer:RTD:RESistance

Syntax

[SENSe:]TEMPerature:TRANsducer:RTD:RESistance[:REFerence] {*<reference>*|MIN|MAX|DEF}

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

Description

The resistance of an RTD is nominal at 0 °C and is referred to as *Ro*. This command selects the nominal resistance (Ro) for 2-wire RTD measurements.

Parameters

Name	Type	Range of Values	Default Value
<reference>	Numeric	Any value between 49Ω and 2.1 kΩ. MIN = 49Ω, MAX = 2.1 kΩ	This is a required parameter. DEF sets Ro = 100Ω

Remarks

- Affects both 2-wire and 4-wire RTD measurements.

- The instrument sets the nominal resistance to 100Ω after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns the nominal resistance setting in ohms.

Examples

The following command sets Ro to 1000Ω.

```
TEMP:TRAN:RTD:RES 1000
```

The following query returns the Ro setting.

```
TEMP:TRAN:RTD:RES?
```

Typical Response: +1.00000000E+03

See Also

[CONFigure:TEMPerature](#)

[MEASure:TEMPerature?](#)

[SENSe:]TEMPerature:TRANsducer:RTD:TYPE

Syntax

[SENSe:]TEMPerature:TRANsducer:RTD:TYPE *<type>*

[SENSe:]TEMPerature:TRANsducer:RTD:TYPE?

Description

This command selects the RTD type for temperature measurements.

Parameters

Name	Type	Range of Values	Default Value
<type>	Discrete	{85}	85

Remarks

- Affects both 2-wire and 4-wire RTD measurements.

- Only Type 85 RTDs are suppported for RTD temperature measurements.

- The instrument supports RTDs with Alpha = 0.00385 (DIN/IEC 751) using ITS-90 software conversions.

- "PT100" is a special label that is sometimes used to refer to an RTD with Alpha = 0.00385 and Ro = 100Ω.

- The instrument sets the RTD type to "85" after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns "+85" (the only type supported).

Examples

The following command selects a Type 85 RTD.

```
TEMP:TRAN:RTD:TYPE 85
```

The following query returns the RTD type selection.

```
TEMP:TRAN:RTD:TYPE?
```

Typical Response: +85

See Also

CONFigure:TEMPerature

[[SENSe:]TEMPerature:TRANsducer:FRTD:TYPE]([SENSe:]TEMPerature:TRANsducer:FRTD:TYPE)

[[SENSe:]TEMPerature:TRANsducer:RTD:RESistance]([SENSe:]TEMPerature:TRANsducer:RTD:RESistance)

[SENSe:]TEMPerature:TRANsducer:THERmistor:TYPE

Syntax

[SENSe:]TEMPerature:TRANsducer:THERmistor:TYPE *<type>*

[SENSe:]TEMPerature:TRANsducer:THERmistor:TYPE?

Description

This command selects the thermistor type for 2-wire temperature measurements.

Parameters

Name	Type	Range of Values	Default Value
<type>	Discrete	{2252|5000|10000}	5000

Remarks

- Affects both 2-wire and 4-wire RTD measurements.

- The instrument supports standard 2252 Ω, 5 kΩ, and 10 kΩ thermistors.

- The instrument sets the thermistor type to "5000" after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns "+2252", "+5000", or "+10000".

Examples

The following command selects a 10 kΩ thermistor.

```
TEMP:TRAN:THER:TYPE 10000
```

The following query returns the thermistor type selection.

```
TEMP:TRAN:THER:TYPE?
```

Typical Response: +10000

See Also

CONFigure:TEMPerature

[SENSe:]TEMPerature:TRANsducer:FTHermistor:TY

Syntax

[SENSe:]TEMPerature:TRANsducer:FTHermistor:TYPE *<type>*

[SENSe:]TEMPerature:TRANsducer:FTHermistor:TYPE?

Description

This command selects the thermistor type for 4-wire temperature measurements.

Parameters

Name	Type	Range of Values	Default Value
<type>	Discrete	{2252|5000|10000|MIN|MAX}	5000

Remarks

- Affects both 2-wire and 4-wire RTD measurements.

- The instrument supports standard 2252 Ω, 5 kΩ, and 10 kΩ thermistors.

- The instrument sets the thermistor type to "5000" after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns "+2252", "+5000", or "+10000".

Examples

The following command selects a 10 kΩ thermistor.

```
TEMP:TRAN:FTH:TYPE 10000
```

The following query returns the thermistor type selection.

```
TEMP:TRAN:FTH:TYPE?
```

Typical Response: +10000

See Also

[CONFigure:TEMPerature](#)

[SENSe:]VOLTage:AC:BANDwidth

Syntax

[SENSe:]VOLTage:AC:BANDwidth {*<filter>*|MIN|MAX|DEF}

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

Description

This command sets the bandwidth for ac voltage measurements. The instrument uses three different ac filters for ac voltage measurements. The instrument selects the slow (3 Hz), medium (20 Hz), or fast (200 Hz) filter based on the frequency that you specify with this command. Set the lowest expected frequency that you expect to encounter. The default is 20 Hz (medium).

Parameters

Name	Type	Range of Values	Default Value
<filter>	Discrete	{3|20|200} MIN = 3 Hz (slow), MAX = 200 Hz (fast)	This is a required parameter DEF sets 20 Hz (medium)

Remarks

- The *<filter>* parameter takes on one of three *discrete* values: 3, 20, or 200. However, you can enter the lowest expected frequency that you intend to encounter, and the command will automatically enter the appropriate value for *<filter>*. For example, if you enter 15 Hz, the slow filter (3 Hz) is selected. If you enter 190 Hz, the medium filter (20 Hz) is selected to provide the appropriate low cutoff.

- Set the lowest frequency that you expect to encounter. However, note that lower bandwidths result in longer settling delays. The following table shows the settling delays for the three bandwidths:

Input Frequency	Default Settling Delay
3 Hz - 300 kHz (*Slow*)	2.5 seconds/reading
20 Hz - 300 kHz (*Medium*)	0.625 second/reading
200 Hz - 300 kHz (*Fast*)	0.025 second/reading

- The CONFigure and MEASure? commands automatically select the default 20 Hz (medium) filter.

- The instrument selects the default 20 Hz (medium) filter after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns "3.0000000" (slow), "2.0000000E+1" (medium), or "2.0000000E+2" (fast).

Examples

The following command selects the slow filter (3 Hz).

```
VOLT:AC:BAND 3
```

The following query returns the ac filter setting.

```
VOLT:AC:BAND?
```

Typical Response: 3.0000000

See Also

[CONFigure[:VOLTage]:AC](#)

[SENSe:]VOLTage:AC:NULL[:STATe]

Syntax

[SENSe:]VOLTage:AC:NULL[:STATe] {ON|OFF}

[SENSe:]VOLTage:AC:NULL[:STATe]?

Description

This command turns the null function on or off for ac voltage measurements.

Remarks

- Use the [SENSe:]VOLTage:AC:NULL:VALue command to set the null value.

- The CONFigure[:VOLTage]:AC and MEASure[:VOLTage]:AC? commands turn off the null state.

- A Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command) returns the null state to off.

Return Format

The query command returns the null state, either "1" (ON), or "0" (OFF).

Examples

The following command turns the null function off.

```
VOLT:AC:NULL:STAT OFF
```

The following query returns the null state.

```
VOLT:AC:NULL:STAT?
```

Typical Response: 0

See Also

[SENSe:]VOLTage:AC:NULL:VALue

CONFigure[:VOLTage]:AC

MEASure[:VOLTage]:AC?

[SENSe:]VOLTage:AC:NULL:VALue

Syntax

[SENSe:]VOLTage:AC:NULL:VALue {*<value>*|MIN|MAX}

[SENSe:]VOLTage:AC:NULL:VALue? [{MIN|MAX}]

Description

This command stores a null value for ac voltage measurements. The null value is subtracted from each sample if the null state is turned on.

Parameters

The *<value>* parameter can take any value between -120% and +120% of the highest range for the present function. MIN = -120% of the highest range. MAX = +120% of the highest range. The default value is 0.

Remarks

- To use the null value, you will also need to turn on the null state with the [SENSe:]VOLTage:AC:NULL[:STATe] command.

- When using this command, it is recommended that you *not* turn on the separate null state with the CALCulate:FUNCtion command. If you do, the individual ("per function") null value set with this command, and the global null value set with the CALCulate:NULL:OFFSet command will be additive.

- A Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command) clears all null values.

Return Format

The query command returns the null value in the form "`+1.00000000E-02`".

Examples

The following command sets the null value to -0.25.

```
VOLT:AC:NULL:VAL -0.25
```

The following query returns the null value.

```
VOLT:AC:NULL:VAL?
```

Typical Response: -2.50000000E-01

See Also

[SENSe:]VOLTage:AC:NULL[:STATe]

[SENSe:]VOLTage:AC:PEAK:STATe

Syntax

[SENSe:]VOLTage:AC:PEAK:STATe {ON|OFF}

[SENSe:]VOLTage:AC:PEAK:STATe?

Description

This command (when STATe= ON) configures the ac voltage measurement function to also produce peak-to-peak measurements, which may be retrieved separately from the main voltage measurement.

Remarks

- Use the FETCh:VOLTage:AC:PTPeak? command to retrieve the peak voltage data.

- A Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command) returns the state to off.

Return Format

The query command returns the state, either "1" (ON), or "0" (OFF).

Examples

The following command turns the peak voltage function on.

```
VOLT:AC:PEAK:STAT ON
```

The following query returns the state.

```
VOLT:AC:PEAK:STAT?
```

Typical Response: 1

See Also

[FETCh:VOLTage:AC:PTPeak?](#)

[SENSe:]VOLTage:AC:RANGe:AUTO

Syntax

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

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

Description

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.

WARNING **The maximum range parameter is 1000 V. However, the SAFETY LIMIT on the front and rear HI/LO input terminals is 750 VAC (rms). The rms voltage is waveform dependent. A sine wave is limited to 750 VAC (rms), but a 1000 Vpk square wave is safe. Connections to AC MAINS are further limited to CAT II (300V). See the "Safety Information" section in the *Agilent 34410A/11A/L4411A User's Guide* for a complete discussion of the safety features, and the safe operation of this instrument.**

Parameters

Name	Type	Range of Values	Default Value
<mode>	Boolean	{OFF|0|ON|1|ONCE}	Autorange ON

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.

- The ONCE parameter performs an immediate autorange, and then sets autoranging to OFF. (Thus, the query returns "0".)

- Selecting a discrete range (see [SENSe:]VOLTage:AC:RANGe command) will disable autoranging.

- The instrument enables autoranging after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

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

Examples

The following command disables autoranging.

```
VOLT:AC:RANG:AUTO OFF
```

The following query returns the autoranging setting.

```
VOLT:AC:RANG:AUTO?
```

Typical Response: 0

See Also

[CONFigure[:VOLTage]:AC](#)

[[SENSe:]VOLTage:AC:RANGe](#)

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

Syntax

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

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

Description

This command selects the measurement range for ac voltage measurements.

WARNING

The maximum range parameter is 1000 V, which is set by MAX. However, the SAFETY LIMIT on the front and rear HI/LO input terminals is 750 VAC (rms). The rms voltage is waveform dependent. A sine wave is limited to 750 VAC (rms), but a 1000 Vpk square wave is safe. Connections to AC MAINS are further limited to CAT II (300V). See the "Safety Information" section in the *Agilent 34410A/11A/L4411A User's Guide* for a complete discussion of the safety features, and the safe operation of this instrument.

Parameters

Name	Type	Range of Values	Default Value
<range>	Discrete	Desired range in volts: 100 mV (MIN) 1 V 10 V 100 V 1000 V (MAX)	This is a required parameter. DEF sets 10 V

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*: "OVLD" from the front panel or "+9.9E+37" from the remote interface.

- The instrument is set to 10 V, with autoranging enabled, after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns the range in the form "+1.00000000E+01".

Examples

The following command selects the 10 volt range.

```
VOLT:AC:RANG 10
```

The following query returns the range selected.

```
VOLT:AC:RANG?
```

Typical Response: +1.00000000E+01

See Also

[CONFigure\[:VOLTage\]:AC](#)

[\[SENSe:\]VOLTage:AC:RANGe:AUTO](#)

[SENSe:]VOLTage[:DC]:APERture

Syntax

[SENSe:]VOLTage[:DC]:APERture {*<seconds>*|MIN|MAX|DEF}

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

Description

This command selects the integration time in seconds (called *aperture time*) for dc voltage measurements.

| NOTE | You should use this command only when you want precise control of the integration time of the multimeter. Otherwise, specifying integration time using NPLC (see [SENSe:]VOLTage[:DC]:NPLC command) offers better power-line noise rejection characteristics (for values of NPLC greater than 1). |

Parameters

Name	Type	Range of Values*	Default Value
<seconds>	Numeric	Desired aperture time in seconds: **34410A:** ~100 µs to ~1 s (with ~20 µs resolution). MIN = ~100 µs, MAX = ~1 s **34411A/L4411A:** ~20 µs to ~1 s (with ~20 µs resolution). MIN = ~20 µs, MAX = ~1 s	This is a required parameter DEF sets ~100 ms

Remarks

- Due to internal quantization, the actual aperture that you set may be slightly different than your specified value. The increment is approximately 20 μs. Use the query command to determine the exact aperture that is set. For example, if you send "VOLT:DC:APER 500 ms", and then send the query "VOLT:DC:APER?" the actual aperture is returned (for example: "+5.00000753E-01").

- Setting an aperture with this command changes any integration time selected with the [SENSe:]VOLTage[:DC]:NPLC command.

- To obtain best normal mode (line frequency noise) rejection, set an integration time equivalent to an integral number of power line cycles with the [SENSe:]VOLTage[:DC]:NPLC command.

- The instrument disables aperture and sets the integration time to 1 PLC after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns the aperture time in the form "`+1.00000000E-01`".

Examples

The following command sets the aperture time to 300 ms.

```
VOLT:DC:APER 300E-03
```

The following query returns the aperture time selected.

```
VOLT:DC:APER?
```

Typical Response: +3.00000000E-01

See Also

CONFigure[:VOLTage][:DC]

[SENSe:]VOLTage[:DC]:APERture:ENABled

[SENSe:]VOLTage[:DC]:APERture:ENABled

Syntax

[SENSe:]VOLTage[:DC]:APERture:ENABled {ON|OFF}

[SENSe:]VOLTage[:DC]:APERture:ENABled?

Description

This command queries whether an aperture time is enabled or disabled for dc voltage measurements.

Remarks

- The CONFigure[:VOLTage][:DC], MEASure[:VOLTage][:DC]?, [SENSe:]VOLTage[:DC]:NPLC, and [SENSe:]VOLTage[:DC]:RESolution commands disable the aperture time mode (these commands select an integration time in number of power line cycles).

Return Format

The query command returns "0" if the aperture time mode is disabled or "1" if the aperture time mode is enabled.

Example

The following command returns the state of the aperture time mode.

```
VOLT:DC:APER:ENAB?
```

Typical Response: 1

See Also

[CONFigure[:VOLTage][:DC]](#)

[[SENSe:]VOLTage[:DC]:APERture](#)

[SENSe:]VOLTage[:DC]:IMPedance:AUTO

[SENSe:]VOLTage[:DC]:IMPedance:AUTO

Syntax

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

[SENSe:]VOLTage[:DC]:IMPedance:AUTO?

Description

This command disables or enables the automatic input impedance mode for dc voltage measurements. Normally, the instrument's input resistance is fixed at 10 MΩ for all dc voltage measurements to minimize noise pickup. In the automatic input impedance mode ("AUTO ON"), the input impedance is automatically varied according to range. For the 100 mV, 1 V, and 10 V ranges the input impedance is automatically set to "HI-Z" (>10 GΩ) to reduce the effects of measurement loading errors on these lower ranges. For the 100 V and 1000 V ranges, the input impedance remains at 10 MΩ.

Remarks

- This command affects dc voltage measurements only.

- With "AUTO OFF" (default), the input impedance for dc voltage measurements is fixed at 10 MΩ for all ranges.

- With "AUTO ON", the input impedance for dc voltage measurements is automatically selected according to range. The impedance is set to "HI-Z" (>10 GΩ) for the 100 mV, 1 V, and 10 V ranges. The 100 V and 1000 V ranges remain at a 10 MΩ input impedance.

- The CONFigure and MEASure? commands automatically select "AUTO OFF" (fixed at 10 MΩ for all ranges).

- This setting is reset to the default (fixed, 10 MΩ) by the *RST and SYSTem:PRESet commands.

Return Format

The query returns the current state of the automatic input impedance mode: "0" (OFF) or "1" (ON).

Example

The following command disables the automatic input impedance mode. All dc voltage measurements are made with a fixed, 10 MΩ input impedance.

```
VOLT:IMP:AUTO OFF
```

The following query returns the current state of the automatic input impedance mode.

```
VOLT:IMP:AUTO?
```

Typical Response: 0

See Also

[CONFigure[:VOLTage][:DC]](#)

[SENSe:]VOLTage[:DC]:NPLC

Syntax

[SENSe:]VOLTage[:DC]:NPLC {*<PLCs>*|MIN|MAX|DEF}

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

Description

This command sets the [integration time](#) in number of power line cycles (PLCs) for dc voltage measurements. Integration time affects the measurement resolution (for better resolution, use a longer integration time) and measurement speed (for faster measurements, use a shorter integration time).

Parameters

Name	Type	Range of Values*	Defa... Valu...
<PLCs>	Discrete	**34410A:** {0.006|0.02|0.06|0.2|1|2|10|100} MIN = 0.006 PLC, MAX = 100 PLC **34411A/L4411A:** {0.001|0.002|0.006|0.02|0.06|0.2|1|2|10|100} MIN = 0.001 PLC, MAX = 100 PLC	This requ... para... DEF PLC
		See [Range, Resolution, and NPLC](#) for more information.	

Remarks

- Selecting an integration time with this command changes any aperture set with the [SENSe:]VOLTage[:DC]:APERture command.

- Only those integration times set to an integral number of power line cycles (1, 2, 10, or 100 PLCs) provide normal mode (line frequency noise) rejection.

- Setting the integration time also sets the resolution for the measurement. The following table shows the relationship between integration time and resolution.

Integration Time (power line cycles)	Resolution
0.001 PLC *(34411A/L4411A)*	30 ppm x Range
0.002 PLC *(34411A/L4411A)*	15 ppm x Range
0.006 PLC	6.0 ppm x Range
0.02 PLC	3.0 ppm x Range
0.06 PLC	1.5 ppm x Range
0.2 PLC	0.7 ppm x Range
1 PLC (default)	0.3 ppm x Range
2 PLC	0.2 ppm x Range
10 PLC	0.1 ppm x Range
100 PLC	0.03 ppm x Range

- The instrument sets the integration time to 1 PLC after a Factory Reset

(*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns the integration time in the form
"+1.00000000E+00".

Examples

The following command set the integration time to 0.2 PLCs.

```
VOLT:DC:NPLC 0.2
```

The following query returns the integration time setting.

```
VOLT:DC:NPLC?
```

Typical Response: +2.00000000E-01

See Also

[CONFigure[:VOLTage][:DC]](#)

[SENSe:]VOLTage[:DC]:NULL[:STATe]

Syntax

[SENSe:]VOLTage[:DC]:NULL[:STATe] {ON|OFF}

[SENSe:]VOLTage[:DC]:NULL[:STATe]?

Description

This command turns the null function on or off for dc voltage measurements.

Remarks

- Use the [SENSe:]VOLTage[:DC]:NULL:VALue command to set the null value.

- The CONFigure[:VOLTage][:DC] and MEASure[:VOLTage][:DC]? commands turn off the null state.

- A Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command) returns the null state to off.

Return Format

The query command returns the null state, either "1" (ON), or "0" (OFF).

Examples

The following command turns the null function off.

```
VOLT:DC:NULL:STAT OFF
```

The following query returns the null state.

```
VOLT:DC:NULL:STAT?
```

Typical Response: 0

See Also

[SENSe:]VOLTage[:DC]:NULL:VALue

CONFigure[:VOLTage][:DC]

MEASure[:VOLTage][:DC]?

[SENSe:]VOLTage[:DC]:NULL:VALue

Syntax

[SENSe:]VOLTage[:DC]:NULL:VALue {*<value>*|MIN|MAX}

[SENSe:]VOLTage[:DC]:NULL:VALue? [{MIN|MAX}]

Description

This command stores a null value for dc voltage measurements. The null value is subtracted from each sample if the null state is turned on.

Parameters

The *<value>* parameter can take any value between -120% and +120% of the highest range for the present function. MIN = -120% of the highest range. MAX = +120% of the highest range. The default value is 0.

Remarks

- To use the null value, you will also need to turn on the null state with the [SENSe:]VOLTage[:DC]:NULL[:STATe] command.

- When using this command, it is recommended that you *not* turn on the separate null state with the CALCulate:FUNCtion command. If you do, the individual ("per function") null value set with this command, and the global null value set with the CALCulate:NULL:OFFSet command will be additive.

- A Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command) clears all null values.

Return Format

The query command returns the null value in the form "`+1.00000000E-02`".

Examples

The following command sets the null value to -0.25.

```
VOLT:DC:NULL:VAL -0.25
```

The following query returns the null value.

```
VOLT:DC:NULL:VAL?
```

Typical Response: -2.50000000E-01

See Also

[SENSe:]VOLTage[:DC]:NULL[:STATe]

[SENSe:]VOLTage[:DC]:PEAK:STATe

Syntax

[SENSe:]VOLTage[:DC]:PEAK:STATe {ON|OFF}

[SENSe:]VOLTage[:DC]:PEAK:STATe?

Description

This command (when STATe= ON) configures the dc voltage measurement function to also produce peak measurements, which may be retrieved separately from the main voltage measurement.

Remarks

- Use the FETCh:VOLTage:AC:PTPeak? command to retrieve the peak voltage data.

- A Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command) returns the state to off.

Return Format

The query command returns the state, either "1" (ON), or "0" (OFF).

Examples

The following command turns the peak voltage function on.

```
VOLT:DC:PEAK:STAT ON
```

The following query returns the state.

```
VOLT:DC:PEAK:STAT?
```

Typical Response: 1

See Also

[FETCh:VOLTage:AC:PTPeak?](#)

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

Syntax

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

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

Description

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.

Parameters

Name	Type	Range of Values	Default Value
<mode>	Boolean	{OFF|0|ON|1|ONCE}	Autorange ON

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.

- The ONCE parameter performs an immediate autorange, and then sets autoranging to OFF. (Thus, the query returns "0".)

- Selecting a discrete range (see [SENSe:]VOLTage[:DC]:RANGe command) will disable autoranging.

- The instrument enables autoranging after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

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

Examples

The following command disables autoranging.

```
VOLT:DC:RANG:AUTO OFF
```

The following query returns the autoranging setting.

```
VOLT:DC:RANG:AUTO?
```

Typical Response: 0

See Also

CONFigure[:VOLTage][:DC]

[SENSe:]VOLTage[:DC]:RANGe

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

Syntax

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

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

Description

This command selects the measurement range for dc voltage measurements.

Parameters

Name	Type	Range of Values	Default Value
<range>	Discrete	Desired range in volts: 100 mV (MIN) 1 V 10 V 100 V 1000 V (MAX)	This is a required parameter. DEF sets 1000 V

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*: "±OVLD" from the front panel or "±9.9E+37" from the remote interface.

- The instrument is set to 1000 V, with autoranging enabled, after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns the range in the form "+1.00000000E+01".

Examples

The following command selects the 10 volt range.

```
VOLT:DC:RANG 10
```

The following query returns the range selected.

```
VOLT:DC:RANG?
```

Typical Response: +1.00000000E+01

See Also

[CONFigure[:VOLTage][:DC]](#)

[[SENSe:]VOLTage[:DC]:RANGe:AUTO](#)

[SENSe:]VOLTage[:DC]:RESolution

Syntax

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

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

Description

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*.

Parameters

Name	Type	Range of Values	Default Value
<resolution>	Numeric	Desired resolution in volts (see Resolution Table).	0.3 ppm x Range (1 PLC)

Remarks

- Setting the resolution with this command changes any aperture set with the [SENSe:]VOLTage[:DC]:APERture command.

- 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.

- To achieve normal mode (line frequency noise) rejection, use a resolution that corresponds to an integration time that is an integral number of power line cycles (see table below). Specify a resolution of 0.3 ppm x Range (which corresponds to 1 PLC) or better to ensure normal mode rejection.

- The instrument sets the resolution to 1 PLC after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns the resolution in the form "`+1.00000000E-03`".

Examples

The following command sets the measurement resolution to 1 mV.

```
VOLT:DC:RES 1E-03
```

The following query returns the resolution selected.

```
VOLT:DC:RES?
```

Typical Response: +1.00000000E-03

See Also

[CONFigure[:VOLTage][:DC]](#)

[SENSe:]VOLTage[:DC]:ZERO:AUTO

Syntax

[SENSe:]VOLTage[:DC]:ZERO:AUTO *<mode>*

[SENSe:]VOLTage[:DC]:ZERO:AUTO?

Description

This command disables or enables the autozero mode for dc voltage measurements.

- When autozero is ON (default), the instrument internally disconnects the input signal following each measurement, and takes a *zero* reading. It then subtracts the zero reading from the preceding reading. This prevents offset voltages present on the instrument's input circuitry from affecting measurement accuracy.

- When autozero is OFF, the instrument uses the last measured zero reading and subtracts it from each measurement. It takes a new zero reading each time you change the function, range, or integration time.

- In the ONCE mode, the instrument takes one zero reading, and then sets autozero to off. The zero reading taken is used for all subsequent measurements until the next change to the function, range, or integration time. If the specified integration time is less than 1 PLC, the one zero reading is taken at 1 PLC to ensure best noise rejection in the zero reading, and then the subsequent measurements are taken at the specified fast integration time (for example 0.02 PLC).

Parameters

Name	Type	Range of Values	Default Value
<mode>	Discrete	{OFF|0|ON|1|ONCE}	This is a required parameter

Remarks

- Autozero ONCE issues an immediate zero measurement, and then sets autozero to OFF.

- The autozero mode is set indirectly when you set the resolution and integration time using the CONfigure or MEASure commands.

- The autozero mode is reset to the default (ON) at power up, or after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns "0" (OFF or ONCE) or "1" (ON).

Examples

The following command disables autozero. With autozero disabled, a new zero measurement is not issued until the next configuration change (function, range, NPLC, or aperture).

```
VOLT:ZERO:AUTO OFF
```

The following query returns the autozero setting.

```
VOLT:ZERO:AUTO?
```

Typical Response: 0

See Also

CONFigure[:VOLTage][:DC]

STATus Subsystem Introduction

Agilent 34410A/11A/L4411A Status System Diagram
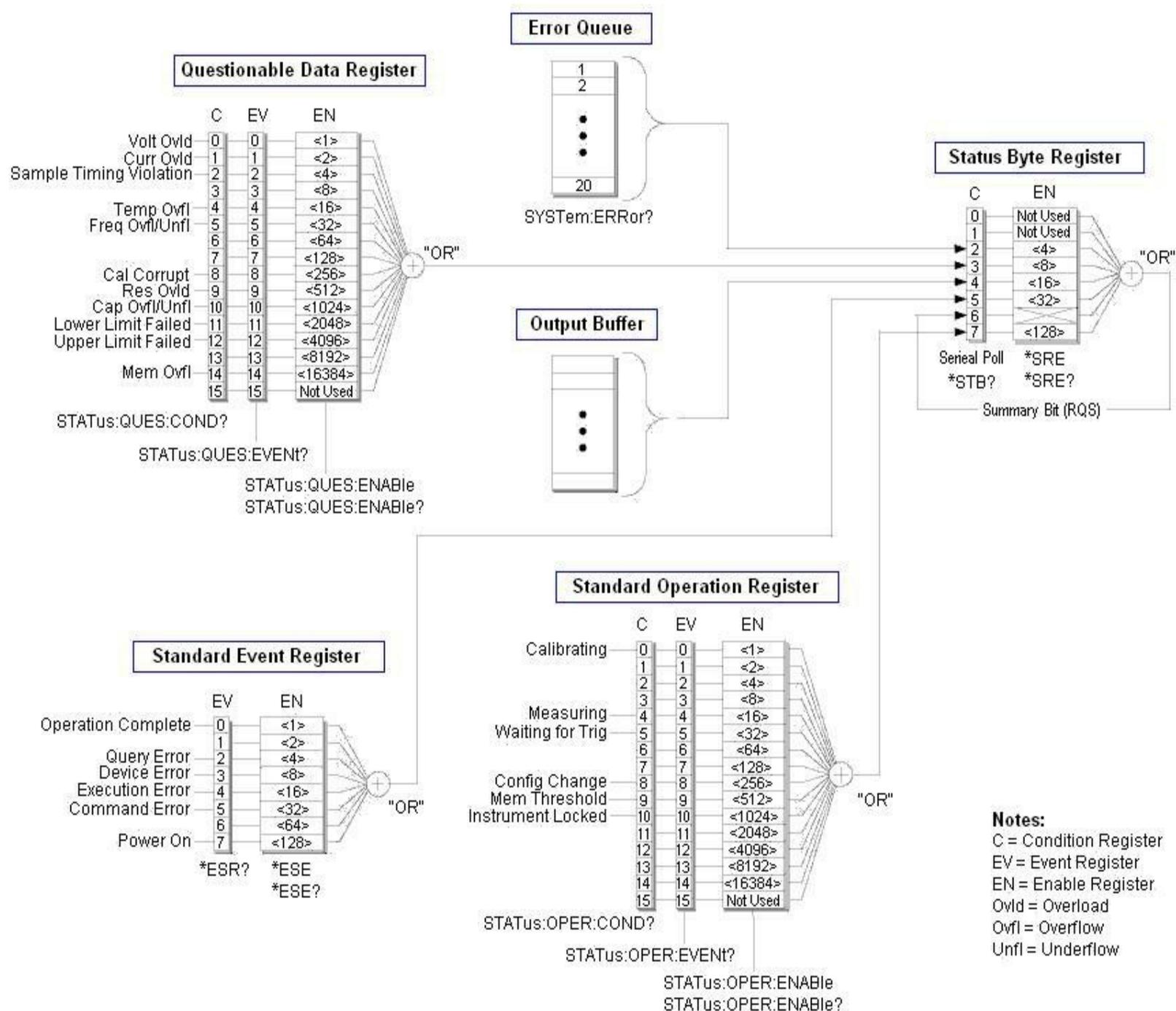
Command Summary

*ESE

*ESE?

*ESR?

*PSC

*PSC?

*SRE

*SRE?

*STB?

STATus:OPERation:CONDition?

STATus:OPERation:ENABle

STATus:OPERation:ENABle?

STATus:OPERation[:EVENt]?

STATus:PRESet

STATus:QUEStionable:CONDition?

STATus:QUEStionable:ENABle

STATus:QUEStionable:ENABle?

STATus:QUEStionable[:EVENt]?

STATus:OPERation:CONDition?

Syntax

STATus:OPERation:CONDition?

Description

This command queries the [condition register](#) for the *Standard Operation Register* group. This is a read-only register and the bits are not cleared when you read the register.

NOTE	For more information on the SCPI Status System for the Agilent 34410A/11A/L4411A, see the [Status System Diagram](#).

Remarks

- The condition register bits reflect the current condition. If a condition goes away, the corresponding bit is cleared in the condition register.

- The following table lists the bit definitions for the *Standard Operation Register*.

Bit Number		Decimal Value	Definition
0	Calibration in Progress	1	Instrument is performing a calibration.
1-3	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.
6-7	Not Used	Not Used	"0" is returned.
8	Configuration Change	256	Instrument configuration has been changed, either from the front panel or from SCPI.
9	Memory Threshold	512	Programmed number of readings have been stored in reading memory (see DATA:POINts:EVENt:THReashold command).
10	Instrument Locked	1024	If a remote interface (GPIB, USB, or LAN) has a lock (see SYSTem:LOCK:REQuest? command), this bit will be set. When a remote interface releases the lock (see SYSTem:LOCK:RELease command), this bit will be cleared.

11-15	Not Used	Not Used	"0" is returned.

Return Format

The command reads the condition register and returns a decimal value which corresponds to the binary-weighted sum of all bits set in the register (see table above). For example, if bit 5 (decimal value = 32) and bit 9 (decimal value = 512) are set, this command will return "+544".

Example

The following command reads the condition register (bit 5 is set).

```
STAT:OPER:COND?
```

Typical Response: +32

See Also

[STATus:OPERation:ENABle](#)

[STATus:OPERation[:EVENt]?](#)

STATus:OPERation:ENABle

Syntax

STATus:OPERation:ENABle *<enable_value>*

STATus:OPERation:ENABle?

Description

This command enables bits in the [enable register](#) for the *Standard Operation Register* group. The selected bits are then reported to the Status Byte.

> **NOTE**
>
> For more information on the SCPI Status System for the Agilent 34410A/11A/L4411A, see the [Status System Diagram](#).

Parameters

Name	Type	Range of Values	Default Value
<enable_value>	Numeric	A decimal value which corresponds to the binary-weighted sum of the bits in the register (see table below).	This is a required parameter

Remarks

- The following table lists the bit definitions for the *Standard Operation Register*.

Bit Number		Decimal Value	Definition
0	Calibration in Progress	1	Instrument is performing a calibration.
1-3	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.
6-7	Not Used	Not Used	"0" is returned.
8	Configuration Change	256	Instrument configuration has been changed, either from the front panel or from SCPI.
9	Memory Threshold	512	Programmed number of readings have been stored in reading memory (see DATA:POINts:EVENt:THReashold command).
10	Instrument Locked	1024	If a remote interface (GPIB, USB, or LAN) has a lock (see SYSTem:LOCK:REQuest? command), this bit will be set. When a remote interface releases the lock (see SYSTem:LOCK:RELease command), this bit will be cleared.
11-15	Not Used	Not Used	"0" is returned.

- Use the <enable_value> parameter to specify which bits will be reported to the Status Byte. The decimal value specified corresponds to the binary-weighted sum of the bits you wish to enable in the register. For example, to enable bit 5 (decimal value = 32) and bit 9 (decimal value = 512), the corresponding decimal value would be 544 (32 + 512).

- 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.

Return Format

The query 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 4 (decimal value = 16) and bit 9 (decimal value = 512) are enabled, the query command will return "`+528`".

Examples

The following command enables bit 5 (decimal value = 32) in the enable register.

```
STAT:OPER:ENAB 32
```

The following query returns which bits are enabled in the register.

```
STAT:OPER:ENAB?
```

Typical Response: +32

See Also

[STATus:OPERation:CONDition?](#)

[STATus:OPERation[:EVENt]?](#)

[STATus:PRESet](#)

STATus:OPERation[:EVENt]?

Syntax

STATus:OPERation[:EVENt]?

Description

This command queries the [event register](#) for the *Standard Operation Register* group. This is a read-only register and the bits are cleared when you read the register.

> **NOTE** For more information on the SCPI Status System for the Agilent 34410A/11A/L4411A, see the [Status System Diagram](#).

Remarks

- The following table lists the bit definitions for the *Standard Operation Register*.

Bit Number		Decimal Value	Definition
0	Calibration in Progress	1	Instrument is performing a calibration.
1-3	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.
6-7	Not Used	Not Used	"0" is returned.
8	Configuration Change	256	Instrument configuration has been changed, either from the front panel or from SCPI.
9	Memory Threshold	512	Programmed number of readings have been stored in reading memory (see DATA:POINts:EVENt:THReashold command).
10	Instrument Locked	1024	If a remote interface (GPIB, USB, or LAN) has a lock (see SYSTem:LOCK:REQuest? command), this bit will be set. When a remote interface releases the lock (see SYSTem:LOCK:RELease command), this bit will be cleared.
11-15	Not Used	Not Used	"0" is returned.

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

- The *RST, SYSTem:PRESet, STATus:PRESet, and *PSC commands have no effect on this register.

Return Format

The command reads the event register and returns a decimal value which corresponds to the binary-weighted sum of all bits set in the register. For example, if bit 4 (decimal value = 16) and bit 9 (decimal value = 512) are set, this command will return "+528".

Example

The following command reads the event register (bit 9 is set).

```
STAT:OPER?
```

Typical Response: +512

See Also

[STATus:OPERation:ENABle](#)

STATus:PRESet

Syntax

STATus:PRESet

Description

This command *clears* all bits in the *Questionable Data* enable register and the *Standard Operation* enable register.

Remarks

- See [STATus Subsystem Introduction](#) for an overview of the status system.

Example

The following command clears the enable register bits.

```
STAT:PRES
```

See Also

[STATus Subsystem Introduction](#)

STATus:QUEStionable:CONDition?

Syntax

STATus:QUEStionable:CONDition?

Description

This command queries the [condition register](#) for the *Questionable Data Register* group. This is a read-only register and the bits are not cleared when you read the register.

| NOTE | For more information on the SCPI Status System for the Agilent 34410A/11A/L4411A, see the [Status System Diagram](#). |

Remarks

- The condition register bits reflect the current condition. If a condition goes away, the corresponding bit is cleared in the condition register.

- The following table lists the bit definitions for the condition register in the *Questionable Data group*.

	Bit Number	Decimal Value	Definition
0	Voltage Overload	1	Only reported as event. Returns "0". *Read the Event Register.*
1	Current Overload	2	Only reported as event. Returns "0". *Read the Event Register.*
2	Sample Timing Violation	4	Only reported as event. Returns "0". *Read the Event Register.*
3	Not Used	Not Used	"0" is returned.
4	Temperature Overload	16	Only reported as event. Returns "0". *Read the Event Register.*
5	Frequency Overload/Underflow	32	Only reported as event. Returns "0". *Read the Event Register.*
6-7	Not Used	Not Used	"0" is returned.
8	Calibration Corrupt	256	At least one calibration constant is corrupt.
	Resistance		Only reported as event. Returns "0".

9	Overload	512	*Read the Event Register.*
10	Capacitance Overload/Underflow	1024	Only reported as event. Returns "0". *Read the Event Register.*
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	Memory Overflow	16384	Reading memory is full. One or more (oldest) readings have been lost.
15	Not Used	Not Used	"0" is returned.

- A Factory Reset (*RST command) will clear all bits in the condition register.

Return Format

The command reads the condition register and returns a decimal value which corresponds to the binary-weighted sum of all bits set in the register (see table above). For example, if bit 12 (decimal value = 4096) is set, this command will return "+4096".

Example

The following command reads the condition register (bit 12 is set).

```
STAT:QUES:COND?
```

Typical Response: +4096

See Also

STATus:QUEStionable:ENABle

STATus:QUEStionable[:EVENt]?

STATus:QUEStionable:ENABle

Syntax

STATus:QUEStionable:ENABle *<enable_value>*

STATus:QUEStionable:ENABle?

Description

This command enables bits in the enable register for the *Questionable Data Register* group. The selected bits are then reported to the Status Byte.

| NOTE | For more information on the SCPI Status System for the Agilent 34410A/11A/L4411A, see the Status System Diagram. |

Parameters

Name	Type	Range of Values	Default Value
<enable_value>	Numeric	A decimal value which corresponds to the binary-weighted sum of the bits in the register (see table below).	This is a required parameter

Remarks

- The following table lists the bit definitions for the *Questionable Data Register*.

Bit Number		Decimal Value	Definition
0	Voltage Overload	1	Range overload on dc or ac volts.
1	Current Overload	2	Range overload on dc or ac current.
2	Sample Timing Violation	4	A sample timing violation has occurred involving the SAMPle:TIMer command. Sample timing may not be valid.
3	Not Used	Not Used	"0" is returned.
4	Temperature Overload	16	Range overload on temperature.
5	Frequency Overload/Underflow	32	Range overload or underflow on frequency.
6-7	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 2- or 4-wire 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.
			Reading is greater than

12	Upper Limit Failed	4096	upper limit in limit test.
13	Not Used	Not Used	"0" is returned.
14	Memory Overflow	16384	Reading memory is full. One or more (oldest) readings have been lost.
15	Not Used	Not Used	"0" is returned.

- Use the <enable_value> parameter to specify which bits will be reported to the Status Byte. The decimal value specified corresponds to the binary-weighted sum of the bits you wish to enable in the register. For example, to enable bit 0 (decimal value = 1), bit 1 (decimal value = 2), and bit 12 (decimal value = 4096), the corresponding decimal value would be 4099 (1 + 2 + 4096).

- 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.

Return Format

The query 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 0 (decimal value = 1) and bit 1 (decimal value = 2) are enabled, the query command will return "+3".

Examples

The following command enables bit 9 (decimal value = 512) in the enable register.

```
STAT:QUES:ENAB 512
```

The following query returns which bits are enabled in the register.

```
STAT:QUES:ENAB?
```

Typical Response: +512

See Also

[STATus:QUEStionable:CONDition?](#)

[STATus:QUEStionable[:EVENt]?](#)

[STATus:PRESet](#)

STATus:QUEStionable[:EVENt]?

Syntax

STATus:QUEStionable[:EVENt]?

Description

This command queries the [event register](#) for the *Questionable Data Register* group. This is a read-only register and the bits are cleared when you read the register.

> **NOTE**
> For more information on the SCPI Status System for the Agilent 34410A/11A/L4411A, see the [Status System Diagram](#).

Remarks

- The following table lists the bit definitions for the *Questionable Data Register*.

Bit Number		Decimal Value	Definition
0	Voltage Overload	1	Range overload on dc or ac volts.
1	Current Overload	2	Range overload on dc or ac current.
2	Sample Timing Violation	4	A sample timing violation has occurred involving the SAMPle:TIMer command. Sample timing may not be valid.
3	Not Used	Not Used	"0" is returned.
4	Temperature Overload	16	Range overload on temperature.
5	Frequency Overload/Underflow	32	Range overload or underflow on frequency.
6-7	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 2- or 4-wire 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.
			Reading is greater than

12	Upper Limit Failed	4096	upper limit in limit test.
13	Not Used	Not Used	"0" is returned.
14	Memory Overflow	16384	Reading memory is full. One or more (oldest) readings have been lost.
15	Not Used	Not Used	"0" is returned.

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

- The *RST, SYSTem:PRESet, STATus:PRESet, and *PSC commands have no effect on this register.

Return Format

The command reads the event register and returns a decimal value which corresponds to the binary-weighted sum of all bits set in the register. For example, if bit 1 (decimal value = 2) and bit 9 (decimal value = 512) are set, this command will return "+514".

Example

The following command reads the event register (bit 10 is set).

```
STAT:QUES?
```

Typical Response: +1024

See Also

STATus:QUEStionable:CONDition?

STATus:QUEStionable:ENABle?

SYSTem Subsystem Introduction

Command Summary

General Commands

SYStem:BEEPer:STATe

SYStem:BEEPer:STATe?

SYSTem:BEEPer[:IMMediate]

SYSTem:ERRor[:NEXT]?

SYSTem:HELP?

SYSTem:LANGuage

SYSTem:LANGuage?

SYSTem:LFRequency?

SYSTem:LFRequency:ACTual?

SYSTem:LOCK:NAME?

SYSTem:LOCK:OWNer?

SYSTem:LOCK:RELease

SYSTem:LOCK:REQuest?

SYSTem:PRESet

SYSTem:SECurity:IMMediate

SYSTem:VERSion?

Remote Interface Configuration Commands

[SYSTem:COMMunicate:ENABle](#)

[SYSTem:COMMunicate:ENABle?](#)

[SYSTem:COMMunicate:GPIB[:SELF]:ADDRess](#)

[SYSTem:COMMunicate:GPIB[:SELF]:ADDRess?](#)

[SYSTem:COMMunicate:LAN:AUTOip[:STATe]](#)

[SYSTem:COMMunicate:LAN:AUTOip[:STATe]?](#)

[SYSTem:COMMunicate:LAN:BSTatus?](#)

[SYSTem:COMMunicate:LAN:CONTrol?](#)

[SYSTem:COMMunicate:LAN:DDNS](#)

[SYSTem:COMMunicate:LAN:DDNS?](#)

[SYSTem:COMMunicate:LAN:DHCP](#)

[SYSTem:COMMunicate:LAN:DHCP?](#)

[SYSTem:COMMunicate:LAN:DNS](#)

[SYSTem:COMMunicate:LAN:DNS?](#)

[SYSTem:COMMunicate:LAN:DOMain](#)

[SYSTem:COMMunicate:LAN:DOMain?](#)

[SYSTem:COMMunicate:LAN:GATEway](#)

[SYSTem:COMMunicate:LAN:GATEway?](#)

[SYSTem:COMMunicate:LAN:HISTory?](#)

[SYSTem:COMMunicate:LAN:HISTory:CLEar](#)

[SYSTem:COMMunicate:LAN:HOSTname](#)

[SYSTem:COMMunicate:LAN:HOSTname?](#)

[SYSTem:COMMunicate:LAN:IPADdress](#)

[SYSTem:COMMunicate:LAN:IPADdress?](#)

[SYSTem:COMMunicate:LAN:KEEPalive](#)

[SYSTem:COMMunicate:LAN:KEEPalive?](#)

[SYSTem:COMMunicate:LAN:LIPaddress?](#)

[SYSTem:COMMunicate:LAN:MAC?](#)

[SYSTem:COMMunicate:LAN:MEDiasense](#)

SYSTem:COMMunicate:LAN:MEDiasense?

SYSTem:COMMunicate:LAN:NETBios

SYSTem:COMMunicate:LAN:NETBios?

SYSTem:COMMunicate:LAN:SMASk

SYSTem:COMMunicate:LAN:SMASk?

SYSTem:COMMunicate:LAN:TELNet:PROMpt

SYSTem:COMMunicate:LAN:TELNet:PROMpt?

SYSTem:COMMunicate:LAN:TELNet:WMESsage

SYSTem:COMMunicate:LAN:TELNet:WMESsage?

NOTE	The Agilent 34410A/11A/L4411A uses the following LAN ports:
	• Port 5024 is used for SCPI Telnet sessions.
	• Port 5025 is used for SCPI Socket sessions.

SYSTem:COMMunicate:LAN:AUTOip[:STATe]

Syntax

SYSTem:COMMunicate:LAN:AUTOip[:STATe] *<mode>*

SYSTem:COMMunicate:LAN:AUTOip[:STATe]?

Description

This command disables or enables use of the Auto-IP standard to automatically assign an IP address to the 34410A/11A/L4411A when on a network that does not have [DHCP](#) servers.

> **NOTE** If you change the Auto-IP setting, you must cycle power on the instrument to activate the new setting.

Parameters

Name	Type	Range of Values	Default Value
<mode>	Boolean	{OFF|0|ON|1}	This is a required parameter

Remarks

- Auto-IP allocates IP addresses from the link-local address range (169.254.xxx.xxx).

- From the factory, the Auto-IP setting is enabled (ON).

- The Auto-IP setting is stored in non-volatile memory, and does not change when power has been off, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

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

Examples

The following command disables Auto-IP.

```
SYST:COMM:LAN:AUTOIP OFF
```

The following query returns the current Auto-IP setting.

```
SYST:COMM:LAN:AUTOIP?
```

Typical Response: 0

See Also

SYSTem:COMMunicate:LAN:DHCP

SYSTem:COMMunicate:LAN:BSTatus?

Syntax

SYSTem:COMMunicate:LAN:BSTatus?

Description

This command returns the instrument's LAN boot status.

Remarks

- This command is used primarily as a troubleshooting tool to determine whether the LAN interface started, and if so how.

- If the LAN interface is disabled (see SYSTem:COMMunicate:ENABle command), this command will return "LAN_NO_LINK" (see table below).

Return Format

The command reads the instrument's LAN boot status and returns one of the following strings.

String Returned	Description
LAN_NO_LINK	No link integrity found. The instrument cannot detect that a LAN cable is connected.
LAN_INIT	The network has not fully initialized. The instrument may be actively looking for an available DHCP server.
LAN_DUP_IP	The instrument attempted to boot using an IP address which is already in use on the network.
LAN_STATIC	The instrument booted with a static IP address.
LAN_DHCP	The instrument booted with a DHCP-assigned address.
LAN_ROLLOVER_STATIC	The instrument booted with DHCP ON, but no DHCP server could be found. Therefore, the instrument has rolled over to a static IP address.
LAN_AUTO_IP	The instrument booted with a local IP address.
LAN_DHCP_LEASE_ERROR	The instrument has lost its DHCP IP address.

Example

The following query returns the instrument's LAN boot status.

```
SYST:COMM:LAN:BST?
```

Typical Response: `LAN_DHCP`

See Also

SYSTem:COMMunicate:LAN:DHCP

SYSTem:COMMunicate:LAN:CONTrol?

Syntax

SYSTem:COMMunicate:LAN:CONTrol?

Description

This command reads the initial Control connection port number for Sockets communications. The initial connection is used to send and receive commands, queries, and query responses.

Remarks

- The Control socket connection is used to send a Device Clear to the instrument or to detect pending Service Request (SRQ) events.

- Always returns "0" if not sent from a socket connection.

Return Format

The command returns the Control connection port number. If "0" is returned, the interface does not support a Socket Control connection.

Example

The following query returns the Control connection port number.

```
SYST:COMM:LAN:CONT?
```

Typical Response: 5000

SYSTem:COMMunicate:LAN:DDNS

Syntax

SYSTem:COMMunicate:LAN:DDNS *<mode>*

SYSTem:COMMunicate:LAN:DDNS?

Description

This command turns Dynamic DNS on or off. Dynamic DNS registers the instrument host name with the DNS server. Contact your network administrator to determine if Dynamic DNS is being used and for the correct address.

NOTE   If you change the DDNS setting, you must cycle power on the instrument to activate the new setting.

Parameters

Name	Type	Range of Values	Default Value
<mode>	Boolean	{OFF|0|ON|1}	DDNS ON

Remarks

- The DNS address is stored in non-volatile memory, and does not change when power has been off, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns the current DDNS state: "0" or "1".

Examples

The following command turns on DDNS.

```
SYST:COMM:LAN:DDNS ON
```

The following query returns the current DDNS state.

```
SYST:COMM:LAN:DDNS?
```

Typical Response: 1

See Also

SYSTem:COMMunicate:LAN:HOSTname

SYSTem:COMMunicate:LAN:DHCP

Syntax

SYSTem:COMMunicate:LAN:DHCP *<mode>*

SYSTem:COMMunicate:LAN:DHCP?

Description

This command disables or enables use of the Dynamic Host Configuration Protocol (DHCP) for the 34410A/11A/L4411A.

When DHCP is <u>enabled</u> (factory setting), the 34410A/11A/L4411A will try to obtain an IP address from a DHCP server. If a DHCP server is found, it will assign a dynamic IP address, Subnet Mask, and Default Gateway to the instrument.

When DHCP is <u>disabled</u> or unavailable, the 34410A/11A/L4411A will use the static IP address, Subnet Mask, and Default Gateway during power-on.

> **NOTE** If you change the DHCP setting, you must cycle power on the instrument to activate the new setting.

Parameters

Name	Type	Range of Values	Default Value
<mode>	Boolean	{OFF|0|ON|1}	This is a required parameter

Remarks

- Most corporate LANs have a DHCP server.

- If a DHCP LAN address is not assigned by a DHCP server, then a static IP will be assumed after approximately 2 minutes. See the SYSTem:COMMunicate:LAN:BSTatus? command for more information on the instrument's boot status.

- The DHCP setting is stored in non-volatile memory, and does not change when power has been off, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

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

Examples

The following command disables DHCP.

```
SYST:COMM:LAN:DHCP OFF
```

The following query returns the current DHCP setting.

```
SYST:COMM:LAN:DHCP?
```

Typical Response: 0

See Also

SYSTem:COMMunicate:LAN:BSTatus?

SYSTem:COMMunicate:LAN:GATEway

SYSTem:COMMunicate:LAN:IPADdress

SYSTem:COMMunicate:LAN:SMASk

SYSTem:COMMunicate:LAN:DNS

Syntax

SYSTem:COMMunicate:LAN:DNS "*<address>*"

SYSTem:COMMunicate:LAN:DNS? [{CURRent|STATic}]

Description

This command assigns the static DNS address (the IP address of the Domain Name System server). Contact your network administrator to determine if DNS is being used and for the correct address. If DHCP is available and enabled, DHCP will auto-assign the DNS address. This auto-assigned DNS address takes precedence over the static DNS address assigned with this command.

NOTE   If you change the DNS address, you must cycle power on the instrument to activate the new setting.

Parameters

Name	Type	Range of Values	Default Value
<address>	Quoted String	Specified in four-byte dot notation ("nnn.nnn.nnn.nnn"), where "nnn" in each case is a byte value in the range 0 through 255.	"0.0.0.0"

Remarks

- The assigned DNS address is used for the DNS server if DHCP is disabled or unavailable. Otherwise, the DNS server address is auto-assigned by DHCP.

- Dot-notation addresses ("nnn.nnn.nnn.nnn" where "nnn" is a byte value) must be expressed with care, as most web software on the PC will interpret byte values with leading zeros as *octal* numbers. For example, "255.255.020.011" is actually equivalent to decimal "255.255.16.9" <u>not</u> "255.255.20.11" because ".020" is interpreted as "16" expressed in octal, and ".011" as "9". To avoid confusion, use only decimal expressions of byte values (0 to 255), with **no leading zeros**.

  For example, the 34410A/11A/L4411A assumes that all dot-notation addresses are expressed as decimal byte values and strips all leading zeros from these byte values. Thus, attempting to set an IP address of "255.255.020.011" will become "255.255.20.11" (a purely decimal expression). Be sure to enter the exact expression, "255.255.20.11", in your PC web software to address the instrument. Do not use "255.255.020.011" – the PC will interpret this address differently due to the leading zeros.

- The DNS address is stored in <u>non-volatile</u> memory, and does not change when power has been off, after a Factory Reset (<u>*RST</u> command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns the current DNS address in the form "nnn.nnn.nnn.nnn".

Note that the query command has two optional parameters. Specify "CURRent" (default) to read the DNS address currently being used by the instrument. Specify "STATic" to read the static DNS address currently stored in non-volatile memory within the instrument. This is the address that is used if DHCP is disabled or currently unavailable. If DHCP is enabled, it will auto-assign the DNS address, and that DHCP assigned address can be read by specifying "CURRent".

Examples

The following command sets the static DNS address.

```
SYST:COMM:LAN:DNS "198.105.232.4"
```

The following query returns the DNS address currently being used by the instrument (the quotes are also returned).

```
SYST:COMM:LAN:DNS? CURR
```

Typical Response: `"198.105.232.4"`

See Also

[SYSTem:COMMunicate:LAN:HOSTname](#)

SYSTem:COMMunicate:LAN:DOMain

Syntax

SYSTem:COMMunicate:LAN:DOMain "*<name>*"

SYSTem:COMMunicate:LAN:DOMain? [{CURRent|STATic}]

Description

This command assigns a Domain Name to the 34410A/11A/L4411A. The Domain Name is translated into an IP address.

NOTE   If you change the Domain Name, you must cycle power on the instrument to activate the new setting.

Parameters

Name	Type	Range of Values	Default Value
<name>	Quoted ASCII String	A string of up to 63 characters. The first character must be a letter (A-Z), but the remaining 62 characters can be letters, numbers (0-9), dashes ("-"), or periods ("."). Blank spaces are not allowed.	No Domain Name assigned

Remarks

- If Dynamic Domain Name System (DNS) is available on your network and your instrument uses DHCP, the Domain Name is registered with the Dynamic DNS service at power-on.

- If DHCP is enabled (see SYSTem:COMMunicate:LAN:DHCP command), the DHCP server can change the specified Domain Name.

- The Domain Name is stored in non-volatile memory, and does not change when power has been off, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command reads the Domain Name and returns an ASCII string enclosed in double quotes. If a Domain Name has not been assigned, a null string (" ") is returned.

Note that the query command has two optional parameters. Specify "CURRent" (default) to read the dynamic Domain Name currently being used by the instrument. Specify "STATic" to read the Domain Name currently stored in non-volatile memory within the instrument (may not be the actual name used by the instrument if DHCP is enabled).

Examples

The following command defines a Domain Name.

```
SYST:COMM:LAN:DOM "example.com"
```

The following query returns the Domain Name currently being used by the instrument (the quotes are also returned).

```
SYST:COMM:LAN:DOM?      or      SYST:COMM:LAN:DOM? CURR
```

Typical Response: `"example.com"`

See Also

[SYSTem:COMMunicate:LAN:DHCP](#)

[SYSTem:COMMunicate:LAN:HOSTname](#)

SYSTem:COMMunicate:LAN:GATEway

Syntax

SYSTem:COMMunicate:LAN:GATEway "*<address>*"

SYSTem:COMMunicate:LAN:GATEway? [{CURRent|STATic}]

Description

This command assigns a Default Gateway for the 34410A/11A/L4411A. The specified IP Address sets the Default Gateway which allows the instrument to communicate with systems that are not on the local subnet. Thus, this is the Default Gateway where packets are sent which are destined for a device not on the local subnet, as determined by the Subnet Mask setting. Contact your network administrator to determine if a gateway is being used and for the correct address.

| NOTE | If you change the Default Gateway, you must cycle power on the instrument to activate the new setting. |

Parameters

Name	Type	Range of Values	Default Value
<address>	Quoted String	Specified in four-byte dot notation ("nnn.nnn.nnn.nnn"), where "nnn" in each case is a byte value in the range 0 through 255.	"0.0.0.0" (no Gateway)

Remarks

- If [DHCP](#) is enabled (see [SYSTem:COMMunicate:LAN:DHCP](#) command), the specified Default Gateway is not used. However, if the DHCP server fails to assign a valid IP address, the currently configured Default Gateway will be used.

- Dot-notation addresses ("nnn.nnn.nnn.nnn" where "nnn" is a byte value) must be expressed with care, as most web software on the PC will interpret byte values with leading zeros as *octal* numbers. For example, "255.255.020.011" is actually equivalent to decimal "255.255.16.9" <u>not</u> "255.255.20.11" because ".020" is interpreted as "16" expressed in octal, and ".011" as "9". To avoid confusion, use only decimal expressions of byte values (0 to 255), with **no leading zeros**.

  For example, the 34410A/11A/L4411A assumes that all dot-notation addresses are expressed as decimal byte values and strips all leading zeros from these byte values. Thus, attempting to set a Default Gateway of "255.255.020.011" will become "255.255.20.11" (a purely decimal expression). Be sure to enter the exact expression, "255.255.20.11", in your PC web software to address the instrument. Do not use "255.255.020.011" – the PC will interpret this address differently due to the leading zeros.

- A value of "0.0.0.0" indicates that subnetting is not being used.

- The Default Gateway is stored in [non-volatile](#) memory, and does not change when power has been off, after a Factory Reset ([*RST](#) command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns the Default Gateway address in the form "nnn.nnn.nnn.nnn".

Note that the query command has two optional parameters. Specify "CURRent" (default) to read the dynamic Default Gateway currently being used by the instrument. Specify "STATic" to read the Default Gateway currently stored in non-volatile memory within the instrument (may not be the actual address used by the instrument if DHCP is enabled).

Examples

The following command sets the Default Gateway address.

```
SYST:COMM:LAN:GATEWAY "255.255.20.11"
```

The following query returns the Default Gateway address currently being used by the instrument (the quotes are also returned).

```
SYST:COMM:LAN:GATEWAY? CURR    or    SYST:COMM:LAN:GATEWAY?
```

Typical Response: "0.0.0.0"

See Also

SYSTem:COMMunicate:LAN:DHCP

SYSTem:COMMunicate:LAN:IPADdress

SYSTem:COMMunicate:LAN:SMASk

SYSTem:COMMunicate:LAN:HISTory?

Syntax

SYSTem:COMMunicate:LAN:HISTory?

Description

This command returns a record of all LAN session connections and disconnections.

Remarks

- To clear the LAN connection history queue, use the SYSTem:COMMunicate:LAN:HISTory:CLEar command.

Return Format

The command returns the LAN connection history in [Definite-Length Block](#) format. The syntax is a pound sign (#) followed by a non-zero digit representing the number of digits in the decimal integer to follow. This digit is followed by a decimal integer indicating the number of 8-bit data bytes to follow. This is followed by a block of data containing the specified number of bytes.

For example:

```
2 digits follow
    |
    #231"169.254.144.33-1 VXI11   Connect"
    |                     |
31 bytes follow     31 bytes of data
```
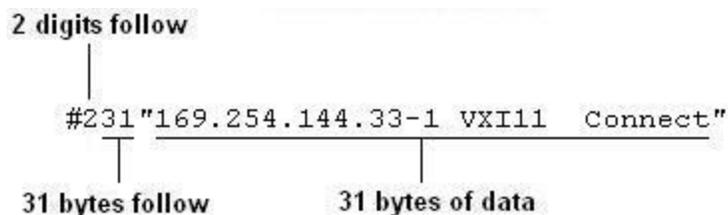
Here is an example of a single connection record, enclosed in quotes:

```
"169.254.144.33-1 VXI11   Connect"
 ‾‾‾‾‾‾‾‾‾‾‾‾‾‾   ‾‾ ‾‾‾   ‾‾‾‾‾‾‾
       ①          ②  ③       ④
```

---
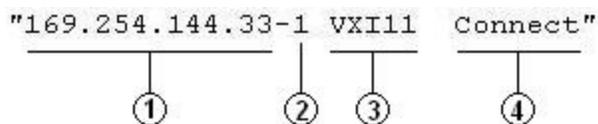
1 IP Address

2 Session Number

3 Session Type (LAN, SOCKets, TELNet, VXI11, or WEB)

4 Connect/Disconnect Status

Each connection record is enclosed in quotes and multiple responses are separated by commas.

If the connection history has been cleared, this command returns "#10" (the null response).

Example

The following query returns the LAN connection history.

```
SYST:COMM:LAN:HIST?
```

Typical Response:

```
#3135"169.254.149.35-1 VXI11 Connect","169.254.149.35-2 VXI11
Connect","169.254.149.35-1 VXI11 Disconnect","169.254.149.35-2
VXI11 Disconnect"
```

See Also

SYSTem:COMMunicate:LAN:HISTory:CLEar

SYSTem:COMMunicate:LAN:HISTory:CLEar

Syntax

SYSTem:COMMunicate:LAN:HISTory:CLEar

Description

This command clears the LAN connection history queue.

Remarks

- Use this command to clear the LAN connection history queue after reading it with the [SYSTem:COMMunicate:LAN:HISTory?](#) command.

Example

The following command clears the LAN connection history queue.

```
SYST:COMM:LAN:HIST:CLE
```

See Also

SYSTem:COMMunicate:LAN:HISTory?

SYSTem:COMMunicate:LAN:HOSTname

Syntax

SYSTem:COMMunicate:LAN:HOSTname "<*name*>"

SYSTem:COMMunicate:LAN:HOSTname? [{CURRent|STATic}]

Description

This command assigns a Host Name to the 34410A/11A/L4411A. The Host Name is the host portion of the domain name, which is translated into an IP address.

NOTE   If you change the Host Name, you must cycle power on the instrument to activate the new setting.

Parameters

Name	Type	Range of Values	Default Value
<name>	[Quoted ASCII String](#)	A string of up to 15 characters. The first character must be a letter (A-Z), but the remaining 14 characters can be letters, numbers (0-9), or dashes ("-"). Blank spaces are not allowed.	**A-34410A-*nnnnn* A-34411A-*nnnnn* or A-L4411A-*nnnnn*** where ***nnnnn*** is the last 5 digits in the instrument's serial number.

Remarks

- If Dynamic Domain Name System (DNS) is available on your network and your instrument uses DHCP, the Host Name is registered with the Dynamic DNS service at power-on.

- If DHCP is enabled (see SYSTem:COMMunicate:LAN:DHCP command), the DHCP server can change the specified Host Name.

- The Host Name is stored in non-volatile memory, and does not change when power has been off, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command reads the Host Name and returns an ASCII string enclosed in double quotes. If a Host Name has not been assigned, a null string (" ") is returned.

Note that the query command has two optional parameters. Specify "CURRent" (default) to read the dynamic Host Name currently being used by the instrument. Specify "STATic" to read the Host Name currently stored in non-volatile memory within the instrument (may not be the actual name used by the instrument if DHCP is enabled).

Examples

The following command defines a Host Name.

```
SYST:COMM:LAN:HOST "LAB1-34410A"
```

The following query returns the Host Name currently being used by the instrument (the quotes are also returned).

```
SYST:COMM:LAN:HOST? CURR    or    SYST:COMM:LAN:HOST?
```

Typical Response: `"LAB1-34410A"`

See Also

SYSTem:COMMunicate:LAN:DHCP

SYSTem:COMMunicate:LAN:DOMain

SYSTem:COMMunicate:LAN:IPADdress

Syntax

SYSTem:COMMunicate:LAN:IPADdress "*<address>*"

SYSTem:COMMunicate:LAN:IPADdress? [{CURRent|STATic}]

Description

This command assigns a static Internet Protocol (IP) Address for the 34410A/11A/L4411A. Contact your network administrator for a valid IP address to use for your instrument.

NOTE	If you change the IP address, you must cycle power on the instrument to activate the new address.

Parameters

Name	Type	Range of Values	Default Value
<address>	Quoted String	Specified in four-byte dot notation ("nnn.nnn.nnn.nnn"), where "nnn" in each case is a byte value in the range 0 through 255.	"169.254.4.10"

Remarks

- If DHCP is enabled (see SYSTem:COMMunicate:LAN:DHCP command), the specified static IP address is not used. However, if the DHCP server fails to assign a valid IP address, the currently configured static IP address will be used.

- Dot-notation addresses ("nnn.nnn.nnn.nnn" where "nnn" is a byte value) must be expressed with care, as most web software on the PC will interpret byte values with leading zeros as *octal* numbers. For example, "255.255.020.011" is actually equivalent to decimal "255.255.16.9" <u>not</u> "255.255.20.11" because ".020" is interpreted as "16" expressed in octal, and ".011" as "9". To avoid confusion, use only decimal expressions of byte values (0 to 255), with **no leading zeros**.

  For example, the 34410A/11A/L4411A assumes that all dot-notation addresses are expressed as decimal byte values and strips all leading zeros from these byte values. Thus, attempting to set an IP address of "255.255.020.011" will become "255.255.20.11" (a purely decimal expression). Be sure to enter the exact expression, "255.255.20.11", in your PC web software to address the instrument. Do not use "255.255.020.011" – the PC will interpret this address differently due to the leading zeros.

- If you are planning to use a static IP address on a Corporate LAN, contact your network administrator to obtain a fixed IP address to be used exclusively for your instrument.

- The IP address is stored in non-volatile memory, and does not change when power has been off, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns the IP address in the form "nnn.nnn.nnn.nnn".

Note that the query command has two optional parameters. Specify "CURRent" (default) to read the dynamic IP address currently being used by the instrument. Specify "STATic" to read the IP address currently stored in non-volatile memory within the instrument (may not be the actual address used by the instrument if DHCP is enabled).

Examples

The following command sets the IP address.

```
SYST:COMM:LAN:IPAD "255.255.25.14"
```

The following query returns the IP address currently being used by the instrument (the quotes are also returned).

```
SYST:COMM:LAN:IPAD? CURR    or    SYST:COMM:LAN:IPAD?
```

Typical Response: `"169.254.149.35"`

See Also

SYSTem:COMMunicate:LAN:DHCP

SYSTem:COMMunicate:LAN:GATEway

SYSTem:COMMunicate:LAN:SMASk

SYSTem:COMMunicate:LAN:KEEPalive

Syntax

SYSTem:COMMunicate:LAN:KEEPalive {*<seconds>*|MIN|MAX}

SYSTem:COMMunicate:LAN:KEEPalive? [{MIN|MAX}]

Description

This command sets the LAN keepalive timeout which specifies a number of seconds to keep a LAN socket active. If there has been no activity on the connection after the specified timeout, the instrument will send keepalive probes to the client to determine if it is still available. After the specified timeout, the connection will be marked as "down" or "dropped".

NOTE
If you specify a timeout value, it is recommended that you use the largest value that still meets the application's need for unreachable client detection. Smaller timeout values will generate more keepalive probes thus using more of the available network bandwidth.

Parameters

Name	Type	Range of Values	Default Value
<seconds>	Numeric	Desired timeout in seconds between 600 seconds and 32,000,000 seconds, or 0 (no timeout). MIN = 600 seconds MAX = 32,000,000 seconds	1,800 seconds (30 minutes)

Remarks

- If you specify a value of "0", no timeout is set; the instrument will wait indefinitely and will not send any keepalive probes to the client.

- For the <seconds> parameter, you can substitute MIN or MAX for a numeric value. MIN selects the smallest value accepted; MAX selects the largest value accepted.

- The timeout is stored in non-volatile memory, and does not change when power has been off, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns the current timeout in seconds.

Examples

The following command sets the timeout to 2,700 seconds (45 minutes).

```
SYST:COMM:LAN:KEEP 2.7E+03
```

The following query returns the timeout currently being used.

```
SYST:COMM:LAN:KEEP?
```

Typical Response: +2.70000000E+03

SYSTem:COMMunicate:LAN:LIPaddress?

Syntax

SYSTem:COMMunicate:LAN:LIPaddress?

Description

This query returns the "last valid Auto IP address used."

Return Format

The query returns the last valid Auto IP address in the form "nnn.nnn.nnn.nnn" (the quotes are also returned).

Examples

The following query returns the last valid Auto IP address used.

```
SYST:COMM:LAN:LIP?
```

Typical Response: "169.254.20.11"

See Also

SYSTem:COMMunicate:LAN:AUTOip[:STATe]

SYSTem:COMMunicate:LAN:MAC?

Syntax

SYSTem:COMMunicate:LAN:MAC?

Description

This command reads the 34410A/11A/L4411A's Media Access Control (MAC) address, also known as the link-layer address, the Ethernet (station) address, LANIC ID, or Hardware Address. This is an unchangeable 48-bit address assigned by the manufacturer to each unique Internet device.

| NOTE | Your network administrator may need the MAC address if they are assigning a static IP address for this device. |

Remarks

- The instrument's MAC address is set at the factory and cannot be changed.

- The MAC address is stored in non-volatile memory, and does not change when power has been off, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

The command reads the MAC address and returns an ASCII string enclosed in double quotes. The MAC address is represented as 12 hexadecimal characters divided into groups of two and separated by dashes (e.g., "XX-XX-XX-XX-XX-XX").

Example

The following query returns the MAC address (the quotes are also returned).

```
SYST:COMM:LAN:MAC?
```

Typical Response: "00-30-D3-00-10-41"

SYSTem:COMMunicate:LAN:MEDiasense

Syntax

SYSTem:COMMunicate:LAN:MEDiasense *<mode>*

SYSTem:COMMunicate:LAN:MEDiasense?

Description

This command disables or enables the mediasense feature.

| NOTE | If you change the mediasense setting, you must cycle power on the instrument to activate the new setting. |

Parameters

Name	Type	Range of Values	Default Value
<mode>	Boolean	{OFF|0|ON|1}	MEDiasense ON

Remarks

- When MEDiasense is enabled, this feature detects a loss of LAN connectivity of greater than 20 seconds, and then, on sensing a reconnection, re-starts the LAN.

- When MEDiasense is disabled, there is no detection of loss of LAN connectivity.

- From the factory, the MEDiasense setting is enabled (ON).

- The MEDiasense setting is stored in non-volatile memory, and does not change when power has been off, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

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

Examples

The following command disables MEDiasense.

```
SYST:COMM:LAN:MED OFF
```

The following query returns the current MEDiasense setting.

```
SYST:COMM:LAN:MED?
```

Typical Response: 0

SYSTem:COMMunicate:LAN:NETBios

Syntax

SYSTem:COMMunicate:LAN:NETBios *\<mode\>*

SYSTem:COMMunicate:LAN:NETBios?

Description

This command disables or enables the use of NETBios to automatically assign an IP address to the 34410A/11A/L4411A for peer-to-peer naming on a private network that uses the NETBios naming service.

NOTE   If you change the NETBios setting, you must cycle power on the instrument to activate the new setting.

Parameters

Name	Type	Range of Values	Default Value
<mode>	Boolean	{OFF|0|ON|1}	NETBios ON

Remarks

- NETBios allocates IP addresses from the private networks naming list.

- From the factory, the NETBios setting is enabled (ON).

- The NETBios setting is stored in [non-volatile](#) memory, and does not change when power has been off, after a Factory Reset ([*RST](#) command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

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

Examples

The following command disables NETBios.

```
SYST:COMM:LAN:NETB OFF
```

The following query returns the current NETBios setting.

```
SYST:COMM:LAN:NETB?
```

Typical Response: 0

See Also

SYSTem:COMMunicate:LAN:DHCP

SYSTem:COMMunicate:LAN:SMASk

Syntax

SYSTem:COMMunicate:LAN:SMASk "*<mask>*"

SYSTem:COMMunicate:LAN:SMASk? [{CURRent|STATic}]

Description

This command assigns a Subnet Mask for the 34410A/11A/L4411A. The instrument uses the Subnet Mask to determine if a client IP address is on the same local subnet. When a client IP address is on a different subnet, all packets must be sent to the Default Gateway. Contact your network administrator to determine if subnetting is being used and for the correct Subnet Mask.

| NOTE | If you change the Subnet Mask, you must cycle power on the instrument to activate the setting. |

Parameters

Name	Type	Range of Values	Default Value
<mask>	Quoted String	Specified in four-byte dot notation ("nnn.nnn.nnn.nnn"), where "nnn" in each case is a byte value in the range 0 through 255.	"255.255.0.0"

Remarks

- If DHCP is enabled (see SYSTem:COMMunicate:LAN:DHCP command), the specified Subnet Mask is not used. However, if the DHCP server fails to assign a valid IP address, the currently configured Subnet Mask will be used.

- Dot-notation addresses ("nnn.nnn.nnn.nnn" where "nnn" is a byte value) must be expressed with care, as most web software on the PC will interpret byte values with leading zeros as *octal* numbers. For example, "255.255.020.011" is actually equivalent to decimal "255.255.16.9" <u>not</u> "255.255.20.11" because ".020" is interpreted as "16" expressed in octal, and ".011" as "9". To avoid confusion, use only decimal expressions of byte values (0 to 255), with **no leading zeros**.

  For example, the 34410A/11A/L4411A assumes that all dot-notation addresses are expressed as decimal byte values and strips all leading zeros from these byte values. Thus, attempting to set a Subnet Mask of "255.255.020.011" will become "255.255.20.11" (a purely decimal expression). Be sure to enter the exact expression, "255.255.20.11", in your PC web software to address the instrument. Do not use "255.255.020.011" – the PC will interpret this address differently due to the leading zeros.

- A value of "0.0.0.0" or "255.255.255.255" indicates that subnetting is not being used.

- The Subnet Mask is stored in non-volatile memory, and does not change when power has been off, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns the Subnet Mask in the form "nnn.nnn.nnn.nnn".

Note that the query command has two optional parameters. Specify "CURRent" (default) to read the dynamic Subnet Mask currently being used by the instrument. Specify "STATic" to read the Subnet Mask currently stored in non-volatile memory within the instrument (may not be the actual mask used by the instrument if DHCP is enabled).

Examples

The following command sets the Subnet Mask.

```
SYST:COMM:LAN:SMAS "255.255.20.11"
```

The following query returns the Subnet Mask currently being used by the instrument (the quotes are also returned).

```
SYST:COMM:LAN:SMAS? CURR     or     SYST:COMM:LAN:SMAS?
```

Typical Response: `"255.255.0.0"`

See Also

SYSTem:COMMunicate:LAN:DHCP

SYSTem:COMMunicate:LAN:GATEway

SYSTem:COMMunicate:LAN:IPADdress

SYSTem:COMMunicate:LAN:TELNet:PROMpt

Syntax

SYSTem:COMMunicate:LAN:TELNet:PROMpt "*<string>*"

SYSTem:COMMunicate:LAN:TELNet:PROMpt?

Description

This command sets the command prompt seen when using a Telnet session to communicate with the 34410A/11A.

Parameters

Name	Type	Range of Values	Default Value
<string>	Quoted ASCII String	A string of up to 15 characters.	"3441xA>"

Remarks

- The 34410A/11A/L4411A uses LAN port 5024 for SCPI Telnet sessions (but 5025 for SCPI Socket sessions).

- Telnet session can typically be stared as follows from a host computer shell:

    telnet *<IP_address> <port>*

    For example:

    ```
    telnet 169.254.4.10 5024
    ```

    To exit a Telnet session, press **<Ctrl-D>**.

- The command prompt is stored in [non-volatile](#) memory, and does not change when power has been off, after a Factory Reset ([*RST](#) command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command reads the command prompt and returns an ASCII string enclosed in double quotes.

Examples

The following command defines the command prompt.

```
SYST:COMM:LAN:TELN:PROM "Command> "
```

The following query returns the command prompt currently being used (the quotes are also returned).

```
SYST:COMM:LAN:TELN:PROM?
```

Typical Response: `"Command> "`

See Also

SYSTem:COMMunicate:LAN:TELNet:WMESsage

SYSTem:COMMunicate:LAN:TELNet:WMESsage

Syntax

SYSTem:COMMunicate:LAN:TELNet:WMESsage "*<string>*"

SYSTem:COMMunicate:LAN:TELNet:WMESsage?

Description

This command sets the welcome message seen when using a Telnet session to communicate with the 34410A/11A.

Parameters

Name	Type	Range of Values	Default Value
<string>	Quoted ASCII String	A string of up to 63 characters.	"Welcome to Agilent's 3441xA 6-1/2 Digit Multimeter"

Remarks

- The 34410A/11A/L4411A uses LAN port 5024 for SCPI Telnet sessions (but 5025 for SCPI Socket sessions).

- The welcome message is stored in non-volatile memory, and does not change when power has been off, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command reads the welcome message and returns an ASCII string enclosed in double quotes.

Examples

The following command defines the welcome message.

```
SYST:COMM:LAN:TELN:WMES "Welcome to 3441xA Telnet Session"
```

The following query returns the welcome message currently being used (the quotes are also returned).

```
SYST:COMM:LAN:TELN:WMES?
```

Typical Response: `"Welcome to 3441xA Telnet Session"`

See Also

SYSTem:COMMunicate:LAN:TELNet:PROMpt

SYSTem:BEEPer:STATe

Syntax

SYSTem:BEEPer:STATe *\<mode\>*

SYSTem:BEEPer:STATe?

Description

This command disables or enables the beeper tone. The factory default is ON. The beeper tone is only available with the 34410A/11A.

Parameters

Name	Type	Range of Values	Default Value
<mode>	Boolean	{OFF|0|ON|1}	This is a required parameter

Remarks

- Turning off the beeper does *not* disable the key click generated when you press a front-panel key.

- A beep tone is *always* emitted (even with the beep state turned OFF) in the following cases:

  - A continuity measurement is less than or equal to the continuity threshold (≤10 Ω).

  - A SYSTem:BEEPer command is sent.

  - An error occurs.

- A beep tone is emitted *only* if the beep state is ON in the following cases:

  - A set LO or HI 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 non-volatile memory, and does not change when power has been off, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

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

Examples

The following command disables the beeper state.

```
SYST:BEEP:STAT OFF
```

The following query returns the beeper state.

```
SYST:BEEP:STAT?
```

Typical Response: 0

See Also

[SYSTem:BEEPer[:IMMediate]](SYSTem:BEEPer[:IMMediate])

SYSTem:BEEPer[:IMMediate]

Syntax

SYSTem:BEEPer[:IMMediate]

Description

This command issues a single beep immediately from the instrument. This may be useful for program development and troubleshooting. The beeper tone is only available with the 34410A/11A.

Remarks

- This command overrides the current beeper state (see the SYSTem:BEEPer:STATe command). This means that you can issue a single beep even if the beeper is turned off.

Example

The following command issues a single beep from the instrument.

```
SYST:BEEP
```

See Also

SYSTem:BEEPer:STATe

SYSTem:COMMunicate:ENABle

Syntax

SYSTem:COMMunicate:ENABle *<mode>*, *<interface>*

SYSTem:COMMunicate:ENABle? *<interface>*

Description

This command disables or enables the GPIB, USB, or LAN remote interface. In addition, this command disables or enables the available remote services such as Sockets, Telnet, VXI11, and the 34410A/11A/L4411A's built-in Web Interface.

NOTE	When you disable, or re-enable, an interface (GPIB, USB, or LAN), you must cycle power on the instrument to activate the new setting. This is also true when you disable or re-enable any LAN service.

Parameters

Name	Type	Range of Values	De Va
<mode>	Boolean	{OFF|0|ON|1}	Th re pa
<interface>	Discrete	{GPIB|USB|LAN|SOCKets|TELNet|VXI11|WEB}	Th re pa

Remarks

- All interfaces are enabled by default as shipped from the factory.

- If you disable the LAN interface, all associated LAN services will not be started when you power on the instrument.

- The 34410A/11A/L4411A uses the following LAN ports:

    - Port 5024 is used for SCPI Telnet sessions.

    - Port 5025 is used for SCPI Socket sessions.

- The interface setting is stored in non-volatile memory, and does not change when power has been off, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns "0" (OFF) or "1" (ON) for the specified interface.

Examples

The following command disables the USB interface.

```
SYST:COMM:ENAB OFF,USB
```

The following query returns the state of the USB interface.

```
SYST:COMM:ENAB? USB
```

Typical Response: 0

See Also

[Remote Interface Configuration Commands](#)

SYSTem:COMMunicate:GPIB[:SELF]:ADDRess

Syntax

SYSTem:COMMunicate:GPIB[:SELF]:ADDRess {*<address>*}

SYSTem:COMMunicate:GPIB[:SELF]:ADDRess?

Description

This command assigns the instrument's GPIB (IEEE-488) address. Each device on the GPIB interface must have a unique address. The instrument's GPIB address is displayed on the 34410A/11A front-panel at power-on. The L4411A GPIB address can be determined using the query form of the command.

Parameters

Name	Type	Range of Values	Default Value
<address>	Numeric	An integral value between 0 and 30.	Required parameter

Remarks

- Factory GPIB address setting is 22.

- Your computer's GPIB interface card has its own address. Be sure to avoid using the computer's address for any instrument on the interface bus.

- The GPIB address is stored in non-volatile memory, and does not change when power has been off, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command returns the GPIB address in the form "+22".

Examples

The following command sets the GPIB address.

```
SYST:COMM:GPIB:ADDR 15
```

The following query returns the GPIB address currently being used by the instrument.

```
SYST:COMM:GPIB:ADDR?
```

Typical Response: +15

See Also

SYSTem:COMMunicate:ENABle

SYSTem:ERRor[:NEXT]?

Syntax

SYSTem:ERRor[:NEXT]?

Description

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 instrument's error queue. Each remote interface I/O session (i.e., GPIB, USB, LAN, etc.) has its own error queue. Errors appear in the error queue of the I/O session that caused the error. For example, if an error was generated by a command sent over the GPIB interface, send the SYSTem:ERRor? command from GPIB to read the error queue.

For a complete listing of the Agilent 34410A/11A/L4411A's error messages, see SCPI Error Messages.

Remarks

- The instrument beeps once each time a command syntax or hardware error is generated. The front-panel ERROR annunciator turns on when one or more errors are currently stored in the error queue.

- Errors are retrieved in first-in-first-out (FIFO) order. The first error returned is the first error that was stored.

- Errors are cleared as you read them. When you have read all errors from the error queue, the ERROR annunciator turns off.

- If more than 20 errors have occurred, the last error stored in the queue (the most recent error) is replaced with `-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"`.

- Errors generated by the instrument hardware are broadcast to all I/O sessions.

- The front panel reports errors from all I/O sessions and clears them. To read the error queue from the front panel, use the Utility menu (press the [Utility] key). See the *Agilent 34410A/11A/L4411A User's Guide* for further information.

- Error conditions are also summarized in the Status Byte Register. For more information on the SCPI Status System for the Agilent 34410A/11A/L4411A, see Status System Introduction.

- The error queue is cleared by the *CLS (Clear Status) command (for the I/O session), and when power is cycled (for all errors). All errors are cleared when you read the error queue. However, the error queue is not cleared by a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The command reads and clears one error string from the error queue. 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"
```

Example

The following query reads and clears one error.

```
SYST:ERR?
```

Typical Response: -101,"Invalid character"

See Also

[*CLS](#)

[*SRE](#)

SYSTem:HELP?

Syntax

SYSTem:HELP?

Description

This command returns a complete list of the SCPI commands for the Agilent 34410A, 34411A, or L4411A.

Return Format

This command returns the complete list of SCPI commands as [Definite Length Block Data](#), delimited with [New Line](#) characters. The first line consists of a pound sign (#) followed by one digit representing the number of digits in the decimal integer to follow. This digit is followed by a decimal integer indicating the number of data bytes to follow, followed by the first New Line. (For example, "#47947" in the first line means that there are 7947 data bytes to follow.) The rest of the block of data consists of one command per line, each terminated with a New Line character.

Example

The following query returns the list of SCPI commands.

```
SYST:HELP?
```

Typical Response:

```
#47947
:ABORt/nquery/
:CALibration:ALL?/qonly/
:CALibration:COUNt?/qonly/
:CALibration:DATA
:CALibration:LFRequency
```

```
*SAV/nquery/
*SRE
*STB?/qonly/
*TRG/nquery/
*TST?/qonly/
*WAI/nquery/
```

In the list of commands:

- `/nquery/` indicates a command with no query.
- `/qonly/` indicates a query only, with no command form.
- All other commands consist of command and query.

The complete syntax of each individual command is found in the *Agilent 34410A./11A/L4411A Programmer's Reference* (this help system, see Commands A-Z).

See Also

[Commands A-Z](#)

[Command Quick Reference](#)

SYSTem:LANGuage

Syntax

SYSTem:LANGuage "*<compatibility>*"

SYSTem:LANGuage?

Description

The Agilent 34410A/11A/L4411A Multimeter provides a SCPI command set that is enhanced, but highly backward-compatible with the Agilent 34401A Multimeter. Nevertheless, due to the added features and enhanced performance of the Agilent 34410A/11A/L4411A, there are some issues that may prevent your 34401A program from running identically using the 34410A/11A/L4411A in its normal SCPI mode. For this reason, a *34401A maximum-compatibility mode* is provided.

The SYSTem:LANGuage command provides a compatibility switch, allowing you to select the *34401A maximum-compatibility mode.* In this mode the 34410A, 34411A, or L4411A instrument emulates the SCPI language for the Agilent 34401A Multimeter (or the former HP 34401A version of that product).

Parameters

Name	Type	Range of Values	Default Value
<compatibility>	Quoted ASCII String	"34401A" "34410A" *(34410A only)* "34411A" *(34411A only)* "L4411A" *(L4411A only)*	"34410A", "34411A" or "L4411A" *(depending on instrument)*

Remarks

- Specify "34401A" for *<compatibility>* to select *34401A maximum compatibility mode*. In this mode, the 34410A, 34411A, or L4411A instrument provides backwards compatibility with the SCPI language used by the 34401A Multimeter. Refer to the *Agilent 34401A Multimeter User's Guide* for a description of the SCPI language for the 34401A. Refer to Agilent 34401A Compatibility Mode for additional information about SCPI compatibility in this mode.

- Specify "34410A" *(34410A only),* "34411A" *(34411A only),* or "L4411A" *(L4411A only)* for *<compatibility>* to return the instrument to its *native SCPI mode*. In its native mode, the instrument follows the SCPI language syntax described in this *SCPI Command Reference:*

  - The 34410A accepts the "34410A" parameter, and operates as described in this *SCPI Command Reference*, except for the additional "34411A-only" functionality where so identified. The default is "34410A" for the 34410A instrument.

  - The 34411A accepts the "34411A" parameter, and operates as described in this *SCPI Command Reference*, including the additional "34411A-only" functionality. The default is "34411A" for the 34411A instrument.

  - The L4411A accepts the "L4411A" parameter, and operates as described in this *SCPI Command Reference*, including the additional "34411A-L4411A" functionality. The default is "L4411A" for the L4411A instrument.

- The SYSTem:LANGuage command is, necessarily, available regardless of the current language compatibility mode selection.

- This command has no effect on front-panel operations.

- The *<compatibility>* parameter is stored in non-volatile memory, and does not change when power has been off, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

The query command reads the current *<compatibility>* mode, and returns an ASCII string enclosed in double quotes: "34401A", "34410A", "34411A", or "L4411A".

Examples

The following command selects the *34401A compatibility mode*:

```
SYST:LANG "34401A"
```

The following query returns the compatibility mode currently being used by the instrument (the quotes are also returned).

```
SYST:LANG?
```

Typical Response: `"34401A"`

See Also

[Agilent 34401A Compatibility Mode](#)

SYSTem:LFRequency

Syntax

SYSTem:LFRequency?

Description

This command returns the current power-line reference frequency used by the 34410A/11A/L4411A analog-to-digital converter. You can set this reference frequency with the CALibration:LFRequency command. Normally, when you apply power to the instrument, the instrument automatically detects the power-line frequency (50 Hz, 60 Hz, or 400 Hz) and uses this value to determine the integration time used.

Remarks

- If the detected power line frequency is 400 Hz, the 50 Hz reference value is actually used (a subharmonic of 400 Hz).

- The instrument multiplies the period of the reference frequency by the specified number of power line cycles ([SENSe:]<*function*>:NPLC commands) to determine the actual integration time.

- The reference frequency setting is stored in volatile memory and will be lost when power is turned off. The instrument automatically measures the power-line frequency (50 Hz, 60 Hz, or 400 Hz) at power-on.

Return Format

The command returns "50" (for 50 Hz or 400 Hz) or "60" indicating the present reference frequency setting.

Example

The following command sets the reference frequency setting to 50 Hz.

```
SYST:LFR 50
```

The following command returns the reference frequency setting.

```
SYST:LFR?
```

Typical Response: `+60`

See Also

CALibration:LFRequency

SYSTem:LFRequency:ACTual?

SYSTem:LFRequency:ACTual

Syntax

SYSTem:LFRequency:ACTual?

Description

This command returns the actual power-line frequency.

Remarks

- The reference frequency used by the 34410A/11A/L4411A analog-to-digital converter is based on the power line frequency measured at power on. But, the reference frequency is set to either 50 Hz (for a power line frequency of 50 Hz or 400 Hz), or 60 Hz (for a 60 Hz power line frequency). The SYSTem:LFRequency? command returns the reference frequency (+50 or +60). The SYSTem:LFRequency:ACTual? command measures and returns the actual power line frequency.

Return Format

The command returns the actual power line frequency measured at power up in the format "+5.99982241E+01".

Example

The following command returns the reference frequency setting.

```
SYST:LFR:ACT?
```

Typical Response: +5.99982241E+01

See Also

SYSTem:LFRequency?

SYSTem:LOCK:NAME?

Syntax

SYSTem:LOCK:NAME?

Description

This command returns the current I/O interface (the I/O interface in use by the querying computer).

Remarks

- Use this command to determine the interface that you are using. Then use the [SYSTem:LOCK:OWNer?](#) command to determine which interface, if any, has the lock.

Return Format

The command returns "GPIB", "USB", "VXI11", or "LAN *<IP Address>*" indicating the I/O interface being used by the querying computer.

Example

The following command queries which I/O interface is in use.

```
SYST:LOCK:NAME?
```

Typical Response: `"LAN169.254.149.35"`

See Also

[SYSTem:LOCK:OWNer?](#)

[SYSTem:LOCK:RELease](#)

[SYSTem:LOCK:REQuest?](#)

SYSTem:LOCK:OWNer?

SYSTem:LOCK:OWNer?

Syntax

SYSTem:LOCK:OWNer?

Description

This command returns the I/O interface that currently has a lock.

Remarks

- When a lock is active, Bit 10 in the Standard Operation Register will be set (see STATus:OPERation:CONDition? command). When the lock is released on all I/O interfaces, this bit will be cleared.

Return Format

The command returns "GPIB", "USB", "VXI11", or "LAN *<IP Address>*" indicating the I/O interface which currently has a lock. If no interfaces have a lock, "NONE" is returned.

Example

The following command queries which I/O interface currently has a lock.

```
SYST:LOCK:OWN?
```

Typical Response: `"LAN169.254.149.35"`

See Also

[SYSTem:LOCK:NAME?](#)

[SYSTem:LOCK:RELease](#)

[SYSTem:LOCK:REQuest?](#)

SYSTem:LOCK:RELease

Syntax

SYSTem:LOCK:RELease

Description

This command decrements the lock count by one and may release the I/O interface from which the command is executed.

Remarks

- When a lock is active, Bit 10 in the Standard Operation Register will be set (see STATus:OPERation:CONDition? command). When the lock is released on all I/O interfaces, this bit will be cleared.

Example

The following command decreases the lock count by one.

```
SYST:LOCK:REL
```

The following series of commands illustrates usage.

Initial State = unlocked, Count = 0

```
<FROM USB>    SYST:LOCK:REQ?     returns "1" (request
successful)
```

State = locked, Count = 1

```
<FROM GPIB>   SYST:LOCK:REQ?     returns "0" because USB has
lock
```

State = locked, Count = 1

```
<FROM USB>    SYST:LOCK:REQ?     returns "1" (request
successful)
```

State = locked, Count = 2

```
<FROM USB>    SYST:LOCK:REL
```

State = locked, Count = 1

```
<FROM USB>    SYST:LOCK:REL
```

State = unlocked, Count = 0

Note that for each successful lock request, a lock release is required. Two requests require two releases.

See Also

SYSTem:LOCK:NAME?

SYSTem:LOCK:OWNer?

SYSTem:LOCK:REQuest?

SYSTem:LOCK:REQuest?

Syntax

SYSTem:LOCK:REQuest?

Description

This command requests a lock of the current I/O interface. This provides a mechanism by which you can lock the instrument's configuration or cooperatively share the instrument with other computers.

Remarks

- Lock requests can be nested and each request will increase the lock count by 1. For every request, you will need a release from the same I/O interface (see SYSTem:LOCK:RELease command).

- Instrument locks are handled at the I/O interface level (GPIB, USB, LAN, etc.) and you are responsible for all coordination between threads and/or programs on that interface.

- When a request is granted, only I/O sessions from the present interface will be allowed to change the state of the instrument. From the other I/O interfaces, you can query the state of the instrument but no measurement configuration changes or measurements are allowed.

- Locks from LAN sessions will be automatically released when a LAN disconnect is detected.

- When a lock is granted, Bit 10 in the Standard Operation Register will be set (see STATus:OPERation:CONDition? command). In addition, the entire instrument front panel, including the **Local** key, will be locked out while a lock is in place ("KEYBOARD LOCKED" is displayed).

Return Format

The command returns "+1" if the lock request is granted or "+0" if denied.

Example

The following command requests a lock of the current I/O interface.

```
SYST:LOCK:REQ?
```

Typical Response: +1

See Also

SYSTem:LOCK:NAME?

SYSTem:LOCK:OWNer?

SYSTem:LOCK:RELease

SYSTem:PRESet

Syntax

SYSTem:PRESet

Description

This command presets the 34410A/11A/L4411A to a known configuration. See Instrument Preset State for a complete listing of the instrument's Preset configuration.

Remarks

- This command is identical in effect to the [*RST](#) command.

Example

The following command presets the instrument.

```
SYST:PRES
```

See Also

[*RST](*RST)

SYSTem:SECurity:IMMediate

Syntax

SYSTem:SECurity:IMMediate

Description

This command sanitizes all user-accessible instrument memory. This complies with requirements in chapter 8 of the National Instrument Security Program Operating Manual (NISPOM). This command is typically used to clear all memory before removing the instrument from a secure area.

CAUTION	This command is recommended for customers, such as military contractors, who must comply with NISPOM. Excessive use of this command may cause premature failure of the flash memory.
	This command destroys all user-defined state information and user-defined I/O settings such as the IP address.

Remarks

- This command initializes all instrument settings to their Factory Reset (*RST command) values.

- This command destroys all user-defined state information (see *SAV and *RCL), and I/O settings such as the GPIB address and IP address are returned to their factory settings.

Example

The following command sanitizes all user-accessible instrument memory.

```
SYST:SEC:IMM
```

See Also

[*SAV](#)

[*RCL](#)

[*RST](#)

SYSTem:VERSion?

Syntax

SYSTem:VERSion?

Description

This command returns the version of the SCPI (Standard Commands for Programmable Instruments) standard with which the instrument is in compliance. The 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.

Return Format

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 (e.g., 1994.0).

Example

The following query returns the SCPI version.

```
SYST:VERS?
```

Typical Response: 1994.0

See Also

[Introduction to SCPI Language](#)

TRIGger Subsystem Introduction

It is recommended that all triggered measurements be made using an appropriate fixed manual range. That is, turn autorange off (SENSe:*<function>*:RANGe:AUTO OFF), or set a fixed range using the SENSe:*<function>*:RANGe, CONFigure, or MEASure command.

Command Summary

TRIGger:COUNt

TRIGger:COUNt?

TRIGger:DELay

TRIGger:DELay?

TRIGger:DELay:AUTO

TRIGger:DELay:AUTO?

TRIGger:LEVel

TRIGger:LEVel?

TRIGger:SLOPe

TRIGger:SLOPE?

TRIGger:SOURce

TRIGger:SOURce?

TRIGger:COUNt

Syntax

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

TRIGger:COUNt? [{MIN|MAX}]

Description

This command selects the number of triggers that will be accepted by the meter before returning to the "idle" trigger state.

| NOTE | It is recommended that all triggered measurements be made using an appropriate fixed manual range. That is, turn autorange off (SENSe:*<function>*:RANGe:AUTO OFF), or set a fixed range using the SENSe:*<function>*:RANGe, CONFigure, or MEASure command. |

Parameters

Name	Type	Range of Values	Default Value
<count>	Numeric	**34410A:** 1 to 50,000 triggers, or continuous (INFinity). MIN = 1 trigger MAX = 50,000 triggers **34411A/L4411A:** 1 to 1,000,000 triggers, or continuous (INFinity). MIN = 1 trigger MAX = 1,000,000 triggers	This is a required parameter

Remarks

- The selected trigger count applies to the trigger source set by the TRIGger:SOURce command.

  a. For the BUS source, the trigger count sets the number of *TRG commands that will be accepted before returning to the "idle" trigger state.

  b. For the IMMediate source, the trigger count just controls the number of readings to be taken.

  c. For the EXTernal source, the trigger count sets the number of external pulses that will be accepted before returning to the "idle" trigger state.

- You can use the specified trigger count in conjunction with a sample count (see SAMPle:COUNt command) which selects the number of readings (samples) the meter will take per trigger. In this case, the total number of reading returned will be the product of the sample count and trigger count.

  Number of Readings = Sample Count x Trigger Count

  If more than 50,000 readings for the 34410A, or 1,000,000 readings for the 34411A/L4411A are to be taken, the data must be read from reading memory fast enough to avoid a memory overflow. The most recent readings are preserved. The oldest readings are overwritten in reading memory if an overflow occurs. No error is generated, but the MEM Ovfl bit (bit 14) is set in the Questionable Data Register.

- A variable trigger count is not available from the front panel. If you set the trigger count and then go to local (front panel), the meter ignores the trigger count setting; however, when you return to remote, the trigger count returns to the previous value you selected.

- The CONFigure and MEASure? commands automatically set the trigger count to 1.

- The instrument sets the trigger count to 1 after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

- It is recommended that all triggered measurements be made using an appropriate fixed manual range. That is, turn autorange off (SENSe:<*function*>:RANGe:AUTO OFF), or set a fixed range using the SENSe:<*function*>:RANGe, CONFigure, or MEASure command.

Return Format

The query command returns the trigger count in the form "+1.00000000E+00". For a continuous trigger (INFinity), the query command returns "+9.90000000E+37".

Examples

The following command sets the trigger count to 10.

```
TRIG:COUN 10
```

The following query returns the current trigger count.

```
TRIG:COUN?
```

Typical Response: +10

See Also

SAMPle:COUNt

TRIGger:SOURce

TRIGger:DELay

Syntax

TRIGger:DELay {*<seconds>*|MIN|MAX|DEF}

TRIGger:DELay? [{MIN|MAX}]

Description

This command sets the delay between the trigger signal and the first measurement. This may be useful in applications where you want to allow the input to settle before taking a reading or for pacing a burst of readings. The programmed trigger delay overrides the default trigger delay that the instrument automatically adds.

NOTE

It is recommended that all triggered measurements be made using an appropriate fixed manual range. That is, turn autorange off (SENSe:*<function>*:RANGe:AUTO OFF), or set a fixed range using the SENSe:*<function>*:RANGe, CONFigure, or MEASure command.

NOTE

For ac measurements (voltage or current), there is a relationship between the bandwidth setting ([SENSe:]VOLTage:AC:BANDwidth or [SENSe:]CURRent:AC:BANDwidth) and the default trigger delay setting. This delay ensures that there is sufficient settling time for the ac measurement. See Automatic Trigger Delays for further information.

Parameters

Name	Type	Range of Values	Default Value
<seconds>	Numeric	0 to ~3600 seconds (~20 µs increment for dc measurements). MIN = 0 seconds, MAX = ~3600 seconds	This is a required parameter. DEF sets the [automatic trigger delay]

Remarks

- The CONTinuity and DIODe test functions *ignore* the trigger delay setting.

- Due to internal quantization, the actual delay that you set may be slightly different than your specified value. The increment is approximately 20 μs. Use the query command to determine the exact delay that is set. For example, if you send "TRIG:DEL 500 ms", and then send the query "TRIG:DEL?" the actual delay is returned (for example: "+5.00000753E-01").

- For ac measurements, the delay is based on the detector bandwidth. (See note above.)

- By default TRIGger:DELay:AUTO is on. The instrument automatically determines the delay based on function, range, and integration time (see Automatic Trigger Delays). However, you may need to set a delay longer than the default/automatic delay for long cables, high capacitance, or high impedance signals. In this case, turn the automatic delay off, and set the desired delay with this command.

- When this command is received, the instrument disables TRIGger:DELay:AUTO.

- If you specify a trigger delay with this command, that same delay is used for *all* functions (*except* CONTinuity and DIODe) and ranges.

- If you have configured the instrument to take more than one reading per trigger (sample count >1, see SAMPle:COUNt command), the specified trigger delay is inserted between the trigger and *each* reading if the sample source is set to AUTO. If the sample source is set to TIMer, the delay occurs only before the first reading (see SAMPle:SOURce).

- The CONFigure and MEASure? commands set the automatic trigger delay.

- The instrument selects an automatic trigger delay after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

- It is recommended that all triggered measurements be made using an appropriate fixed manual range. That is, turn autorange off (SENSe:<*function*>:RANGe:AUTO OFF), or set a fixed range using the SENSe:<*function*>:RANGe, CONFigure, or MEASure command.

Return Format

The query command returns the delay in seconds.

Examples

The following command sets a 2-second trigger delay.

```
TRIG:DEL 2
```

The following query returns the trigger delay selected.

```
TRIG:DEL?
```

Typical Response: +2.00000000E+00

See Also

[Automatic Trigger Delays](#)

[SAMPle:COUNt](#)

[SAMPle:SOURce](#)

[TRIGger:DELay:AUTO](#)

[TRIGger:SOURce](#)

TRIGger:DELay:AUTO

Syntax

TRIGger:DELay:AUTO *<mode>*

TRIGger:DELay:AUTO?

Description

This command disables or enables an [automatic trigger delay](#). If enabled, the instrument determines the delay based on function, range, and integration time or bandwidth.

> **NOTE**
>
> It is recommended that all triggered measurements be made using an appropriate fixed manual range. That is, turn autorange off (SENSe:*<function>*:RANGe:AUTO OFF), or set a fixed range using the SENSe:*<function>*:RANGe, CONFigure, or MEASure command.

Parameters

Name	Type	Range of Values	Default Value
<mode>	Boolean	{OFF|0|ON|1}	This is a required parameter.

Remarks

- Selecting a specific trigger delay using the TRIGger:DELay command disables the automatic trigger delay.

- The CONFigure and MEASure? commands set the trigger delay to Automatic.

- The instrument enables an automatic trigger delay after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

- It is recommended that all triggered measurements be made using an appropriate fixed manual range. That is, turn autorange off (SENSe:*<function>*:RANGe:AUTO OFF), or set a fixed range using the SENSe:*<function>*:RANGe, CONFigure, or MEASure command.

Return Format

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

Examples

The following command enables an automatic trigger delay.

```
TRIG:DEL:AUTO ON
```

The following query returns the automatic trigger delay setting.

```
TRIG:DEL:AUTO?
```

Typical Response: 1

See Also

TRIGger:DELay

TRIGger:LEVel (34411A/L4411A)

Syntax

TRIGger:LEVel {*<level>*|MIN|MAX|DEF}

TRIGger:LEVel? [{MIN|MAX}]

Description

The 34411A and L4411A (but not the 34410A) allow you to trigger on a defined level of the input signal. This command sets the level on which a trigger occurs when the trigger source is set to INTernal (see [TRIGger:SOURce](#)).

NOTE

It is recommended that all triggered measurements be made using an appropriate fixed manual range. That is, turn autorange off (SENSe:*<function>*:RANGe:AUTO OFF), or set a fixed range using the SENSe:*<function>*:RANGe, CONFigure, or MEASure command.

Parameters

If autoranging is off, the *<value>* parameter can take any value between -120% and +120% of the *present* range for the currently selected function. The *<value>* is entered in the *fundamental units* for the function (that is volts, ohms, or amperes). MIN = -120% and MAX = +120%. Default = 0. This is a required parameter.

If autoranging is on, *<value>* can take any value between -120% and +120% of the *highest* range for the currently selected function. For example, for dc volts with autoranging, the highest range is 1000 volts, and the MAX value is 120% of that: 1200 volts.

Remarks

- This command is supported by the 34411A and L4411A.

- This command is supported only for ac and dc voltage, ac and dc current, and 2-wire and 4-wire resistance measurements.

- To use the trigger level you must select INTernal as the trigger source with the TRIGger:SOURce command.

- If a manual range is selected, the accuracy of the trigger level is ±1 percent of the selected range. If autoranging is in use (not recommended), accuracy is ±1 percent of the most appropriate range for the specified trigger level. For example, if you have set a trigger level of 8 Vdc with autoranging, the accuracy of the trigger level is ±1 percent of the 10 Vdc range, or 0.1 Vdc.

- The hysteresis of the trigger level is 1 percent of the current manual range. If autoranging is in use (not recommended), hysteresis is 1 percent of the most appropriate range for the specified trigger level.

- If you are using a wide aperture (NPLC or aperture mode) and the signal level varies significantly within the aperture, you may get an unexpected variation in the magnitude of the triggered measurement from the specified trigger level.

- If you do not specify a trigger delay with the TRIGger:DELay command, the automatic trigger delay applies. It is recommended that you set a shorter delay, or delay = 0, for level triggering.

- The trigger level is set to the default value ("0") after a Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

- It is recommended that all triggered measurements be made using an appropriate fixed manual range. That is, turn autorange off (SENSe:<function>:RANGe:AUTO OFF), or set a fixed range using the SENSe:<function>:RANGe, CONFigure, or MEASure command.

- If the selected trigger source is invalid due to a settings conflict, the source reverts automatically to IMMediate on an INIT. For an INTernal trigger on a level, this will happen if you select a manual range and then set a trigger level outside ±120 % of that range. A settings conflict error message is also generated.

Return Format

The query command returns the current trigger level.

Examples

The following commands set up the 34411A for level triggering. The CONFigure command configures the instrument for dc voltage measurements. The 1 V range is selected with 0.1 mV resolution. The TRIGger:SOURce command selects INTernal as the source. The TRIGger:LEVel command sets the trigger level at 0.75 volts. The INITiate command puts the instrument into the "wait for trigger" mode.

```
CONF:VOLT:DC 1,0.0001 TRIG:SOUR INT
TRIG:LEV 0.75
INIT
```

The following query returns the current trigger level.

```
TRIG:LEV?
```

Typical Response: +7.50000000E-01

See Also

TRIGger:DELay

TRIGger:SOURce

TRIGger:SLOPe

Syntax

TRIGger:SLOPe *<slope>*

TRIGger:SLOPe?

Description

This command selects whether the instrument uses the rising edge or the falling edge of the trigger signal on the rear-panel *Ext Trig* BNC connector. The default is NEG (falling edge).

For the 34411A and L4411A, this command also affects the slope of detection for an internal trigger on a defined level (see the TRIGger:LEVel command).

NOTE

It is recommended that all triggered measurements be made using an appropriate fixed manual range. That is, turn autorange off (SENSe:*<function>*:RANGe:AUTO OFF), or set a fixed range using the SENSe:*<function>*:RANGe, CONFigure, or MEASure command.

Parameters

Name	Type	Range of Values	Default Value
<slope>	Discrete	{POSitive|NEGative}	NEG

Remarks

- The actual trigger event occurs on either the rising edge (if POS is selected) or the falling edge (if NEG is selected) of the trigger signal. See Ext Trig Input for further information.

- The instrument selects a negative slope after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

- It is recommended that all triggered measurements be made using an appropriate fixed manual range. That is, turn autorange off (SENSe:*<function>*:RANGe:AUTO OFF), or set a fixed range using the SENSe:*<function>*:RANGe, CONFigure, or MEASure command.

Return Format

The query command returns either "POS" or "NEG".

Examples

The following command sets the trigger slope to negative (falling edge).

```
TRIG:SLOP NEG
```

The following query returns currently selected trigger slope.

```
TRIG:SLOP?
```

Typical Response: NEG

See Also

Ext Trig Input

TRIGger:LEVel

TRIGger:SOURce

TRIGger:SOURce

Syntax

TRIGger:SOURce *<source>*

TRIGger:SOURce?

Description

This command selects the trigger source for measurements. The instrument will accept a software (bus) command, an immediate (continuous) trigger, or an external TTL trigger pulse. The 34411A and L4411A will also accept a trigger level.

NOTE

It is recommended that all triggered measurements be made using an appropriate fixed manual range. That is, turn autorange off (SENSe:*<function>*:RANGe:AUTO OFF), or set a fixed range using the SENSe:*<function>*:RANGe, CONFigure, or MEASure command.

Parameters

Name	Type	Range of Values	Default Value
<source>	Discrete	**34410A:** {IMMediate|EXTernal|BUS} **34411A/L4411A:** {IMMediate|EXTernal|BUS|INTernal}	This is a required parameter.

Remarks

- After selecting the trigger source, you must place the instrument in the "wait-for-trigger" state using the INITiate or READ? command. A trigger will not be accepted from the selected trigger source until the instrument is in the "wait-for-trigger" state.

- 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 DMM is in the "wait-for-trigger" state.

- For the EXTernal source, the instrument will accept a hardware trigger applied to the rear-panel *Ext Trig Input* BNC connector. The instrument takes one reading, or the specified number of readings (sample count), each time a TTL pulse (low-true for slope = negative) is received. If the instrument receives an external trigger before it is ready to accept one, it will buffer one trigger.

- The INTernal source is only available for the 34411A and L4411A, which provides *trigger level* capability. To trigger on a level on the input signal, select INTernal for the source, and set the level with the TRIGger:LEVel command. *This syntax is not available on the 34410A.*

- The CONFigure and MEASure? commands automatically set the trigger source to IMMediate.

- The instrument selects the IMMediate trigger source after a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

- It is recommended that all triggered measurements be made using an appropriate fixed manual range. That is, turn autorange off (SENSe:<function>:RANGe:AUTO OFF), or set a fixed range using the SENSe:<function>:RANGe, CONFigure, or MEASure command.

- If the selected trigger source is invalid due to a settings conflict, the source reverts automatically to IMMediate on an INIT. A settings conflict error message is also generated.

Return Format

The query command returns the present trigger source: "IMM", "EXT", "BUS", or "INT" (34411A/L4411A).

Examples

The following command selects the external trigger source. In this configuration, the instrument is triggered once each time a low-true TTL pulse is received on the rear-panel *Ext Trig Input* connector.

```
TRIG:SOUR EXT
INIT
```

The following command selects the bus (software) trigger source. Note that the *TRG command will not be accepted unless the instrument is in the "wait-for-trigger" state.

```
TRIG:SOUR BUS
INIT
*TRG
```

The following query returns the trigger source currently selected.

```
TRIG:SOUR?
```

Typical Response: EXT

See Also

[*TRG](#)

[TRIGger:LEVel](#)

[TRIGger:SLOPe](#)

Commands A-Z

A

[ABORt](#)

C

*CLS

CALibration:ADC?

CALibration[:ALL]?

CALibration:COUNt?

CALibration:LFRequency

CALibration:LFRequency?

CALibration:LFRequency:ACTual?

CALibration:SECure:CODE

CALibration:SECure:STATe

CALibration:SECure:STATe?

CALibration:STORe

CALibration:STRing

CALibration:STRing?

CALibration:VALue

CALibration:VALue?

CALCulate:AVERage:AVERage?

CALCulate:AVERage:CLEar

CALCulate:AVERage:COUNt?

CALCulate:AVERage:MAXimum?

CALCulate:AVERage:MINimum?

CALCulate:AVERage:PTPeak?

CALCulate:AVERage:SDEViation?

CALCulate:DB:REFerence

CALCulate:DB:REFerence?

CALCulate:DBM:REFerence

CALCulate:DBM:REFerence?

CALCulate:FUNCtion

CALCulate:FUNCtion?

CALCulate:LIMit:LOWer

CURRent:AC:NULL[:STATe]

CURRent:AC:NULL[:STATe]?

CURRent:AC:NULL:VALue

CURRent:AC:NULL:VALue?

CURRent:AC:PEAK:STATe

CURRent:AC:PEAK:STATe?

CURRent:AC:RANGe:AUTO

CURRent:AC:RANGe:AUTO?

CURRent:AC:RANGe[:UPPer]

CURRent:AC:RANGe[:UPPer]?

CURRent[:DC]:APERture

CURRent[:DC]:APERture?

CURRent[:DC]:APERture:ENABled?

CURRent[:DC]:NPLC

CURRent[:DC]:NPLC?

CURRent[:DC]:NULL[:STATe]

CURRent[:DC]:NULL[:STATe]?

CURRent[:DC]:NULL:VALue

CURRent[:DC]:NULL:VALue?

CURRent[:DC]:PEAK:STATe

CURRent[:DC]:PEAK:STATe?

CURRent[:DC]:RANGe:AUTO

CURRent[:DC]:RANGe:AUTO?

CURRent[:DC]:RANGe[:UPPer]

CURRent[:DC]:RANGe[:UPPer]?

CURRent[:DC]:RESolution

CURRent[:DC]:RESolution?

CURRent[:DC]:ZERO:AUTO

CURRent[:DC]:ZERO:AUTO?

D

E

⬆TOP

F

[FETCh?](#)

[FETCh:CURRent:AC:PTPeak?](#)

[FETCh:CURRent[:DC]:PEAK:MAXimum?](#)

[FETCh:CURRent[:DC]:PEAK:MINmum?](#)

[FETCh:CURRent[:DC]:PTPeak?](#)

[FETCh:VOLTage:AC:PTPeak?](#)

[FETCh:VOLTage[:DC]:PEAK:MAXimum?](#)

[FETCh:VOLTage[:DC]:PEAK:MINmum?](#)

[FETCh:VOLTage[:DC]:PTPeak?](#)

[FORMat:BORDer](#)

[FORMat:BORDer?](#)

[FORMat[:DATA]](#)

[FORMat[:DATA]?](#)

[FREQuency:APERture](#)

[FREQuency:APERture?](#)

[FREQuency:NULL[:STATe]](#)

[FREQuency:NULL[:STATe]?](#)

[FREQuency:NULL:VALue](#)

[FREQuency:NULL:VALue?](#)

[FREQuency:RANGe:LOWer](#)

[FREQuency:RANGe:LOWer?](#)

[FREQuency:VOLTage:RANGe:AUTO](#)

[FREQuency:VOLTage:RANGe:AUTO?](#)

[FREQuency:VOLTage:RANGe[:UPPer]](#)

[FREQuency:VOLTage:RANGe[:UPPer]?](#)

[FRESistance:APERture](#)

[FRESistance:APERture?](#)

[FRESistance:APERture:ENABled?](#)

I

[*IDN?](#)

[INITiate[:IMMediate]](#)

L

[*LRN?](#)

M

MEASure:CAPacitance?

MEASure:CONTinuity?

MEASure:CURRent:AC?

MEASure:CURRent[:DC]?

MEASure:DIODe?

MEASure:FREQuency?

MEASure:FRESistance?

MEASure:PERiod?

MEASure:RESistance?

MEASure:TEMPerature?

MEASure[:VOLTage]:AC?

MEASure[:VOLTage][:DC]?

MEMory:NSTates?

MEMory:STATe:CATalog?

MEMory:STATe:DELete

MEMory:STATe:DELete:ALL

MEMory:STATe:NAME

MEMory:STATe:NAME?

MEMory:STATe:RECall:AUTO

MEMory:STATe:RECall:AUTO?

MEMory:STATe:RECall:SELect

MEMory:STATe:RECall:SELect?

MEMory:STATe:VALid?

O

[*OPC](#)

[*OPC?](#)

[OUTPut:TRIGger:SLOPe](#)

P

R

S

*SAV

*SRE

*SRE?

*STB?

SAMPle:COUNt

SAMPle:COUNt?

SAMPle:COUNt:PRETrigger

SAMPle:COUNt:PRETrigger?

SAMPle:SOURce

SAMPle:SOURce?

SAMPle:TIMer

SAMPle:TIMer?

[SENSe:]CAPacitance:NULL[:STATe]

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

[SENSe:]CAPacitance:NULL:VALue

[SENSe:]CAPacitance:NULL:VALue?

[SENSe:]CAPacitance:RANGe:AUTO

[SENSe:]CAPacitance:RANGe:AUTO?

[SENSe:]CAPacitance:RANGe[:UPPer]

[SENSe:]CAPacitance:RANGe[:UPPer]?

[SENSe:]CURRent:AC:BANDwidth

[SENSe:]CURRent:AC:BANDwidth?

[SENSe:]CURRent:AC:NULL[:STATe]

[SENSe:]CURRent:AC:NULL[:STATe]?

[SENSe:]CURRent:AC:NULL:VALue

[SENSe:]CURRent:AC:NULL:VALuE?

[SENSe:]CURRent:AC:PEAK:STATe

[SENSe:]CURRent:AC:PEAK:STATe?

[SENSe:]CURRent:AC:RANGe:AUTO

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

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

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

[SENSe:]CURRent[:DC]:APERture

[SENSe:]CURRent[:DC]:APERture?

[SENSe:]CURRent[:DC]:APERture:ENABled?

[SENSe:]CURRent[:DC]:NPLC

[SENSe:]CURRent[:DC]:NPLC?

[SENSe:]CURRent[:DC]:NULL[:STATe]

[SENSe:]CURRent[:DC]:NULL[:STATe]?

[SENSe:]CURRent[:DC]:NULL:VALue

[SENSe:]CURRent[:DC]:NULL:VALuE?

[SENSe:]CURRent[:DC]:PEAK:STATe

[SENSe:]CURRent[:DC]:PEAK:STATe?

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

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

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

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

[SENSe:]CURRent[:DC]:RESolution

[SENSe:]CURRent[:DC]:RESolution?

[SENSe:]CURRent[:DC]:ZERO:AUTO

[SENSe:]CURRent[:DC]:ZERO:AUTO?

[SENSe:]FREQuency:APERture

[SENSe:]FREQuency:APERture?

[SENSe:]FREQuency:NULL[:STATe]

[SENSe:]FREQuency:NULL[:STATe]?

[SENSe:]FREQuency:NULL:VALue

[SENSe:]FREQuency:NULL:VALue?

[SENSe:]FREQuency:RANGe:LOWer

[SENSe:]FREQuency:RANGe:LOWer?

[SENSe:]FREQuency:VOLTage:RANGe:AUTO

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

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

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

[SENSe:]FRESistance:APERture

[SENSe:]FRESistance:APERture?

[SENSe:]FRESistance:APERture:ENABled?

[SENSe:]FRESistance:NPLC

[SENSe:]FRESistance:NPLC?

[SENSe:]FRESistance:NULL[:STATe]

[SENSe:]FRESistance:NULL[:STATe]?

[SENSe:]FRESistance:NULL:VALue

[SENSe:]FRESistance:NULL:VALue?

[SENSe:]FRESistance:OCOMpensated

[SENSe:]FRESistance:OCOMpensated?

[SENSe:]FRESistance:RANGe:AUTO

[SENSe:]FRESistance:RANGe:AUTO?

[SENSe:]FRESistance:RANGe[:UPPer]

[SENSe:]FRESistance:RANGe[:UPPer]?

[SENSe:]FRESistance:RESolution

[SENSe:]FRESistance:RESolution?

[SENSe:]FUNCtion[:ON]

[SENSe:]FUNCtion[:ON]?

[SENSe:]PERiod:APERture

[SENSe:]PERiod:APERture?

[SENSe:]PERiod:NULL[:STATe]

[SENSe:]PERiod:NULL[:STATe]?

[SENSe:]PERiod:NULL:VALue

[SENSe:]PERiod:NULL:VALue?

[SENSe:]PERiod:RANGe:LOWer

[SENSe:]PERiod:RANGe:LOWer?

[SENSe:]PERiod:VOLTage:RANGe:AUTO

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

[SENSe:]PERiod:VOLTage:RANGe[:UPPer]

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

[SENSe:]RESistance:APERture

[SENSe:]RESistance:APERture?

[SENSe:]RESistance:APERture:ENABled?

[SENSe:]RESistance:NPLC

[SENSe:]RESistance:NPLC?

[SENSe:]RESistance:NULL[:STATe]

[SENSe:]RESistance:NULL[:STATe]?

[SENSe:]RESistance:NULL:VALue

[SENSe:]RESistance:NULL:VALue?

[SENSe:]RESistance:OCOMpensated

[SENSe:]RESistance:OCOMpensated?

[SENSe:]RESistance:RANGe:AUTO

[SENSe:]RESistance:RANGe:AUTO?

[SENSe:]RESistance:RANGe[:UPPer]

[SENSe:]RESistance:RANGe[:UPPer]?

[SENSe:]RESistance:RESolution

[SENSe:]RESistance:RESolution?

[SENSe:]RESistance:ZERO:AUTO

[SENSe:]RESistance:ZERO:AUTO?

[SENSe:]TEMPerature:APERture

[SENSe:]TEMPerature:APERture?

[SENSe:]TEMPerature:APERture:ENABled?

[SENSe:]TEMPerature:NPLC

[SENSe:]TEMPerature:NPLC?

[SENSe:]TEMPerature:NULL[:STATe]

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

[SENSe:]TEMPerature:NULL:VALue

[SENSe:]TEMPerature:NULL:VALue?

[SENSe:]TEMPerature:TRANsducer:FTHermistor:TYPE

[SENSe:]TEMPerature:TRANsducer:FTHermistor:TYPE?

[SENSe:]TEMPerature:TRANsducer:FRTD:OCOMpensated

[SENSe:]TEMPerature:TRANsducer:FRTD:OCOMpensated?

[SENSe:]TEMPerature:TRANsducer:FRTD:RESistance[:REFerence]

[SENSe:]TEMPerature:TRANsducer:FRTD:RESistance[:REFerence]?

[SENSe:]TEMPerature:TRANsducer:FRTD:TYPE

[SENSe:]TEMPerature:TRANsducer:FRTD:TYPE?

[SENSe:]TEMPerature:TRANsducer:RTD:OCOMpensated

[SENSe:]TEMPerature:TRANsducer:RTD:OCOMpensated?

[SENSe:]TEMPerature:TRANsducer:RTD:RESistance[:REFerence]

[SENSe:]TEMPerature:TRANsducer:RTD:RESistance[:REFerence]?

[SENSe:]TEMPerature:TRANsducer:RTD:TYPE

[SENSe:]TEMPerature:TRANsducer:RTD:TYPE?

[SENSe:]TEMPerature:TRANsducer:THERmistor:TYPE

[SENSe:]TEMPerature:TRANsducer:THERmistor:TYPE?

[SENSe:]TEMPerature:TRANsducer:TYPE

[SENSe:]TEMPerature:TRANsducer:TYPE?

[SENSe:]TEMPerature:ZERO:AUTO

[SENSe:]TEMPerature:ZERO:AUTO?

[SENSe:]VOLTage:AC:BANDwidth

[SENSe:]VOLTage:AC:BANDwidth?

[SENSe:]VOLTage:AC:NULL[:STATe]

[SENSe:]VOLTage:AC:NULL[:STATe]?

[SENSe:]VOLTage:AC:NULL:VALue

[SENSe:]VOLTage:AC:NULL:VALue?

[SENSe:]VOLTage:AC:PEAK:STATe

[SENSe:]VOLTage:AC:PEAK:STATe?

[SENSe:]VOLTage:AC:RANGe:AUTO

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

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

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

[SENSe:]VOLTage[:DC]:APERture

[SENSe:]VOLTage[:DC]:APERture?

[SENSe:]VOLTage[:DC]:APERture:ENABled?

[SENSe:]VOLTage[:DC]:IMPedance:AUTO

[SENSe:]VOLTage[:DC]:IMPedance:AUTO?

[SENSe:]VOLTage[:DC]:NPLC

[SENSe:]VOLTage[:DC]:NPLC?

[SENSe:]VOLTage[:DC]:NULL[:STATe]

[SENSe:]VOLTage[:DC]:NULL[:STATe]?

[SENSe:]VOLTage[:DC]:NULL:VALue

[SENSe:]VOLTage[:DC]:NULL:VALue?

[SENSe:]VOLTage[:DC]:PEAK:STATe

[SENSe:]VOLTage[:DC]:PEAK:STATe?

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

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

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

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

[SENSe:]VOLTage[:DC]:RESolution

[SENSe:]VOLTage[:DC]:RESolution?

[SENSe:]VOLTage[:DC]:ZERO:AUTO

[SENSe:]VOLTage[:DC]:ZERO:AUTO?

STATus:OPERation:CONDition?

STATus:OPERation:ENABle

STATus:OPERation:ENABle?

STATus:OPERation[:EVENt]?

STATus:PRESet

STATus:QUEStionable:CONDition?

STATus:QUEStionable:ENABle

STATus:QUEStionable:ENABle?

STATus:QUEStionable[:EVENt]?

SYSTem:BEEPer[:IMMediate]

SYStem:BEEPer:STATe

SYStem:BEEPer:STATe?

SYSTem:COMMunicate:ENABle

SYSTem:COMMunicate:ENABle?

SYSTem:COMMunicate:GPIB[:SELF]:ADDRess

SYSTem:COMMunicate:GPIB[:SELF]:ADDRess?

SYSTem:COMMunicate:LAN:AUTOip[:STATe]

SYSTem:COMMunicate:LAN:AUTOip[:STATe]?

SYSTem:COMMunicate:LAN:BSTatus?

SYSTem:COMMunicate:LAN:CONTrol?

SYSTem:COMMunicate:LAN:DDNS

SYSTem:COMMunicate:LAN:DDNS?

SYSTem:COMMunicate:LAN:DHCP

SYSTem:COMMunicate:LAN:DHCP?

SYSTem:COMMunicate:LAN:DNS

SYSTem:COMMunicate:LAN:DNS?

SYSTem:COMMunicate:LAN:DOMain

SYSTem:COMMunicate:LAN:DOMain?

SYSTem:COMMunicate:LAN:GATEway

SYSTem:COMMunicate:LAN:GATEway?

SYSTem:COMMunicate:LAN:HISTory?

SYSTem:COMMunicate:LAN:HISTory:CLEar

SYSTem:COMMunicate:LAN:HOSTname

SYSTem:COMMunicate:LAN:HOSTname?

SYSTem:COMMunicate:LAN:IPADdress

SYSTem:COMMunicate:LAN:IPADdress?

SYSTem:COMMunicate:LAN:KEEPalive

SYSTem:COMMunicate:LAN:KEEPalive?

SYSTem:COMMunicate:LAN:LIPaddress?

SYSTem:COMMunicate:LAN:MAC?

SYSTem:COMMunicate:LAN:MEDiasense

SYSTem:COMMunicate:LAN:MEDiasense?

SYSTem:COMMunicate:LAN:NETBios

SYSTem:COMMunicate:LAN:NETBios?

SYSTem:COMMunicate:LAN:SMASk

SYSTem:COMMunicate:LAN:SMASk?

SYSTem:COMMunicate:LAN:TELNet:PROMpt

SYSTem:COMMunicate:LAN:TELNet:PROMpt?

SYSTem:COMMunicate:LAN:TELNet:WMESsage

SYSTem:COMMunicate:LAN:TELNet:WMESsage?

SYSTem:ERRor[:NEXT]?

SYSTem:HELP?

SYSTem:LANGuage

SYSTem:LANGuage?

SYSTem:LFRequency?

SYSTem:LFRequency:ACTual?

SYSTem:LOCK:NAME?

SYSTem:LOCK:OWNer?

SYSTem:LOCK:RELease

[SYSTem:LOCK:REQuest?](#)

[SYSTem:PRESet](#)

[SYSTem:SECurity:IMMediate](#)

[SYSTem:VERSion?](#)

T

[*TRG](#)

[*TST?](#)

[TEMPerature:APERture](#)

[TEMPerature:APERture?](#)

[TEMPerature:APERture:ENABled?](#)

[TEMPerature:NPLC](#)

[TEMPerature:NPLC?](#)

[TEMPerature:NULL[:STATe]](#)

[TEMPerature:NULL[:STATe]?](#)

[TEMPerature:NULL:VALue](#)

[TEMPerature:NULL:VALue?](#)

[TEMPerature:TRANsducer:FRTD:OCOMpensated](#)

[TEMPerature:TRANsducer:FRTD:OCOMpensated?](#)

[TEMPerature:TRANsducer:FRTD:RESistance[:REFerence]](#)

[TEMPerature:TRANsducer:FRTD:RESistance[:REFerence]?](#)

[TEMPerature:TRANsducer:FRTD:TYPE](#)

[TEMPerature:TRANsducer:FRTD:TYPE?](#)

[TEMPerature:TRANsducer:RTD:OCOMpensated](#)

[TEMPerature:TRANsducer:RTD:OCOMpensated?](#)

[TEMPerature:TRANsducer:RTD:RESistance[:REFerence]](#)

[TEMPerature:TRANsducer:RTD:RESistance[:REFerence]?](#)

[TEMPerature:TRANsducer:RTD:TYPE](#)

[TEMPerature:TRANsducer:RTD:TYPE?](#)

[TEMPerature:TRANsducer:THERmistor:TYPE](#)

[TEMPerature:TRANsducer:THERmistor:TYPE?](#)

[TEMPerature:TRANsducer:TYPE](#)

[TEMPerature:TRANsducer:TYPE?](#)

[TEMPerature:ZERO:AUTO](#)

U

UNIT:TEMPerature

UNIT:TEMPerature?

V

VOLTage:AC:BANDwidth

VOLTage:AC:BANDwidth?

VOLTage:AC:NULL[:STATe]

VOLTage:AC:NULL[:STATe]?

VOLTage:AC:NULL:VALue

VOLTage:AC:NULL:VALue?

VOLTage:AC:PEAK:STATe

VOLTage:AC:PEAK:STATe?

VOLTage:AC:RANGe:AUTO

VOLTage:AC:RANGe:AUTO?

VOLTage:AC:RANGe[:UPPer]

VOLTage:AC:RANGe[:UPPer]?

VOLTage[:DC]:APERture

VOLTage[:DC]:APERture?

VOLTage[:DC]:APERture:ENABled?

VOLTage[:DC]:IMPedance:AUTO

VOLTage[:DC]:IMPedance:AUTO?

VOLTage[:DC]:NPLC

VOLTage[:DC]:NPLC?

VOLTage[:DC]:NULL[:STATe]

VOLTage[:DC]:NULL[:STATe]?

VOLTage[:DC]:NULL:VALue

VOLTage[:DC]:NULL:VALue?

VOLTage[:DC]:PEAK:STATe

VOLTage[:DC]:PEAK:STATe?

VOLTage[:DC]:RANGe:AUTO

VOLTage[:DC]:RANGe:AUTO?

VOLTage[:DC]:RANGe[:UPPer]

VOLTage[:DC]:RANGe[:UPPer]?

[VOLTage[:DC]:RESolution](#)

[VOLTage[:DC]:RESolution?](#)

[VOLTage[:DC]:ZERO:AUTO](#)

[VOLTage[:DC]:ZERO:AUTO?](#)

[VOLTage[:DC]:RESolution](#)

[VOLTage[:DC]:RESolution?](#)

[VOLTage[:DC]:ZERO:AUTO](#)

[VOLTage[:DC]:ZERO:AUTO?](#)

W

Agilent 34410A/11A/L4411A Command Quick Reference

[Printable PDF Version](#)

Syntax Conventions

- Braces (**{ }**) enclose the parameter choices for a given command string. The braces are not sent with the command string.

- A vertical bar (**|**) separates multiple parameter choices for a given command string. The bar is not sent with the command string.

- Triangle brackets (**< >**) indicate that you must specify a value for the enclosed parameter. For example, the above syntax statement shows the <range> parameter enclosed in triangle brackets. The brackets are not sent with the command string. You must specify a value for the parameter (e.g., "VOLT:DC:RANG 10").

- Some parameters are enclosed in square brackets (**[ ]**). The square brackets indicate that the parameter is optional and can be omitted. The brackets are not sent with the command string. If you do not specify a value for an optional parameter, the instrument chooses a default value.

Measurement Commands

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

MEASure:CONTinuity?

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

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

MEASure:DIODe?

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

MEASure:FRESistance? [{<range>|AUTO|MIN|MAX|DEF} [,

{<resolution>|MIN|MAX|DEF}]]

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

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

MEASure:TEMPerature? {FRTD|RTD|THERmistor|DEF}, {<type>|DEF} [,1 [, {<resolution>|MIN|MAX|DEF}]]

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

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

Temperature Configuration Commands

CONFigure:TEMPerature {FRTD|RTD|THERmistor|DEF}, {<type>|DEF} [,1 [,{<resolution>|MIN|MAX|DEF}]]
CONFigure?

[SENSe:]TEMPerature:APERture {<seconds>|MIN|MAX|DEF}
[SENSe:]TEMPerature:APERture? [{MIN|MAX}]

[SENSe:]TEMPerature:APERture:ENABled?

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

[SENSe:]TEMPerature:NULL[:STATe] {ON|OFF}
[SENSe:]TEMPerature:NULL[:STATe]?

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

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

[SENSe:]TEMPerature:ZERO:AUTO {OFF|0|ON|1|ONCE}
[SENSe:]TEMPerature:ZERO:AUTO?

UNIT:TEMPerature {C|F|K}
UNIT:TEMPerature?

RTD Configuration

[SENSe:]TEMPerature:TRANsducer:FRTD:OCOMpensated {OFF|0|ON|1}
[SENSe:]TEMPerature:TRANsducer:FRTD:OCOMpensated?

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

[SENSe:]TEMPerature:TRANsducer:FRTD:TYPE {85}
[SENSe:]TEMPerature:TRANsducer:FRTD:TYPE?

[SENSe:]TEMPerature:TRANsducer:RTD:OCOMpensated {OFF|0|ON|1}
[SENSe:]TEMPerature:TRANsducer:RTD:OCOMpensated?

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

[SENSe:]TEMPerature:TRANsducer:RTD:TYPE {85}
[SENSe:]TEMPerature:TRANsducer:RTD:TYPE?

Thermistor Configuration

[SENSe:]TEMPerature:TRANsducer:FTHermistor:TYPE {2252|5000|10000}

[SENSe:]TEMPerature:TRANsducer:FTHermistor:TYPE?

[SENSe:]TEMPerature:TRANsducer:THERmistor:TYPE {2252|5000|10000}
[SENSe:]TEMPerature:TRANsducer:THERmistor:TYPE?

Voltage Configuration Commands

DC Voltage Configuration

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

[SENSe:]VOLTage[:DC]:APERture {<seconds>|MIN|MAX|DEF}
[SENSe:]VOLTage[:DC]:APERture? [{MIN|MAX}]

[SENSe:]VOLTage[:DC]:APERture:ENABled?

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

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

[SENSe:]VOLTage[:DC]:NULL[:STATe] {ON|OFF}

[SENSe:]VOLTage[:DC]:NULL[:STATe]?

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

[SENSe:]VOLTage[:DC]:PEAK:STATe {ON|OFF}
[SENSe:]VOLTage[:DC]:PEAK:STATe?

[SENSe:]VOLTage[:DC]:RANGe:AUTO {OFF|0|ON|1|ONCE}
[SENSe:]VOLTage[:DC]:RANGe:AUTO?

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

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

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

AC Voltage Configuration

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

[SENSe:]VOLTage:AC:BANDwidth {3|20|200|MIN|MAX|DEF}
[SENSe:]VOLTage:AC:BANDwidth? [{MIN|MAX}]

[SENSe:]VOLTage:AC:NULL[:STATe] {ON|OFF}
[SENSe:]VOLTage:AC:NULL[:STATe]?

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

[SENSe:]VOLTage:AC:PEAK:STATe {ON|OFF}
[SENSe:]VOLTage:AC:PEAK:STATe?

[SENSe:]VOLTage:AC:RANGe:AUTO {OFF|0|ON|1|ONCE}
[SENSe:]VOLTage:AC:RANGe:AUTO?

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

Resistance Configuration Commands

2-Wire Resistance Configuration

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

{*<resolution>*|MIN|MAX|DEF}]]
CONFigure?

[SENSe:]RESistance:APERture {*<seconds>*|MIN|MAX|DEF}
[SENSe:]RESistance:APERture? [{MIN|MAX}]

[SENSe:]RESistance:APERture:ENABled?

[SENSe:]RESistance:NPLC {*<PLCs>*|MIN|MAX|DEF}
[SENSe:]RESistance:NPLC? [{MIN|MAX}]

[SENSe:]RESistance:NULL[:STATe] {ON|OFF}
[SENSe:]RESistance:NULL[:STATe]?

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

[SENSe:]RESistance:OCOMpensated {OFF|0|ON|1}
[SENSe:]RESistance:OCOMpensated?

[SENSe:]RESistance:RANGe:AUTO {OFF|0|ON|1}
[SENSe:]RESistance:RANGe:AUTO?

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

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

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

4-Wire Resistance Configuration

CONFigure:FRESistance [{*<range>*|AUTO|MIN|MAX|DEF} [,
{*<resolution>*|MIN|MAX|DEF}]]
CONFigure?

[SENSe:]FRESistance:APERture {*<seconds>*|MIN|MAX|DEF}
[SENSe:]FRESistance:APERture? [{MIN|MAX}]

[SENSe:]FRESistance:APERture:ENABled?

[SENSe:]FRESistance:NPLC {*<PLCs>*|MIN|MAX|DEF}
[SENSe:]FRESistance:NPLC? [{MIN|MAX}]

[SENSe:]FRESistance:NULL[:STATe] {ON|OFF}
[SENSe:]FRESistance:NULL[:STATe]?

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

[SENSe:]FRESistance:OCOMpensated {OFF|0|ON|1}
[SENSe:]FRESistance:OCOMpensated?

[SENSe:]FRESistance:RANGe:AUTO {OFF|0|ON|1|ONCE}
[SENSe:]FRESistance:RANGe:AUTO?

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

[SENSe:]FRESistance:RESolution {<resolution>|MIN|MAX|DEF}
[SENSe:]FRESistance:RESolution? [{MIN|MAX}]

Current Configuration Commands

DC Current Configuration

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

[SENSe:]CURRent[:DC]:APERture {<seconds>|MIN|MAX|DEF}
[SENSe:]CURRent[:DC]:APERture? [{MIN|MAX}]

[SENSe:]CURRent[:DC]:APERture:ENABled?

[SENSe:]CURRent[:DC]:NPLC {<PLCs>|MIN|MAX|DEF}
[SENSe:]CURRent[:DC]:NPLC? [{MIN|MAX}]

[SENSe:]CURRent[:DC]:NULL[:STATe] {ON|OFF}
[SENSe:]CURRent[:DC]:NULL[:STATe]?

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

[SENSe:]CURRent[:DC]:PEAK:STATe {ON|OFF}
[SENSe:]CURRent[:DC]:PEAK:STATe?

[SENSe:]CURRent[:DC]:RANGe:AUTO {OFF|0|ON|1|ONCE}
[SENSe:]CURRent[:DC]:RANGe:AUTO?

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

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

[SENSe:]CURRent[:DC]:ZERO:AUTO {OFF|0|ON|1|ONCE}
[SENSe:]CURRent[:DC]:ZERO:AUTO?

AC Current Configuration

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

[SENSe:]CURRent:AC:BANDwidth {3|20|200|MIN|MAX|DEF}
[SENSe:]CURRent:AC:BANDwidth? [{MIN|MAX}]

[SENSe:]CURRent:AC:NULL[:STATe] {ON|OFF}
[SENSe:]CURRent:AC:NULL[:STATe]?

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

[SENSe:]CURRent:AC:PEAK:STATe {ON|OFF}
[SENSe:]CURRent:AC:PEAK:STATe?

[SENSe:]CURRent:AC:RANGe:AUTO {OFF|0|ON|1|ONCE}
[SENSe:]CURRent:AC:RANGe:AUTO?

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

Capacitance Configuration Commands

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

[SENSe:]CAPacitance:NULL[:STATe] {ON|OFF}
[SENSe:]CAPacitance:NULL[:STATe]?

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

[SENSe:]CAPacitance:RANGe:AUTO {OFF|0|ON|1|ONCE}
[SENSe:]CAPacitance:RANGe:AUTO?

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

Continuity and Diode Configuration Commands

CONFigure:CONTinuity

CONFigure:DIODe

Frequency and Period Configuration Commands

Frequency Configuration

CONFigure:FREQuency [{*<range>*|MIN|MAX|DEF} [, {*<resolution>*|MIN|MAX|DEF}]]
CONFigure?

[SENSe:]FREQuency:APERture {*<seconds>*|MIN|MAX|DEF}
[SENSe:]FREQuency:APERture? [{MIN|MAX}]

[SENSe:]FREQuency:NULL[:STATe] {ON|OFF}
[SENSe:]FREQuency:NULL[:STATe]?

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

[SENSe:]FREQuency:RANGe:LOWer {3|20|200|MIN|MAX|DEF}
[SENSe:]FREQuency:RANGe:LOWer? [{MIN|MAX}]

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

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

Period Configuration

CONFigure:PERiod [{*<range>*|MIN|MAX|DEF} [, {*<resolution>*|MIN|MAX|DEF}]]
CONFigure?

[SENSe:]PERiod:APERture {*<seconds>*|MIN|MAX|DEF}
[SENSe:]PERiod:APERture? [{MIN|MAX}]

[SENSe:]PERiod:NULL[:STATe] {ON|OFF}
[SENSe:]PERiod:NULL[:STATe]?

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

[SENSe:]PERiod:RANGe:LOWer {3|20|200|MIN|MAX|DEF}
[SENSe:]PERiod:RANGe:LOWer? [{MIN|MAX}]

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

[SENSe:]PERiod:VOLTage:RANGe[:UPPer]

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

Measurement Configuration Commands

ABORt

INITiate[:IMMediate]

FORMat:BORDer {NORMal|SWAPped}
FORMat:BORDer?

FORMat[:DATA] {ASCii | REAL} [, *<length>*]
FORMat[:DATA]?

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

READ?

ROUTe:TERMinals?

SAMPle:COUNt {<count>|MIN|MAX|INFinity}
SAMPle:COUNt? [{MIN|MAX}]

SAMPle:COUNt:PRETrigger {*<PTcount>*|MIN|MAX}
SAMPle:COUNt:PRETrigger? [{MIN|MAX}]

SAMPle:SOURce {AUTO|TIMer}
SAMPle:SOURce?

SAMPle:TIMer {<interval>|MIN|MAX}
SAMPle:TIMer? [{MIN|MAX}]

TRIGger:COUNt {*<count>*|MIN|MAX|DEF|INFinity}
TRIGger:COUNt? [{MIN|MAX}]

TRIGger:DELay {<seconds>|MIN|MAX}
TRIGger:DELay? [{MIN|MAX}]

TRIGger:DELay:AUTO {OFF|0|ON|1}>
TRIGger:DELay:AUTO?

TRIGger:LEVel{*<level>*|MIN|MAX}
TRIGger:LEVel? [{MIN|MAX}]

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

TRIGger:SOURce {IMMediate|EXTernal|BUS}
TRIGger:SOURce?

Triggering Commands

*TRG

INITiate[:IMMediate]

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

READ?

TRIGger:COUNt {*<count>*|MIN|MAX|DEF|INFinity}
TRIGger:COUNt? [{MIN|MAX}]

TRIGger:DELay {*<seconds>*|MIN|MAX}
TRIGger:DELay? [{MIN|MAX}]

TRIGger:DELay:AUTO {OFF|0|ON|1}
TRIGger:DELay:AUTO?

TRIGger:LEVel{*<level>*|MIN|MAX}
TRIGger:LEVel? [{MIN|MAX}]

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

TRIGger:SOURce {IMMediate|EXTernal|BUS}
TRIGger:SOURce?

Calculation (Math) Commands

CALCulate:AVERage:AVERage?

CALCulate:AVERage:CLEar

CALCulate:AVERage:COUNt?

CALCulate:AVERage:MAX?

CALCulate:AVERage:MIN?

CALCulate:AVERage:PTPeak?

CALCulate:AVERage:SDEViation?

CALCulate:DB:REFerence {*<value>* | MIN | MAX}
CALCulate:DB:REFerence? {MIN | MAX}

CALCulate:DBM:REFerence {*<value>* | MIN | MAX}
CALCulate:DBM:REFerence? {MIN | MAX}

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

CALCulate:FUNCtion?

CALCulate:LIMit:LOWer {*<value>* | MIN | MAX}
CALCulate:LIMit:LOWer? {MIN | MAX}

CALCulate:LIMit:UPPer {*<value>* | MIN | MAX}
CALCulate:LIMit:UPPer? {MIN | MAX}

CALCulate:NULL:OFFSet {*<value>* | MIN | MAX}
CALCulate:NULL:OFFSet? {MIN | MAX}

CALCulate[:STATe] {OFF | ON}
CALCulate:STATe?

Reading Memory Commands

DATA:LAST?

DATA:COPY NVMEM, RDG_STORE

DATA:DATA? NVMEM

DATA:DELete NVMEM

DATA:POINts:EVENt:THReshold *<num_readings>*
DATA:POINts:EVENt:THReshold?

DATA:POINts?

DATA:REMove? *<num_readings>*

FETCh?

FETCh:CURRent:AC:PTPeak?

FETCh:CURRent[:DC]:PEAK:MAX?

FETCh:CURRent[:DC]:PEAK:MIN?

FETCh:CURRent[:DC]:PTPeak?

FETCh:VOLTage:AC:PTPeak?

FETCh:VOLTage[:DC]:PEAK:MAX?

FETCh:VOLTage[:DC]:PEAK:MIN?

FETCh:VOLTage[:DC]:PTPeak?

R? [*<max_count>*]

Calibration Commands

CALibration:ADC?

CALibration[:ALL]?

CALibration:COUNt?

CALibration:LFRequency {50|60}
CALibration:LFRequency?

CALibration:LFRequency:ACTual?

CALibration:SECure:CODE *<new_code>*

CALibration:SECure:STATe {OFF|0|ON|1}, *<code>*
CALibration:SECure:STATe?

CALibration:STORe

CALibration:STRing "*<string>*"
CALibration:STRing?

CALibration:VALue *<value>*
CALibration:VALue?

State Storage Commands

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

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

MEMory:NSTates?

MEMory:STATe:CATalog?

MEMory:STATe:DELete {0|1|2|3|4}
MEMory:STATe:DELete:ALL

MEMory:STATe:NAME {0|1|2|3|4} [,*<name>*]
MEMory:STATe:NAME? {0|1|2|3|4}

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

MEMory:STATe:RECall:SELect {0|1|2|3|4}
MEMory:STATe:RECall:SELect?

MEMory:STATe:VALid? {0|1|2|3|4}

IEEE-488 Commands

*CLS

*ESE *<enable_value>*
*ESE?

*ESR?

*IDN?

*LRN?

*OPC

*OPC?

*PSC {0|1}
*PSC?

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

*RST

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

*SRE *<enable_value>*
*SRE?

*STB?

*TRG

*TST?

*WAI

System-Related Commands

*IDN?

*RST

*TST?

CALibration:LFRequency?

DISPlay[:WINDow[1|2][:STATe]] {OFF|0|ON|1}
DISPlay[:WINDow[1|2][:STATe]]?

DISPlay[:WINDow[{1|2}]]:TEXT:CLEar

DISPlay[:WINDow[{1|2}]]:TEXT[:DATA] "*<string>*"
DISPlay[:WINDow[{1|2}]]:TEXT[:DATA]?

DISPlay:WINDow2:TEXT:FEED "*<feed>*"
DISPlay:WINDow2:TEXT:FEED?

SYSTem:BEEPer[:IMMediate]

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

SYSTem:ERRor[:NEXT]?

SYSTem:HELP?

SYSTem:LANGuage "{34401A|34410A|34411A}"
SYSTem:LANGuage?

SYSTem:LFRequency:ACTual?

SYSTem:LFRequency?

SYSTem:PRESet

SYSTem:SECurity:IMMediate

SYSTem:VERSion?

Remote Interface Configuration Commands

SYSTem:COMMunicate:ENABle {OFF|0|ON|1},
{GPIB|USB|LAN|SOCKets|TELNet|VXI11|WEB}
SYSTem:COMMunicate:ENABle?
{GPIB|USB|LAN|SOCKets|TELNet|VXI11|WEB}

SYSTem:COMMunicate:GPIB[:SELF]:ADDRess {<address>}
SYSTem:COMMunicate:GPIB[:SELF]:ADDRess?

SYSTem:LOCK:NAME?

SYSTem:LOCK:OWNer?

SYSTem:LOCK:RELease

SYSTem:LOCK:REQuest?

LAN Configuration Commands

SYSTem:COMMunicate:LAN:AUTOip[:STATe] {OFF|0|ON|1}
SYSTem:COMMunicate:LAN:AUTOip[:STATe]?

SYSTem:COMMunicate:LAN:BSTatus?

SYSTem:COMMunicate:LAN:CONTrol?

SYSTem:COMMunicate:LAN:DDNS {OFF|0|ON|1}
SYSTem:COMMunicate:LAN:DDNS?

SYSTem:COMMunicate:LAN:DHCP {OFF|0|ON|1}
SYSTem:COMMunicate:LAN:DHCP?

SYSTem:COMMunicate:LAN:DNS *<address>*
SYSTem:COMMunicate:LAN:DNS?

SYSTem:COMMunicate:LAN:DOMain "*<name>*"
SYSTem:COMMunicate:LAN:DOMain? [{CURRent|STATic}]

SYSTem:COMMunicate:LAN:GATEway *<address>*
SYSTem:COMMunicate:LAN:GATEway? [{CURRent|STATic}]

SYSTem:COMMunicate:LAN:HISTory:CLEar

SYSTem:COMMunicate:LAN:HISTory?

SYSTem:COMMunicate:LAN:HOSTname "*<name>*"
SYSTem:COMMunicate:LAN:HOSTname? [{CURRent|STATic}]

SYSTem:COMMunicate:LAN:IPADdress *<address>*
SYSTem:COMMunicate:LAN:IPADdress? [{CURRent|STATic}]

SYSTem:COMMunicate:LAN:KEEPalive {*<seconds>*|MIN|MAX}
SYSTem:COMMunicate:LAN:KEEPalive? [{MIN|MAX}]

SYSTem:COMMunicate:LAN:LIPaddress?

SYSTem:COMMunicate:LAN:MEDiasense {OFF|0|ON|1}
SYSTem:COMMunicate:LAN:MEDiasense?

SYSTem:COMMunicate:LAN:MAC?

SYSTem:COMMunicate:LAN:NETBios {OFF|0|ON|1}
SYSTem:COMMunicate:LAN:NETBios?

SYSTem:COMMunicate:LAN:SMASk *<mask>*
SYSTem:COMMunicate:LAN:SMASk? [{CURRent|STATic}]

SYSTem:COMMunicate:LAN:TELNet:PROMpt "*<string>*"
SYSTem:COMMunicate:LAN:TELNet:PROMpt?

SYSTem:COMMunicate:LAN:TELNet:WMESsage "*<string>*"
SYSTem:COMMunicate:LAN:TELNet:WMESsage?

Status System Commands

*CLS

*ESE *<enable_value>*
*ESE?

*ESR?

*PSC {0|1}
*PSC?

*SRE *<enable_value>*
*SRE?

*STB?

STATus:OPERation:CONDition?

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

STATus:OPERation[:EVENt]?

STATus:PRESet

STATus:QUEStionable:CONDition?

STATus:QUEStionable:ENABle *<enable_value>*
STATus:QUEStionable:ENABle?

STATus:QUEStionable[:EVENt]?

SCPI Error Messages

| | | |

The Agilent 34410A/11A/L4411A returns error messages in accord with the SCPI standard.

- A record of up to 20 errors can be stored in the instrument's error queue. Each remote interface I/O session (GPIB, USB, VXI-11, Telnet/Sockets) has its own interface-specific error queue. Errors appear in the error queue of the I/O session that caused the error. For example, if an error was generated by a command sent over the GPIB interface, send the command from GPIB to read the error queue.

- The instrument beeps once each time a command syntax or hardware error is generated. The front-panel ERROR annunciator turns on when one or more errors are currently stored in the error queue.

- A special global error queue holds all power-on and hardware-related errors (for example, over-temperature).

- Errors are retrieved in first-in-first-out (FIFO) order. The first error returned is the first error that was stored. Once you have read all of the interface-specific errors, the errors in the global error queue are retrieved.

- Errors are cleared as you read them. When you have read all errors from the interface-specific and global error queues, the ERROR annunciator turns off and the errors are cleared.

- If more than 20 errors have occurred, the last error stored in the queue (the most recent error) is replaced with -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".

- The front panel reports errors from all I/O sessions as well as the global error queue. To read the error queue from the front panel, press **[Shift] + [Data Log]** (**Utility**), and then select "SCPI Errors" in the utility menu.

- Error conditions are also summarized in the Status Byte Register. For more information on the SCPI Status System for the Agilent 34410A/11A/L4411A, see .

- The interface-specific error queues are cleared by the *CLS (Clear Status)

command and when power is cycled. All errors are cleared when you read the error queue. The error queue is not cleared by a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

- **Front-Panel Operation:**

  If the **ERROR** annunciator is on, there are errors in the error queue. The **Remote** annunciator is likely on as well. Press the **[Shift]** (**Local**) key to return the instrument to local operation (the **Remote** annunciator will go off). Then press **[Shift] + [Data Log]** (**Utility**), select "SCPI ERRORS" in the utility menu, and press **[Enter]**. Use the menu navigation "arrow" keys to view the error messages. Use the left and right arrow keys to select the "next" or "previous" message in the queue. Use the up and down arrow keys to scroll through the displayed message as required. Press **[Enter]** or **[Exit]** to exit and clear the error queue.

- **Remote Interface Operation:**

  SYSTem:ERRor?   *Read and clear one error from the queue*

  Errors have the following format (the error string may contain up to 80 characters):

  -113,"Undefined header"

Execution Errors

-101, "Invalid character"

-102, "Syntax error"

-103, "Invalid separator"

-113, "Undefined header"

-123, "Numeric overflow"

-151, "Invalid string data"

-213, "INIT ignored"

-222, "Data out of range; value not accepted"

-222, "Data out of range; value clipped to upper limit"

-222, "Data out of range; value clipped to lower limit"

-222, "Data out of range; value clipped to lower limit"

-224, "Illegal parameter value, ranges must be positive"

-230, "Data stale"

-231, "Internal software error"

-292, "Referenced name does not exist"

-313, "Calibration memory lost; memory corruption detected"

-313, "Calibration memory lost; due to firmware revision change"

-314, "Save/recall memory lost; memory corruption detected"

-314, "Save/recall memory lost; due to firmware revision change"

-315, "Configuration memory lost; memory corruption detected"

-315, "Configuration memory lost; due to firmware revision change"

-330, "Self-test failed"

-350, "Error queue overflow"

-410, "Query INTERRUPTED"

-420, "Query UNTERMINATED"

Instrument Errors

201, "Memory lost: stored state"

202, "Memory lost: power-on state"

203, "Memory lost: stored readings"

221, "Settings conflict: calculate limit state forced off"

223, "Settings conflict: trig source changed to IMM"

251, "Unsupported temperature transducer type"

263, "Not able to execute while instrument is measuring"

291, "Not able to recall state: it is empty"

305, "Not able to perform requested operation"

311, "Not able to specify resolution with Auto range"

514, "Not allowed"

514, "Not allowed; Instrument locked by another I/O session"

521, "Communications: input buffer overflow"

522, "Communications: output buffer overflow"

532, "Not able to achieve requested resolution"

540, "Cannot use overload as math reference"

550, "Not able to execute command in local mode"

624, "Unable to sense line frequency"

Self-Test Errors

The 34410A/11A/L4411A self-test (see the [*TST?](#) command) performs a series of tests on the instrument hardware. Any failure of these tests will generate a SCPI error number -330, with additional test failure information. Refer to the *Agilent 34410A/11A/L4411A Service Guide* for more information.

The form of this error message is as follows:

-**330,"Self-test failed; <*test# - testname*>"**

Where ***test#*** is the number of the test that failed (range 600 - 622) and ***testname*** describes the test. Here is an example of a test failure message:

-330,"Self-test failed; 619 - AC 0.1VAC Zero Test"

The following is the list of test numbers and descriptions:

Test #	Test Name:
600	Front Panel Communications
601	Front Panel All On Test
602	A/D Feedback Test
603	Fine A/D Test
604	Fine A/D Linearity
605	A/D & FE Measure Zero
606	Input Amplifier x100 Zero Test
607	Input Amplifier x10 Zero Test

608	Input Amplifier x1 Zero Test
609	Input Leakage Test
610	Input Amplifier x10 Gain Test
611	Input Amplifier x1 Gain Test
612	Ohms 500nA Current Source
613	DC High Voltage Divider Test
614	Ohms 5uA Current Source Test
615	Ohms 10uA Current Source
616	Ohms 100uA to 200 Ohm Shunt
617	Ohms 1mA to 2 Ohm Shunt
618	High Current Shunt Test
619	AC 0.1VAC Zero Test
620	Precharge Amplifier Gain Test
621	Precharge Offset Range Test
622	FPGA Ping Test

Calibration Errors

The following errors indicate failures that may occur during a calibration. Refer to the *Agilent 34410A/11A/L4411A Service Guide* for more information.

701, "Calibration error; security defeated by hardware jumper"

702, "Calibration error; calibration memory is secured"

703, "Calibration error; secure code provided was invalid"

704, "Calibration error: secure code too long"

705, "Calibration error; calibration aborted"

706, "Calibration error: value out of range"

707, "Calibration error: signal measurement out of range"

708, "Calibration error: signal frequency out of range"

709, "Calibration error: no cal for this function or range"

710, "Calibration error: full scale correction out of range"

711, "Calibration error: ADC calibration failed"

720, "Calibration error: DCV offset out of range"

721, "Calibration error: DCI offset out of range"

722, "Calibration error: RES offset out of range"

726, "Calibration error: ACV offset out of range"

727, "Calibration error: ACI offset out of range"

730, "Calibration error: precharge DAC convergence failed"

731, "Calibration error: A/D turnover correction out of range"

732, "Calibration error: AC flatness DAC convergence failed"

733, "Calibration error: AC low frequency convergence failed"

734, "Calibration error: AC low frequency correction out of range"

747, "Calibration variable does not exist"

748, "Cal: mainframe cal memory write failure"

Firmware Update Errors

791, "Firmware update error; unable to begin download"

792, "Firmware update error; programming operation failed"

793, "Firmware update error; data record invalid character"

794, "Firmware update error; data record length mismatch"

795, "Firmware update error; data record checksum mismatch"

796, "Firmware update error; bad checksum for download start"

797, "Firmware update error; bad checksum for download complete"

798, "Firmware update error; download in progress"

799, "Firmware update error; unable to complete download"

800, "Firmware update error; invalid programming address"

Power-On and Reset State

The following tables show the factory defaults for various instrument settings. The parameters marked with a bullet (•) are stored in *non-volatile* memory, and are not affected by power-on or a system reset. Other parameters are stored in volatile memory and are reset to the indicated values at power-on or after a *RST or SYSTem:PRESet command is issued.

NOTE

The power-on/reset state may be different than that in the tables if you have enabled the power-on state recall mode. This mode is entered from the **Utility** menu. See the *Agilent 34410A/11A/L4411A User's Guide* for further information.

Measurement Configuration	Factory Setting
Function	DC Volts
Range	Autorange (for all functions)
Resolution	6½ Digits (0.3 ppm x Range)*
Integration Time	NPLC On, 1 PLC*
Autozero	On*
Aperture	Off, 1 second*
• Input Impedance	• 10 MΩ *(fixed for all dc voltage ranges)*

AC Input Filter (bandwidth)	20 Hz *(medium filter)*
Nulls *(individual functions)*	Off, 0 *(for all measurement functions)*
Second Display	Off

* For all DC measurement functions.

Math Operations	Factory Setting
Math State	Off
Math Registers	Cleared *(all registers)*
dB Relative Value	0
dBm Reference Resistance	600 Ω

Triggering Operations	Factory Setting
Trigger Count	1
Trigger Source	Immediate
Trigger Delay	Auto Delay

Sample Count	1
Sample Source	Auto
Sample Timer	1 second

System-Related Operations	Factory Setting
• Beeper Mode (34410A/11A)	• On
• Radix Character (34410A/11A)	• Period
• Thousands Separator (34410A/11A)	• On
Display State (34410A/11A)	On
Reading Memory	Cleared
Error Queue	See note
• Stored States	• No Change
• Calibration State	• Secured

The Error Queue is cleared at

NOTE power on. However, it is not cleared by a *RST or SYSTem:PRESet command, nor by a front panel Reset (**Shift** + **2nd Disp**).

Input/Output Configuration	Factory Setting
Enable Interfaces:[1]	
• LAN	• Enabled
• GPIB	• Enabled
• USB	• Enabled
LAN Settings:[2]	
• DHCP	• On
• Auto IP	• On
• IP Address	• 169.254.4.10
• Subnet Mask	• 255.255.0.0
• Default Gateway	• 0.0.0.0
• DNS Server	• 0.0.0.0

• Host Name	• A-34410A-*nnnnn* (for 34410A) **3** • A-34411A-*nnnnn* (for 34411A) • A-L4411A-*nnnnn* (for L4411A)
• LAN Services**1**	• Enable All *(VISA LAN, Sockets, Telnet, Web Server)*
GPIB Settings:	
• GPIB Address	• 22
1 Interface enable or LAN service changes take effect only after you cycle power. **2** LAN setting changes require a LAN restart. From SCPI you must cycle power. **3** Where *nnnnn* represents the last 5 digits of the instrument serial number.	

The Agilent 34410A/11A/L4411A uses the following LAN ports:

NOTE

- Port 5024 is used for SCPI Telnet sessions.
- Port 5025 is used for SCPI Socket sessions.

Automatic Trigger Delays

If you do not specify a trigger delay in the TRIGger:DELay command, the instrument selects a delay for you. The delay is determined by the function, range, integration time, and ac filter setting as shown below. See the TRIGger:DELay and TRIGger:DELay:AUTO commands.

NOTE
For measurements from the remote interface, the automatic trigger delay values are as shown in the following tables. These values are also used for single-trigger, reading-hold, and level-trigger measurements from the front panel. *However, for **auto-trigger measurements from the front panel only**, the automatic trigger delay is 50 ms for all measurement functions.*

DC Voltage (for all ranges):

Integration Time	Trigger Delay
≥1 PLC	160 µs
0.06 PLC or 0.2 PLC	130 µs
≤0.02 PLC	100 µs

DC Current (for all ranges):

Integration Time	Trigger Delay
≥1 PLC	1.5 ms
0.06 PLC or 0.2 PLC	1.0 ms

≤0.02 PLC	1.0 ms

Resistance (2-wire):

Range	Trigger Delay		
	≤0.02 PLC	0.06 PLC *or* 0.2 PLC	≥1 PLC
100 Ω	80 µs	100 µs	130 µs
1 kΩ	110 µs	130 µs	160 µs
10 kΩ	130 µs	160 µs	190 µs
100 kΩ	540 µs	670 µs	800 µs
1 MΩ	5.0 ms	6.0 ms	7.5 ms
10 MΩ	60 ms	70 ms	84 ms
100 MΩ	60 ms	70 ms	84 ms
1 GΩ	60 ms	70 ms	84 ms

Two-wire temperature measurements actually use the 2-wire resistance function. The above table applies to 2-wire temperature measurements, but all temperature measurements use

autoranging. The range in use cannot be predicted, nor can the delay. For temperature measurements, use TRIGger:DELay? to determine the current delay.

Resistance (4-wire):

Range	Trigger Delay		
	≤0.02 PLC	0.06 PLC *or* 0.2 PLC	≥1 PLC
100 Ω	1.0 ms	1.0 ms	1.5 ms
1 kΩ	1.0 ms	1.0 ms	1.5 ms
10 kΩ	1.0 ms	1.0 ms	1.5 ms
100 kΩ	1.0 ms	1.0 ms	1.5 ms
1 MΩ	10 ms	10 ms	15 ms
10 MΩ	100 ms	100 ms	100 ms
100 MΩ	100 ms	100 ms	100 ms
1 GΩ	100 ms	100 ms	100 ms

Four-wire temperature measurements actually use the 4-wire resistance function. The above table applies to 4-wire temperature

measurements, but all temperature measurements use autoranging. The range in use cannot be predicted, nor can the delay. For temperature measurements, use TRIGger:DELay? to determine the current delay.

Capacitance:

Trigger Delay
0 s

For capacitance measurements the automatic trigger delay is zero because capacitor discharge is part of the measurement.

AC Voltage (for all ranges):

AC Filter	Trigger Delay
Slow (3 Hz)	2.5 s
Medium (20 Hz)	0.625 s
Fast (200 Hz)	0.025 s

AC Current (for all ranges):

AC Filter	Trigger Delay

Slow (3 Hz)	1.66 s
Medium (20 Hz)	0.25 s
Fast (200 Hz)	0.025 s

Frequency, Period:

Trigger Delay
1 s

NOTE   The continuity and diode test functions *ignore* the trigger delay.

Agilent 34401A Compatibility Mode

Your Agilent 34410A, 34411A, or L4411A multimeter provides a SCPI command set that is enhanced, but highly backward-compatible with the Agilent 34401A Multimeter. In fact, several commands have been added specifically for backward compatibility. These include:

CALCulate:NULL:OFFSet

INPut:IMPedance:AUTO

[SENSe:]DETector:BANDwidth

[SENSe:]ZERO:AUTO

Nevertheless, due to the added features and enhanced performance of the Agilent 34410A/11A/L4411A, there are some issues that may prevent your 34401A program from running identically using the 34410A/11A/L4411A in its normal SCPI mode. These include different range selections, resolution selections, and so forth. To best assure that you can run your 34401A program on the 34410A/11A/L4411A, a *34401A maximum-compatibility mode* is provided. In this mode, the SCPI syntax is changed to follow that of the 34401A, as described in the *Agilent 34401A User's Guide,* rather than the native 34410A, 34411A, or L4411A SCPI syntax. The compatibility mode can be selected using the SYSTem:LANGuage command.

When the *34401A maximum-compatibility mode* has been selected, most SCPI commands should run syntactically the same as the SCPI commands described in the *Agilent 34401A User's Guide*. In fact, the instrument even returns the identification string for a 34401A when you execute *IDN?. However, there are some differences, which are described below:

1. The 34410A/11A/L4411A hardware does not implement the DC:DC Ratio feature. Therefore, the following commands are not implemented:

   CONFigure:VOLTage:DC:RATio

   MEASure:VOLTage:DC:RATio?

   [SENSe:]FUNCtion "VOLTage:DC:RATio"

2. The 34410A/11A/L4411A hardware does not allow you to modify the threshold setting for continuity measurements.

3. The 34410A/11A/L4411A hardware does not allow you to modify the

sensitivity setting for the touch-hold feature.

4. The 34410A/11A/L4411A hardware does not provide an RS-232 serial interface.

5. Compatibility is provided only for *SCPI commands* for the 34401A. No compatibility is provided for alternate languages such as for the HP 3478A or the Fluke 8840A/8842A instruments.

6. Although timing adjustments have been made for compatibility, if your program depends on the exact hardware timing characteristics of the 34401A, you may encounter timing differences that affect program execution or measurements.

Range,Resolution, and NPLC

The following table can be used to determine the integration time (in NPLCs) based on the specified range and resolution.

NPLCs	100	10	2	1	0.2	0.06	0.02	0.006	0.00
ResFactor	0.03 ppm	0.1 ppm	0.2 ppm	0.3 ppm	0.7 ppm	1.5 ppm	3 ppm	6 ppm	15 ppr
Range	Resolution								
1E-4 1E-3 1E-2	3E-12 3E-11 3E-10	1E-11 1E-10 1E-9	2E-11 2E-10 2E-9	3E-11 3E-10 3E-9	7E-11 7E-10 7E-9	15E-11 15E-10 15E-9	3E-10 3E-9 3E-8	6E-10 6E-9 6E-8	15E 10 15E 15E
1E-1 1 1E1	3E-9 3E-8 3E-7	1E-8 1E-7 1E-6	2E-8 2E-7 2E-6	3E-8 3E-7 3E-6	7E-8 7E-7 7E-6	15E-8 15E-7 15E-6	3E-7 3E-6 3E-5	6E-7 6E-6 6E-5	15E 15E 15E
1E2 1E3 1E4	3E-6 3E-5 3E-4	1E-5 1E-4 1E-3	2E-5 2E-4 2E-3	3E-5 3E-4 3E-3	7E-5 7E-4 7E-3	15E-5 15E-4 15E-3	3E-4 3E-3 3E-2	6E-4 6E-3 6E-2	15E 15E 15E
1E5 1E6	3E-3 3E-	1E-2 1E-1	2E-2 2E-1	3E-2 3E-1	7E-2 7E-1	15E-2 15E-1	3E-1 3	6E-1 6	15E 15

1E7	2 3E-1	1	2	3	7	15	30	60	15E-
1E8 1E9	3 30	10 1E+2	20 2E+2	30 3E+2	70 7E+2	150 15E+2	3E+2 3E+3	6E+2 6E+3	15E- 15E-

To determine the NPLCs for a specified range and resolution, locate the range in the left column. Measurement units do not apply (i.e. for 1V or 1A, use the 1 range; for 100V or 100 ohms, use the 100 range). From the range value, follow the corresponding row of resolutions to the right until the specified resolution lies within two adjacent columns.

The NPLC value at the top of the left-adjacent column is the NPLC "setting" for the given range and resolution.

For example: for a specified 10 VDC range and 10uV resolution, locate range 10 (1E1) in the table. Moving to the right, the 10uV resolution (10E-6) falls between the adjacent columns containing 7E-6 and 15E-6. The corresponding NPLC value is found by following the left-adjacent column (the 7E-6 column) to the top where the NPLC setting is 0.2.

Volatile Memory

Information in memory is lost when power is turned off.

Non-Volatile Memory

Information in memory is <u>not</u> lost when power is turned off.

DHCP

Short for *Dynamic Host Configuration Protocol*, a protocol for assigning dynamic IP addresses to devices on a network. With dynamic addressing, a device can have a different IP address every time it connects to the network.