

# Keysight U2741A USB Modular 5.5 Digits Digital Multimeter

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# 1 Introduction to Programming

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This chapter introduces the remote programming basics of the U2741A device. The programming commands provide the means of remote control.

## Introduction to the SCPI Language

Standard Commands for Programmable Instruments (SCPI), 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 **CONFigure** subsystem is shown below to illustrate the tree system.

### CONFigure

```
[ :VOLTage]
```

```
  [:DC]
```

```
    [<range|MIN|MAX|AUTO>[,<resolution|MIN|MAX|DEF>]]
```

```
:CURREnt
```

```
  :AC
```

```
    [<range|MIN|MAX|AUTO>[,<resolution|MIN|MAX|DEF>]]
```

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

## SCPI Conventions and Data Formats

The following SCPI conventions are used throughout this guide.

<b>Angle brackets</b> < >	Items within angle brackets are parameter abbreviations. For example, <b>&lt;range&gt;</b> indicates a specific form of numerical data.
<b>Vertical bar</b> 	Vertical bars separate alternative parameters. For example, <b>VOLT CURR</b> indicates that either <b>VOLT</b> or <b>CURR</b> can be used as a parameter.
<b>Square brackets</b> [ ]	Items within square brackets are optional. The representation <b>[SOURCE:]VOLTage</b> means that <b>SOURCE:</b> may be omitted.
<b>Parenthesis</b> ( )	Items within parentheses are used in place of the usual parameter types to specify a channel list. The notation <b>(@1:3)</b> specifies a channel list that includes channels 1, 2, and 3. The notation <b>(@1,3)</b> specifies a channel list that includes only channels 1 and 3.
<b>Braces</b> { }	Braces indicate parameters that may be repeated zero or more times. It is used especially for showing arrays. The notation <b>&lt;A&gt;{,&lt;B&gt;}</b> shows that parameter “ <b>A</b> ” must be entered, while parameter “ <b>B</b> ” may be omitted, or may be entered one or more times.

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

<b>Numeric</b>	Commands that require parameters to accept all commonly used decimal representations of numbers including optional signs, decimal points, and scientific notation. You can also send engineering unit suffixes with numeric parameters, for example, <b>MΩ</b> or <b>kΩ</b> .
<b>Discrete</b>	Parameters used to program settings that have a limited number of values, for example, <b>BUS</b> , <b>IMMediate</b> , <b>EXTernal1</b> . 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.
<b>Boolean</b>	Parameters that represent a single binary condition that is either true or false. For a false condition, the U2741A will accept <b>OFF</b> or <b>0</b> . For a true condition, the U2741A will accept <b>ON</b> or <b>1</b> . When you query a boolean setting, the U2741A will always return <b>0</b> or <b>1</b> .
<b>String</b>	Parameters that 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.



## 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 1, 1e-5**

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

**SENS:VOLT:DC:RANG 1; NPLC 10**

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

**SENS:VOLT:DC:RANG 1**

**SENS:VOLT:DC:NPLC 10**

Use a colon and 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 and semicolon:

**CONF:VOLT:DC 1;:SENS:VOLT:DC:NPLC 10**

## 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 DC voltage range to 1:

**SENS:VOLT:DC:RANG 1**

You can then query the voltage range setting by sending:

**SENS:VOLT:DC:RANG?**

## SCPI Command Terminators

A command string sent to the U2741A must terminate with a **<new line>** (**<NL>**) character. The IEEE-488 End-Of-Identify (EOI) 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.

## 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 operation. 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?
```

## Using the MIN, MAX, and AUTO Parameters

You can substitute **MINimum**, **MAXimum**, or **AUTOMATIC** in place of a parameter for many commands. For example, consider the following command:

```
SENS:VOLT:DC:RANG [<range|MINimum|MAXimum|AUTOMATIC>]
```

Instead of selecting a specific voltage range, you can substitute **MIN** to set the range to its minimum value, **MAX** to set the range to its maximum value, or **AUTO** to set it to automatic.

## 2 SCPI Status Registers

SCPI Status Registers 20

This chapter explains the SCPI status registers that record various instrument conditions of the U2741A.

# SCPI Status Registers

The U2741A uses the Status Byte register group and Standard Event register group to record various instrument conditions. The figure below shows the relationship between various registers in the U2741A SCPI status system.

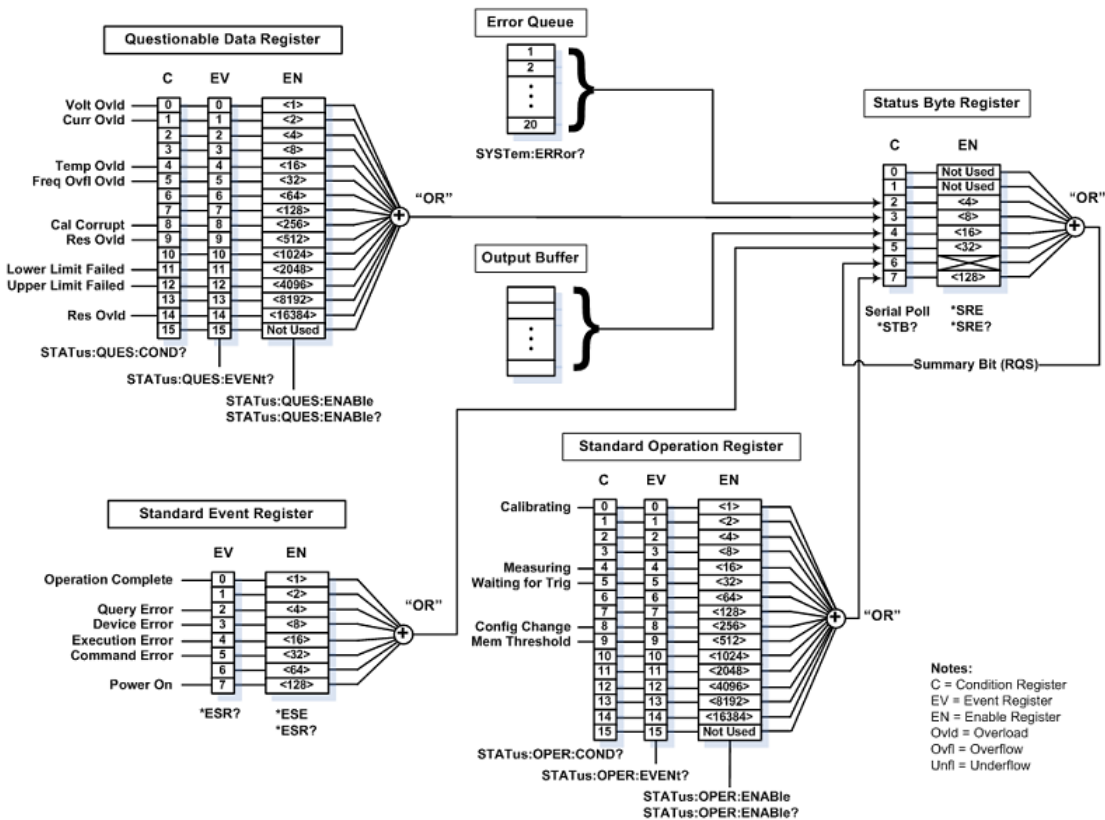


Figure 2-1 Status system diagram

## Status Byte Register

The Status Byte summary register reports conditions from the other status registers. Query data that is waiting in the U2741A output buffer is immediately reported through message available bit (bit 4). Bits in the summary register are not latched. Clearing an event register will clear the corresponding bits in the Status Byte summary register. Reading all messages in the output buffer, including any pending queries, will clear the message available bit.

### Bit Definitions: Status Byte Register

Bit number	Decimal value	Definition
0 Not Used	1	Always zero
1 Not Used	2	Always zero
2 Error Queue	4	There is at least one error code in the error queue
3 Not Used	8	Always zero
4 Message Available	16	Data is available in the U2741A output buffer
5 Standard Event	32	One or more bits are set in the Standard Event register (bits must be enabled in Standard Event enable register)
6 Master Summary	64	One or more bits are set in Status Byte Register and may generate a Request for Service (RQS)
7 Standard Operation Summary	128	One or more bits are set in the Standard Operation Register (bits must be enabled in Standard Operation enable register)

The Status Byte summary register will be cleared when:

- You execute the clear status (**\*CLS**) command.
- Querying the Standard Event register (**\*ESR?** command will clear only bit 4 in the Summary Register)

The Status Byte Enable register is cleared when you execute the **\*SRE 0** command.

## Standard Event Register

The Standard Event register reports the following types of instrument events: power-on detected, command syntax errors, command execution errors, calibration errors, query errors, or when an **\*OPC** command is executed. Any or all of these conditions can be reported in the Standard Event summary bit through enable register. To set the enable register mask, you write a decimal value to the register using the event status enable (**\*ESE**) command.

### Bit Definitions: Standard Event Register

Bit number	Decimal value	Definition
0 Operation Complete	1	All commands prior to and including <b>*OPC</b> have been executed
1 Not Used	2	Always zero
2 Query Error	4	The U2741A 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 Error	8	A self-test or calibration error occurred. For a complete listing of the error messages, see <a href="#">SCPI Error Messages</a> .
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	64	Always zero
7 Power On	128	Power has been turned off and on since the last time the event register was read or cleared

The Standard Event register is cleared when:

- You execute the clear status (**\*CLS**) command.
- Querying the event register using the event status register (**\*ESR?**) command.

The Standard Event Enable register is cleared when you execute the **\*ESE 0** command.

**NOTE**

Please refer to **Chapter 11** for more details on the common IEEE commands mentioned above.

---

## Questionable Data Register

The Questionable Data register group provides the information on the quality or integrity of the U2741A. The outputs of the Questionable Data group are logically-ORed into the Questionable summary bit (3) of the Status Byte 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	Not Used	4	0 is returned
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 to 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 resistance
10	Capacitance Overload/ Underflow	1024	Range overload or underflow on capacitance
11	Lower Limit Failed	2048	Reading is less than lower limit in limit test
12	Upper Limit Failed	4096	Reading is greater than upper limit in limit test
13	Not Used	Not Used	0 is returned
14	Memory Overflow	16384	Reading memory is full. One or more (oldest) readings have been lost
15	Not Used	Not Used	0 is returned

The **STATus:PRESet** command will clear all bits in the enable register. This command presets the Questionable Data registers.



## Standard Operation Register

The Standard Operation register group provides the information for the operation of the U2741A. The outputs of the Standard Operation group are logically-ORed into the Standard Operation summary bit (7) of the Status Byte register.

Bit number		Decimal value	Definition
0	Calibration in Progress	1	U2741A is performing a calibration
1 to 3	Not Used	Not Used	0 is returned
4	Measuring	16	U2741A is initiated, and is making, or about to make a measurement
5	Waiting for Trigger	32	U2741A is waiting for a trigger
6 to 7	Not Used	Not Used	0 is returned
8	Configuration Change	256	U2741A configuration has been changed
9	Not Used	Not Used	0 is returned
10	Not Used	Not Used	0 is returned
11 to 15	Not Used	Not Used	0 is returned

The **STATus:PRESet** command will clear all bits in the enable register. This command presets the Standard Operation registers.

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This chapter explains the CALibrate commands that allow users to perform external calibration for the U2741A.

## CALibration:ADC?

### Syntax

#### **CALibration:ADC?**

This command performs a low-level calibration of the analog-to-digital (ADC) converter circuitry. This is the first step in a recalibration sequence, and must be done before doing the offset calibration.

### Remarks

It will return a **+0** if the calibration passes and **+1** if it fails. Refer to the *Keysight U2741A USB Modular 5.5 Digits Digital Multimeter Service Guide* for detailed procedures, including how to connect to a calibration source, recommended equipments, the specified calibration points, and so forth.

### Example

**CAL:ADC?**

//Commands the U2741A to execute the calibration

Typical Response: **+0**

### See Also

**CALibration:VALue**

**CALibration[:ALL]?**

**CALibration:SECure:STATe**

## CALibration[:ALL]?

### Syntax

**CALibration[:ALL]?**

This command performs the calibration of the U2741A using the specified calibration value set by the **CALibrate:VALue** command. Before you can calibrate the U2741A, you must unsecure it by entering the correct security code.

### Remarks

It will return a **0** if the calibration passes and **+1** if it fails. Refer to the *Keysight U2741A USB Modular 5.5 Digits Digital Multimeter Service Guide* for detailed procedures, including how to connect to a calibration source, recommended equipments, the specified calibration points, and so forth.

### Example

**CAL?** //Commands the U2741A to execute the calibration

Typical Response: **+0**

### See Also

**CALibration:VALue**

**CALibration:SECure:STATe**

## CALibration:COUNT?

### Syntax

**CALibration:COUNT?**

This command queries the number of times the U2741A has been calibrated.

### NOTE

Ensure that your U2741A has been calibrated before it leaves the factory. When you receive your U2741A, be sure to read the count to determine the initial values. For a more detailed discussion of the calibration procedures, see the *Keysight U2741A USB Modular 5.5 Digits Digital Multimeter Service Guide*. Please refer to the *Service Guide* before attempting to calibrate the U2741A.

---

### Remarks

- The calibration count increments up to a maximum of  $2^{32}$  after which it wraps around to 0. Since the value increases by one for each successful calibration point, a complete calibration may increase the value by many counts.
- You can read the calibration count regardless whether the U2741A is secured or unsecured.
- The calibration count is stored in nonvolatile memory and does not change when power has been turned off or after a factory reset (**\*RST** command) if a **CAL:STOR** command is issued.

### Example

**CAL:COUNT?**

Typical Response: **15**

# CALibration:SECure:CODE

## Syntax

**CALibration:SECure:CODE** <new\_code>

This command sets the new security code. To change the security code, you must first unsecure the U2741A using the old security code, and then enter a new code.

## Parameter

Item	Type	Range of values	Default value
new_code	String	A string of up to 12 characters. You do not have to use all 12 characters but the first character must always be a letter (A to Z). The remaining 11 characters can be letters, numbers (0 to 9), or the underscore character ("_"). Blank spaces are not allowed.	ATU2741A

## Remarks

- The security code is set to ATU2741A when the U2741A is shipped from the factory.
- The security code is stored in nonvolatile memory, and does not change when the power has been turned off or after a factory reset (**\*RST** command).

## Example

CAL:SEC:CODE ABCDEFGH

//Sets the new security code to  
ABCDEFGH

## See Also

**CALibration:SECure:STATe**

# CALibration:SECure:STATe

## Syntax

**CALibration:SECure:STATe {OFF|0|ON|1|RESET},<code>**

This command secures or unsecures the U2741A for calibration. To unsecure the U2741A, you must provide a security code to prevent accidental or unauthorized calibrations of the U2741A. Before you can calibrate the U2741A, you must unsecure it by entering the correct security code.

**CALibration:SECure:STATe?**

This command queries the secured state of the U2741A.

## Parameters

Item	Type	Range of values	Default value
state	Boolean	{OFF 0 ON 1 RESET} OFF or 0: Disables the security ON or 1: Enables the security RESET: Resets the security code to the factory default setting	OFF
code	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 to Z). The remaining 11 characters can be letters, numbers (0 to 9), or the underscore character ("_"). Blank spaces are not allowed.	ATU2741A

## Remarks

- The security code is set to ATU2741A and is secured when the U2741A is shipped from the factory.
- Unsecuring the U2741A using this command enables the U2741A to be calibrated.
- The security code is stored in nonvolatile memory, and does not change when the power has been turned off or after a factory reset (\*RST command).
- To calibrate the U2741A, use the **CAL:VAL** and **CAL?** commands.
- If you forget your security code, you can use the **CAL:SEC:STAT RESET, ATU2741A** to override user-defined security code.



### Example

**CAL:SEC:STAT ON,ABCDEFG**

//Sets the secured state to **ON**

**CAL:SEC:STAT?**

//Queries the secured state

Typical Response: **1**

### See Also

**CALibration:SECure:CODE**

## CALibration:STORe

### Syntax

#### **CALibration:STORe**

This command stores the calibration results of the known calibration signal used by the calibration procedures as outlined in the *Keysight U2741A USB Modular 5.5 Digits Digital Multimeter Service Guide*. The results is stored in a nonvolatile memory.

### Remarks

Refer to the *Keysight U2741A USB Modular 5.5 Digits Digital Multimeter Service Guide* for detailed procedures, including how to connect to a calibration source, recommended equipments, the specified calibration points, and so forth.

### Example

```
CAL:STOR                      //Stores all the calibration results into  
                              the nonvolatile memory
```

### See Also

**CALibration[:ALL]?**

## CALibration:STRing

### Syntax

**CALibration:STRing** <string>

This command can be used to record the U2741A calibration information. For example, you store such information as the last calibration date, the next calibration due date, the U2741A serial number and so forth.

**CALibration:STRing?**

This command queries the calibration message.

### Parameter

Item	Type	Range of values	Default value
string	String	A string of up to 40 characters enclosed in quotes. You can use letters (A to Z), numbers (0 to 9), and special characters like "@", "%", "*".	N/A

### Remarks

- The calibration message can be read or write regardless of the secured state.
- Recording a calibration message will overwrite any message previously stored in the memory.
- The calibration string is stored in nonvolatile memory, and does not change when the power has been turned off or after a factory reset (\*RST command).
- If no message has been entered, an empty quoted string " " will be returned.

### Examples

**CAL:STR "CAL: 21 Nov 2005"** //Sets the calibration message

**CAL:STR?** //Queries the calibration message

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

### See Also

**CALibration:SECure:STATe**

# CALibration:VALue

## Syntax

**CALibration:VALue <value>**

This command specifies the value of the known calibration signal used by the calibration procedures as outlined in the *Keysight U2741A USB Modular 5.5 Digits Digital Multimeter Service Guide*.

**CALibration:VALue?**

This command queries the present calibration value.

## Parameter

Item	Type	Range of values	Default value
value	Numeric	The applied calibration signal in the units specified by the present measurement function.	N/A

## Remarks

Refer to the *Keysight U2741A USB Modular 5.5 Digits Digital Multimeter Service Guide* for detailed procedures, including how to connect a calibration source, recommended equipment, the specified calibration points, and so forth.

## Examples

**CAL:VAL 10.0001** //Sets the calibration value to 10.0001

**CAL:VAL?** //Queries the calibration value

Typical Response: **+1.00001E+01**

## See Also

**CALibration[:ALL]?**

## 4 CONFigure Subsystem

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This chapter explains the CONFigure subsystem.

## CONFigure?

### Syntax

#### CONFigure?

This command queries the present U2741A configuration and response returned in quoted string.

### Remarks

The **\*RST** command will set all measurement parameters to their factory settings, clear reading memory, and clear all stored statistical data.

### Example

**CONF?** //Queries the present configuration state

Typical Response: "VOLT +1.00000E+01, +3.00000E-05"

## CONFigure:CONTinuity

### Syntax

#### CONFigure:CONTinuity

This command presets and configures the U2741A for continuity measurements. This command does not initiate the measurement.

### Remarks

- The **CONF** command does not place the U2741A in the “wait-for-trigger” state. Use the **INIT** or **READ?** command in conjunction with **CONF** to place the U2741A in the “wait-for-trigger” state.
- The range is fixed at 1 k $\Omega$  (a two-wire resistance measurement) and the resolution is fixed at 4.5 digits.
- The measurement is considered to have continuity if the measured resistance is less than or equal to the continuity threshold of 10. If the measurements are more than 10, **+9.9E+37** is returned from the remote interface.

### Examples

```
CONF:CONT //Configures the U2741A to measure  
continuity
```

```
READ? //Triggers a measurement and read
```

Typical Response: **+8.68500E-01**

### See Also

**CONFigure?**

**MEASure[:VOLTage][:DC]?**

**FETCh?**

**INITiate[:IMMediate]**

**READ?**

# CONFigure:CURRent:AC

## Syntax

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

This command presets and configures the U2741A for AC current measurements with the specified range and resolution. This command does not initiate the measurement. For AC measurements resolution is fixed at the 5.5 digits.

## Parameters

Item	Type	Range of values	Default value
range	Numeric	10 mA, 100 mA, 1 A , 2 A	1 A
resolution	Numeric	N/A	5.5

## Remarks

- The **CONF** command does not place the U2741A in the “wait-for-trigger” state. Use the **INIT** or **READ?** command in conjunction with **CONF** to place the U2741A in the “wait-for-trigger” state.
- You can allow the U2741A to automatically select the measurement range using autorange or you can select a fixed range using manual range. Autorange is convenient because the U2741A decides which range to use for each measurement based on the input signal. For faster measurements, use manual range on each measurement as additional time is required for autorange since the U2741A has to make a range selection.
- Autorange thresholds

Lower range at:	<10% of range
Upper range at:	>120% of range

- If the input signal is greater than can be measured on the selected range, the U2741A gives an overload indication of **+9.9E+37** from the remote interface.



### Examples

**CONF:CURR:AC 2**

//Configures the U2741A to measure AC  
current at 2 A range

**READ?**

//Triggers a measurement and read

Typical Response: **+1.86850E+00**

### See Also

**CONFigure?**

**MEASure[:VOLTage][:DC]?**

**FETCh?**

**INITiate[:IMMediate]**

**READ?**

# CONFigure:CURRent[:DC]

## Syntax

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

This command presets and configures the U2741A for DC current measurements with the specified range and resolution. This command does not initiate the measurement.

## Parameters

Item	Type	Range of values	Default value
range	Numeric	10 mA, 100 mA, 1 A, 2 A	1 A
resolution	Numeric	3.00e-5, 2.00e-5, 1.00e-5, 5.00e-6, 2.00e-6, 1.50e-6	1.50e-6

## Remarks

- The **CONF** command does not place the U2741A in the “wait-for-trigger” state. Use the **INIT** or **READ?** command in conjunction with **CONF** to place the U2741A in the “wait-for-trigger” state.
- You can allow the U2741A to automatically select the measurement range using autorange or you can select a fixed range using manual range. Autorange is convenient because the U2741A decides which range to use for each measurement based on the input signal. For faster measurements, use manual range on each measurement as additional time is required for autorange since the U2741A has to make a range selection.
- Autorange thresholds

Lower range at:	<10% of range
Upper range at:	>120% of range

- If the input signal is greater than can be measured on the selected range, the U2741A gives an overload indication of **+9.9E+37** from the remote interface.

### Examples

**CONF:CURR 2, 0.00001**

//Configures the U2741A to measure DC  
current at 2 A range and 10  $\mu$ A  
resolution

**READ?**

//Triggers a measurement and read

Typical Response: **+1.86850E+00**

### See Also

**CONFigure?**

**MEASure[:VOLTage][:DC]?**

**FETCH?**

**INITiate[:IMMediate]**

**READ?**

## CONFigure:DIODE

### Syntax

#### CONFigure:DIODE

This command presets and configures the U2741A for diode measurements. This command does not initiate the measurement.

### Remarks

- The **CONF** command does not place the U2741A in the “wait-for-trigger” state. Use the **INIT** or **READ?** command in conjunction with **CONF** to place the U2741A in the “wait-for-trigger” state.
- The range and resolution are fixed for diode test with the range at 1 VDC with a 1  $\mu$ A constant current source output and the resolution is fixed at 4.5 digits.
- The voltage value is returned if it is within 0 V and 1.2 V. If the value is greater than 1.2 V, **+9.9E+37** is returned from the remote interface.

### Example

```
CONF:DIOD                      //Configures the U2741A to measure
                                diode
```

```
READ?                          //Triggers a measurement and read
```

Typical Response: **+8.68500E-01**

### See Also

**CONFigure?**

**MEASure[:VOLTage][:DC]?**

**FETCH?**

**INITiate[:IMMediate]**

**READ?**

CONFigure:FREQuency

Syntax

```
CONFigure:FREQuency[<range|MIN|MAX|DEF>
[,<resolution|MIN|MAX|DEF>]]
```

This command presets and configures the U2741A for frequency measurements with the specified range and resolution. This command does not initiate the measurement.

Parameters

Item	Type	Range of values	Default value
range	Numeric	1 Hz, 1 MHz	1 Hz
resolution	Numeric	N/A	5.5

Remarks

- The **CONF** command does not place the U2741A in the “wait-for-trigger” state. Use the **INIT** or **READ?** command in conjunction with **CONF** to place the U2741A in the “wait-for-trigger” state.
- Frequency is measured on AC voltage signals. Thus, the proper AC voltage should be first set using the **[SENS:]VOLT:AC:RANG** command. The voltage range should be 0.1 V or greater for more accurate frequency measurement.
- 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 range), the U2741A gives an overload indication of **+9.9E+37** from the remote interface. Autorange can be enabled for the input voltage.
- The frequency measurement does not autorange.
- With no signal applied, **0** is returned.

**Example**

```
CONF:FREQ 1 //Configures the U2741A to measure
              frequency of 1 Hz
READ?        //Triggers a measurement and read
Typical Response: +1.00000E+00
```

**See Also****CONFigure?****MEASure[:VOLTage][:DC]?****FETCH?****INITiate[:IMMediate]****READ?**

CONFigure:FRESistance

Syntax

```
CONFigure:FRESistance [<range|MIN|MAX|AUTO>
[,<resolution|MIN|MAX|DEF>]]
```

This command presets and configures the U2741A for four-wire resistance measurements with the specified range and resolution. This command does not initiate the measurement.

Parameters

Item	Type	Range of values	Default value
range	Numeric	100 $\Omega$ , 1 k $\Omega$ , 10 k $\Omega$ , 100 k $\Omega$ , 1 M $\Omega$ , 10 M $\Omega$ ,100 M $\Omega$	100 $\Omega$
resolution	Numeric	3.00e-5, 2.00e-5, 1.00e-5, 5.00e-6, 2.00e-6, 1.50e-6	1.50e-6

Remarks

- The **CONF** command does not place the U2741A in the “wait-for-trigger” state. Use the **INIT** or **READ?** command in conjunction with **CONF** to place the U2741A in the “wait-for-trigger” state.
- You can allow the U2741A to automatically select the measurement range using autorange or you can select a fixed range using manual range. Autorange is convenient because the U2741A decides which range to use for each measurement based on the input signal. For faster measurements, use manual range on each measurement as additional time is required for autorange since the U2741A has to make a range selection.
- Autorange thresholds

Lower range at:	<10% of range
Upper range at:	>120% of range

- If the input signal is greater than can be measured on the selected range, the U2741A gives an overload indication of **+9.9E+37** from the remote interface.

### Examples

```
CONF:FRES 1e3, 0.00001
```

```
//Configures the U2741A to measure  
resistance at 1 kΩ range and 10 μOhm  
resolution using four-wire  
measurement method
```

```
READ?
```

```
//Triggers a measurement and read
```

```
Typical Response: +1.86850E+02
```

### See Also

```
CONFigure?
```

```
MEASure[:VOLTage][:DC]?
```

```
FETCH?
```

```
INITiate[:IMMediate]
```

```
READ?
```



## CONFigure:RESistance

### Syntax

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

This command presets and configures the U2741A for two-wire resistance measurements with the specified range and resolution. This command does not initiate the measurement.

### Parameters

Item	Type	Range of values	Default value
range	Numeric	100 $\Omega$ , 1 k $\Omega$ , 10 k $\Omega$ , 100 k $\Omega$ , 1 M $\Omega$ , 10 M $\Omega$ , 100 M $\Omega$	100 $\Omega$
resolution	Numeric	3.00e-5, 2.00e-5, 1.00e-5, 5.00e-6, 2.00e-6, 1.50e-6	1.50e-6

### Remarks

- The **CONF** command does not place the U2741A in the “wait-for-trigger” state. Use the **INIT** or **READ?** command in conjunction with **CONF** to place the U2741A in the “wait-for-trigger” state.
- You can allow the U2741A to automatically select the measurement range using autorange or you can select a fixed range using manual range. Autorange is convenient because the U2741A decides which range to use for each measurement based on the input signal. For faster measurements, use manual range on each measurement as additional time is required for autorange since the U2741A has to make a range selection.
- 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, the U2741A gives an overload indication of **+9.9E+37** from the remote interface.

### Examples

```
CONF:RES 1e3, 0.00001
```

//Configures the U2741A to measure  
resistance at 1 k $\Omega$  range and 10  $\mu$ Ohm  
resolution

```
READ?
```

//Triggers a measurement and read

Typical Response: +1.86850E+02

### See Also

CONFigure?

MEASure[:VOLTage][:DC]?

FETCh?

INITiate[:IMMediate]

READ?

# CONFigure:SSI

## Syntax

**CONFigure:SSI {SLAVE|NONE}, (@address\_list)**

This command sets the Synchronous Simultaneous Interface (SSI) state (slave or none) when used in the U2781A modular instrument chassis. This command will force all triggering sources to the SSI.

**CONFigure:SSI?**

This query command returns the SSI state as **SLAV** or **NONE** and the corresponding address.

## Parameters

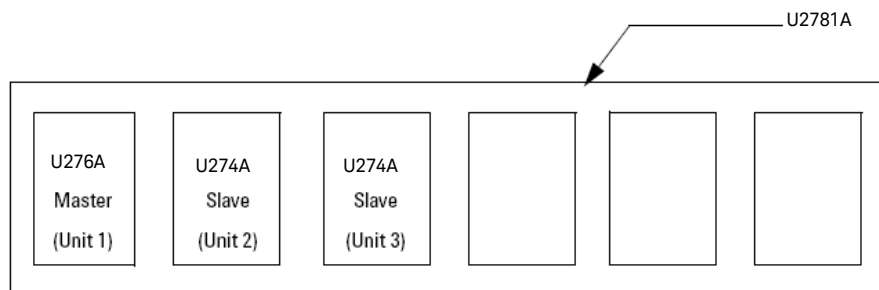
Item	Type	Range of values	Default value
SSI	Discrete	SLAVE or NONE	NONE
address_list	Numeric	0 to 7	0

NOTE

- Slaves can only be controlled by one master, normally a source unit.
- If the SSI configuration is set to NONE, then the address list need not be specified.
- For more information on the SSI, refer to the *Keysight U2781A USB Modular Instrument Chassis User’s Guide*.

## Examples

The following example sets one unit of the U2761A to master and two units of the U2741A to slaves. Refer to *Keysight U2761A USB Modular Function/Arbitrary Waveform Generator Programmer’s Reference Guide* for information on the U2761A.



For Unit 1: **CONF:SSI MAST, (@0,1)**

For Unit 2: **CONF:SSI SLAV, (@0)**

For Unit 3: **CONF:SSI SLAV, (@1)**

The following queries return the string values.

For Unit 1: **CONF:SSI?**

Typical Response: **MAST,0,1**

For Unit 2: **CONF:SSI?**

Typical Response: **SLAV,0**

For Unit 3: **CONF:SSI?**

Typical Response: **SLAV,1**

CONFigure:TEMPerature

Syntax

CONFigure:TEMPerature [<probe\_type|DEF>]

This command presets and configures the U2741A for temperature measurements with the specified probe type. This command does not initiate the measurement.

Parameter

Item	Type	Range of values	Default value
probe_type	Discrete	THER DEFault	THER

Remarks

- The **CONF** command does not place the U2741A in the “wait-for-trigger” state. Use the **INIT** or **READ?** command in conjunction with **CONF** to place the U2741A in the “wait-for-trigger” state.
- For temperature measurements, the U2741A internally selects the range. You cannot select the range to be used.
- To change the temperature units, use the **UNIT:TEMP** command.
- For the thermistor measurements, U2741A autoranges to the correct range for the transducer resistance measurement.

Examples

CONF:TEMP THER

//Configures the U2741A to measure temperature using a two-wire thermistor

READ?

//Triggers a measurement and read

Typical Response: +7.780E+01

See Also

CONFigure?

MEASure[:VOLTage][:DC]?

UNIT:TEMPerature

FETCh?

INITiate[:IMMediate]

READ?

# CONFigure[:VOLTage]:AC

## Syntax

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

This command presets and configures the U2741A for AC voltage measurements with the specified range and resolution. This command does not initiate the measurement. For AC measurements resolution is fixed at the 5.5 digits.

## Parameters

Item	Type	Range of values	Default value
range	Numeric	100 mV, 1 V, 10 V, 100 V, 1 kV	10 V
resolution	Numeric	N/A	5.5

## Remarks

- The **CONF** command does not place the U2741A in the “wait-for-trigger” state. Use the **INIT** or **READ?** command in conjunction with **CONF** to place the U2741A in the “wait-for-trigger” state.
- You can allow the U2741A to automatically select the measurement range using autorange or you can select a fixed range using manual range. Autorange is convenient because the U2741A decides which range to use for each measurement based on the input signal. For faster measurements, use manual range on each measurement as additional time is required for autorange since the U2741A has to make a range selection.
- Autorange thresholds

Lower range at:	<10% of range
Upper range at:	>120% of range

- If the input signal is greater than can be measured on the selected range, the U2741A gives an overload indication of **+9.9E+37** from the remote interface.

### Examples

**CONF:AC 1**

//Configures the U2741A to measure AC  
voltage at 1 V range

**READ?**

//Triggers a measurement and read

Typical Response: **+1.86850E-01**

### See Also

**CONFigure?**

**MEASure[:VOLTage][:DC]?**

**FETCH?**

**INITiate[:IMMediate]**

**READ?**

# CONFigure[:VOLTage][:DC]

## Syntax

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

This command presets and configures the U2741A for DC voltage measurements with the specified range and resolution. This command does not initiate the measurement.

## Parameters

Item	Type	Range of values	Default value
range	Numeric	100 mV, 1 V, 10 V, 100 V, 1 kV	10 V
resolution	Numeric	3.00e-5, 2.00e-5, 1.00e-5, 5.00e-6, 2.00e-6, 1.50e-6	1.50e-6

## Remarks

- The **CONF** command does not place the U2741A in the “wait-for-trigger” state. Use the **INIT** or **READ?** command in conjunction with **CONF** to place the U2741A in the “wait-for-trigger” state.
- You can allow the U2741A to automatically select the measurement range using autorange or you can select a fixed range using manual range. Autorange is convenient because the U2741A decides which range to use for each measurement based on the input signal. For faster measurements, use manual range on each measurement as additional time is required for autorange since the U2741A has to make a range selection.
- Autorange thresholds

Lower range at:	<10% of range
Upper range at:	>120% of range

- If the input signal is greater than can be measured on the selected range, the U2741A gives an overload indication of **+9.9E+37** from the remote interface.



### Examples

```
CONF 1, 0.00001
```

```
//Configures the U2741A to measure DC  
voltage at 1 V range and 10  $\mu$ V  
resolution
```

```
READ?
```

```
//Triggers a measurement and read
```

```
Typical Response: +1.86850E-01
```

### See Also

```
CONFigure?
```

```
MEASure[:VOLTage][:DC]?
```

```
FETCH?
```

```
INITiate[:IMMediate]
```

```
READ?
```

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# 5 MEASure Subsystem

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This chapter explains how the MEASure command subsystem is configured when acquiring data from the U2741A.

## MEASure:CONTInuity?

### Syntax

#### MEASure:CONTInuity?

This command presets, configures the U2741A for continuity measurements and make a measurement. Continuity is a special type of fixed-range two-wire resistance measurement. The reading is sent to the U2741A output buffer.

### Remarks

- The range is fixed at 1 k $\Omega$  (a two-wire resistance measurement) and the resolution is fixed at 4.5 digits.
- The measurement is considered to have continuity if the measured resistance is less or equal to the continuity threshold of 10  $\Omega$  and the value can be obtained via the remote interface. If the measurements are more than 10  $\Omega$ , **+9.9E+37** is returned from the remote interface.
- If the **TRIG:SOUR** is set to **BUS**, the **MEAS?** command overwrites the **BUS** trigger and returns a measurement.

### Example

MEAS:CONT?

//Configures the U2741A to measure continuity and triggers a measurement

Typical Response: **+8.65800E-01**

### See Also

**CONFigure Subsystem**

## MEASure:CURRent:AC?

### Syntax

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

This command presets, configures the U2741A for AC current measurements with the specified range and resolution and make a measurement. The reading is sent to the output buffer. For AC measurements, the resolution is fixed at 5.5 digits.

### Parameters

Item	Type	Range of values	Default value
range	Numeric	10 mA, 100 mA, 1 A, 2 A	1 A
resolution	Numeric	N/A	5.5

### Remarks

- You can allow the U2741A to automatically select the measurement range using autorange or you can select a fixed range using manual range. Autorange is convenient because the U2741A decides which range to use for each measurement based on the input signal. For faster measurements, use manual range on each measurement as additional time is required for autorange since the U2741A has to make a range selection.
- Autorange thresholds

Lower range at:	<10% of range
Upper range at:	>120% of range

- If the input signal is greater than can be measured on the selected range, the U2741A gives an overload indication of **+9.9E+37** from the remote interface.
- If the **TRIG:SOUR** is set to **BUS**, the **MEAS?** command overwrites the **BUS** trigger and returns a measurement.

### Example

**MEAS:CURR:AC? 2**

//Configures the U2741A to measure AC  
current at 2 A range and triggers a  
measurement

Typical Response: **+1.86850E+00**

### See Also

**CONFigure Subsystem**

## MEASure:CURRent[:DC]?

### Syntax

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

This command presets, configures the U2741A for DC current measurements with the specified range and resolution, and make a measurement. The reading is sent to the output buffer.

### Parameters

Item	Type	Range of values	Default value
range	Numeric	10 mA, 100 mA, 1 A, 2 A	1 A
resolution	Numeric	3.00e-5, 2.00e-5, 1.00e-5, 5.00e-6, 2.00e-6, 1.50e-6	1.50e-6

### Remarks

- You can allow the U2741A to automatically select the measurement range using autorange or you can select a fixed range using manual range. Autorange is convenient because the U2741A decides which range to use for each measurement based on the input signal. For faster measurements, use manual range on each measurement as additional time is required for autorange since the U2741A has to make a range selection.
- Autorange thresholds

Lower range at:	<10% of range
Upper range at:	>120% of range

- If the input signal is greater than can be measured on the selected range, the U2741A gives an overload indication of **+9.9E+37** from the remote interface.
- If the **TRIG:SOUR** is set to **BUS**, the **MEAS?** command overwrites the **BUS** trigger and returns a measurement.

### Example

**MEAS:CURR? 2**

//Configures the U2741A to measure DC  
current at 2 A range and triggers a  
measurement

Typical Response: **+1.86850E+00**

### See Also

**CONFigure Subsystem**



## MEASure:DIODe?

### Syntax

**MEASure:DIODe?**

This command presets, configures the U2741A for diode measurements, and make a measurement. The reading is sent to the output buffer.

### Remarks

- The range and resolution are fixed for diode test with the range at 1 VDC with a 1 mA constant current source output and the resolution is fixed at 4.5 digits.
- The voltage value is returned if it is within 0 V and 1.2 V. If the value is greater than 1.2 V, **+9.9E+37** is returned from the remote interface.
- If the **TRIG:SOUR** is set to **BUS**, the **MEAS?** command overwrites the **BUS** trigger and returns a measurement.

### Example

```
MEAS:DIOD?                                //Configures the U2741A to measure
                                           diode and triggers a measurement
```

Typical Response: **+8.65800E-01**

### See Also

**CONFigure Subsystem**

# MEASure:FREQuency?

## Syntax

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

This command presets, configures the U2741A for frequency measurements with the specified range and resolution, and make a measurement. The reading is sent to the output buffer.

## Parameters

Item	Type	Range of values	Default value
range	Numeric	1 Hz, 1 MHz	1 Hz
resolution	Numeric	N/A	5.5

## Remarks

- Frequency is measured on AC voltage signals. Thus, the proper AC voltage should be first set using the [**SENS:**] **VOLT:AC:RANG** command. The voltage range should be  $\geq 0.1$  V for more accurate frequency measurement.
- 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 range), the U2741A gives an overload indication of **+9.9E+37** from the remote interface. Autorange can be enabled for the input voltage.
- The frequency measurement does not autorange.
- With no signal applied, **0** is returned.
- If the **TRIG:SOUR** is set to **BUS**, the **MEAS?** command overwrites the **BUS** trigger and returns a measurement.

### Example

**MEAS:FREQ? 1**

//Configures the U2741A to measure  
frequency of 1 Hz and triggers a  
measurement

Typical Response: **+1.00000E+00**

### See Also

**CONFigure Subsystem**

# MEASure:FRESistance?

## Syntax

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

This command presets, configures the U2741A for four-wire resistance measurements with the specified range and resolution, and make a measurement. The reading is sent to the output buffer.

## Parameters

Item	Type	Range of values	Default value
range	Numeric	100 $\Omega$ , 1 k $\Omega$ , 10 k $\Omega$ , 100 k $\Omega$ , 1 M $\Omega$ , 10 M $\Omega$ , 100 M $\Omega$	100 $\Omega$
resolution	Numeric	3.00e-5, 2.00e-5, 1.00e-5, 5.00e-6, 2.00e-6, 1.50e-6	1.50e-6

## Remarks

- You can allow the U2741A to automatically select the measurement range using autorange or you can select a fixed range using manual range. Autorange is convenient because the U2741A decides which range to use for each measurement based on the input signal. For faster measurements, use manual range on each measurement as additional time is required for autorange since the U2741A has to make a range selection.
- Autorange thresholds

Lower range at:	<10% of range
Upper range at:	>120% of range

- If the input signal is greater than can be measured on the selected range, the U2741A gives an overload indication of **+9.9E+37** from the remote interface.
- If the **TRIG:SOUR** is set to **BUS**, the **MEAS?** command overwrites the **BUS** trigger and returns a measurement.

### Example

```
MEAS:FRES? 1e3, 0.00001
```

//Configures the U2741A to measure resistance at 1 k $\Omega$  range and 10  $\mu$ Ohm resolution using four-wire measurement method and triggers a measurement

Typical Response: **+1.86850E+02**

### See Also

**CONFigure Subsystem**

# MEASure:RESistance?

## Syntax

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

This command presets, configures the U2741A for two-wire resistance measurements with the specified range and resolution, and make a measurement. The reading is sent to the output buffer.

## Parameters

Item	Type	Range of values	Default value
range	Numeric	100 $\Omega$ , 1 k $\Omega$ , 10 k $\Omega$ , 100 k $\Omega$ , 1 M $\Omega$ , 10 M $\Omega$ , 100 M $\Omega$	100 $\Omega$
resolution	Numeric	3.00e-5, 2.00e-5, 1.00e-5, 5.00e-6, 2.00e-6, 1.50e-6	1.50e-6

## Remarks

- You can allow the U2741A to automatically select the measurement range using autorange or you can select a fixed range using manual range. Autorange is convenient because the U2741A decides which range to use for each measurement based on the input signal. For faster measurements, use manual range on each measurement as additional time is required for autorange since the U2741A has to make a range selection.
- Autorange thresholds

Lower range at:	<10% of range
Upper range at:	>120% of range

- If the input signal is greater than can be measured on the selected range, the U2741A gives an overload indication of **+9.9E+37** from the remote interface.
- If the **TRIG:SOUR** is set to **BUS**, the **MEAS?** command overwrites the **BUS** trigger and returns a measurement.

### Example

```
MEAS:RES? 1e3, 0.00001
```

```
//Configures the U2741A to measure  
resistance at 1 k $\Omega$  range and 10  $\mu\Omega$   
resolution using two-wire  
measurement method and triggers a  
measurement
```

Typical Response: **+1.86850E+02**

### See Also

[CONFigure Subsystem](#)

[CONFigure:RESistance](#)

# MEASure:TEMPerature?

## Syntax

**MEASure:TEMPerature?** [**<probe\_type|DEF>**]

This command presets, configures the U2741A for temperature measurements with the specified range and resolution, and make a measurement. The reading is sent to the output buffer.

## Parameter

Item	Type	Range of values	Default value
probe_type	Discrete	THER DEfault	THER

## Remarks

- For temperature measurements, the U2741A internally selects the range. You cannot select the range to be used.
- For temperature measurements, the resolution is fixed at 3.5 digits.
- To change the temperature units, use the **UNIT:TEMP** command.
- For the thermistor measurements, U2741A autoranges to the correct range for the transducer resistance measurement.
- If the **TRIG:SOUR** is set to **BUS**, the **MEAS?** command overwrites the **BUS** trigger and returns a measurement.

## Example

MEAS:TEMP? THER

//Configures the U2741A to measure temperature using a two-wire thermistor and triggers a measurement

Typical Response: **+7.78000E+01**

## See Also

**CONFigure Subsystem**  
**UNIT:TEMPerature**



## MEASure[:VOLTage]:AC?

### Syntax

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

This command presets, configures the U2741A for AC voltage measurements with the specified range and resolution, and make a measurement. The reading is sent to the output buffer. For AC measurements resolution is fixed at the 5.5 digits.

### Parameters

Item	Type	Range of values	Default value
range	Numeric	100 mV, 1 V, 10 V, 100 V, 1 kV	10 V
resolution	Numeric	N/A	5.5

### Remarks

- You can allow the U2741A to automatically select the measurement range using autorange or you can select a fixed range using manual range. Autorange is convenient because the U2741A decides which range to use for each measurement based on the input signal. For faster measurements, use manual range on each measurement as additional time is required for autorange since the U2741A has to make a range selection.
- Autorange thresholds

Lower range at:	<10% of range
Upper range at:	>120% of range

- If the input signal is greater than can be measured on the selected range, the U2741A gives an overload indication of **+9.9E+37** from the remote interface.
- If the **TRIG:SOUR** is set to **BUS**, the **MEAS?** command overwrites the **BUS** trigger and returns a measurement.

### Example

**MEAS:AC? 1**

//Configures the U2741A to measure AC  
voltage at 1 V range and triggers a  
measurement

Typical Response: **+1.86850E-01**

### See Also

**CONFigure Subsystem**

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

### Syntax

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

This command presets, configures the U2741A for DC voltage measurements with the specified range and resolution, and make a measurement. The reading is sent to the output buffer.

### Parameters

Item	Type	Range of values	Default value
range	Numeric	100 mV, 1 V, 10 V, 100 V, 1 kV	10 V
resolution	Numeric	3.00e-5, 2.00e-5, 1.00e-5, 5.00e-6, 2.00e-6, 1.50e-6	1.50e-6

### Remarks

- You can allow the U2741A to automatically select the measurement range using autorange or you can select a fixed range using manual range. Autorange is convenient because the U2741A decides which range to use for each measurement based on the input signal. For faster measurements, use manual range on each measurement as additional time is required for autorange since the U2741A has to make a range selection.
- Autorange thresholds

Lower range at:	<10% of range
Upper range at:	>120% of range

- If the input signal is greater than can be measured on the selected range, the U2741A gives an overload indication of **+9.9E+37** from the remote interface.
- If the **TRIG:SOUR** is set to **BUS**, the **MEAS?** command overwrites the **BUS** trigger and returns a measurement.

### Example

```
MEAS? 1, 0.0001
```

```
//Configures the U2741A to measure DC  
voltage at 1 V range and 100  $\mu$ V  
resolution and triggers a measurement
```

Typical Response: **+1.86850E-01**

### See Also

**CONFigure Subsystem**

## 6 SENSE Subsystem

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# [SENSe:]FUNCTION

## Syntax

[SENSe:]FUNCTION <function>

This command selects the measurement function. All the function-related measurement attributes except autorange are retained.

[SENSe:]FUNCTION?

This command queries the selected measurement function.

## Parameter

Item	Type	Range of values	Default value
function	String	CONTInuity, CURRent:AC, CURRent[:DC], DIODe, FREQuency, RESistance, FRESistance, TEMPerature, VOLTage:AC, or VOLTage[:DC]	Required parameter

## Remarks

- If you change the measurement function, all measurement attributes of the previous function (range, resolution, and so forth) are retained. If you return to the original function, all previously-defined measurement attributes will be restored.
- This command has no default value. However, the U2741A defaults to DC volts after a factory reset (\*RST command).
- Autorange will be turned off after [SENS:]FUNC has been set.
- The parameter is case-sensitive.

## Examples

FUNC"CONT"

//Selects the continuity function

FUNC?

//Queries the selected measurement function

Typical Response: CONT

## See Also

CONFigure Subsystem

# [SENSe:]CURRent:AC:RANGe

## Syntax

[SENSe:]CURRent:AC:RANGe <range|MIN|MAX|AUTO>

This command sets the measurement range for AC current measurements.

[SENSe:]CURRent:AC:RANGe?

This command queries the measurement range for AC current measurements.

## Parameter

Item	Type	Range of values	Default value
range	Numeric	10 mA, 100 mA, 1 A, 2 A MIN = 10 mA MAX = 2 A	1 A

## Remarks

- Selecting a fixed range will disable autorange.
- If the input signal is greater than can be measured on the selected range (manual range), the U2741A gives an overload indication of **+9.9E+37** from the remote interface.
- The U2741A is set to 1 A, with autorange enabled, after a factory reset (\*RST command)

## Examples

CURR:RANG 1 //Configures the U2741A to measure AC current at 1 A range

CURR:RANG? //Queries the range

Typical Response: **+1.00000E+00**

## See Also

**CONFigure:CURRent:AC**  
**[SENSe:]CURRent:AC:RANGe:AUTO**

[SENSe:]CURRent:AC:RANGe:AUTO

Syntax

[SENSe:]CURRent:AC:RANGe:AUTO <state>

This command disables or enables autorange for AC current measurements. Autorange is convenient because the U2741A automatically selects the range for each measurement based on the input signal detected.

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

This command queries the autorange mode for AC current measurements.

Parameter

Item	Type	Range of values	Default value
state	Boolean	{OFF 0 ON 1} OFF or 0: Disables the auto mode ON or 1: Enables the auto mode	ON

Remarks

- Autorange thresholds:

Lower range at:	<10% of range
Upper range at:	>120% of range

- With autorange enabled, the U2741A selects the appropriate range based on the input signal detected.
- Selecting a discrete range (see [SENSe:]CURRent:AC:RANGe command) will disable autorange.
- The U2741A enables autorange after a factory reset (\*RST command).



### Examples

**CURR:RANG:AC:AUTO ON**

//Sets autorange for AC current measurement to **ON**

**CURR:RANG:AC:AUTO?**

//Queries the autorange mode

Typical Response: **1**

### See Also

**CONFigure:CURRent:AC**

**[SENSe:]CURRent:AC:RANGe**



# [SENSe:]CURRent[:DC]:RANGe

## Syntax

[SENSe:]CURRent[:DC]:RANGe <range|MIN|MAX|AUTO>

This command sets the measurement range for DC current measurements.

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

This command queries the measurement range for DC current measurements.

## Parameter

Item	Type	Range of values	Default value
range	Numeric	10 mA, 100 mA, 1 A, 2 A MIN = 10 mA MAX = 2 A	1 A

## Remarks

- Selecting a fixed range will disable autorange.
- If the input signal is greater than can be measured on the selected range (manual range), the U2741A gives an overload indication of **+9.9E+37** from the remote interface.
- The U2741A is set to 1 A, with autorange enabled, after a factory reset (\*RST command)

## Examples

CURR:RANG 1 //Configures the U2741A to measure DC current at 1 A range

CURR:RANG? //Queries the DC current range

Typical Response: **+1.00000E+00**

## See Also

**CONFigure:CURRent[:DC]**

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

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

## Syntax

[SENSe:]CURRent[:DC]:RANGe:AUTO <state>

This command disables or enables autorange for DC current measurements. Autorange is convenient because the U2741A automatically selects the range for each measurement based on the input signal detected.

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

This command queries the autorange mode for DC current measurements.

## Parameter

Item	Type	Range of values	Default value
state	Boolean	{OFF 0 ON 1} OFF or 0: Disables the auto mode ON or 1: Enables the auto mode	ON

## Remarks

- Autorange thresholds:

Lower range at:	<10% of range
Upper range at:	>120% of range

- With autorange enabled, the U2741A selects the appropriate range based on the input signal detected.
- Selecting a fixed range (see [SENSe:]CURRent:AC:RANGe command) will disable autorange.
- The U2741A enables autorange after a factory reset (\*RST command).

### Examples

**CURR:RANG:AUTO ON**

//Sets autorange for DC current measurement to **ON**

**CURR:RANG:AUTO?**

//Queries the autorange mode

Typical Response: **1**

### See Also

**CONFigure:CURRent[:DC]**

**[SENSe:]CURRent:AC:RANGe**

# [SENSe:]CURRent[:DC]:RESolution

## Syntax

```
[SENSe:]CURRent[:DC]:RESolution <range|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.

## Parameter

Item	Type	Range of values	Default value
range	Numeric	3.00e-5, 2.00e-5, 1.00e-5, 5.00e-6, 2.00e-6, 1.50e-6	1.50e-6

## Remarks

- For the **<resolution>** parameter, you can substitute **MIN** or **MAX** for a numeric value. **MIN** selects the smallest value accepted, which gives the highest resolution; **MAX** selects the largest value accepted, which gives the least resolution.
- The U2741A sets the resolution to 5.5 digits after a factory reset (\*RST command).

## Examples

```
CURR:RES 0.00003           //Sets the measurement resolution to  
                           30 µA  
CURR:RES                  //Queries the selected resolution  
Typical Response: +3.00000E-05
```

## See Also

```
CONFigure:CURRent[:DC]
```

[SENSe:]CURRent[:DC]:ZERO:AUTO

Syntax

[SENSe:]CURRent[:DC]:ZERO:AUTO <state>

This command disables or enables the autozero mode for DC current measurements.

- When autozero is **ON** (default), the U2741A 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 currents present on the U2741A input circuitry from affecting measurement accuracy.
- When autozero is **OFF**, the U2741A 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.

[SENSe:]CURRent[:DC]:ZERO:AUTO?

This command queries the autozero mode for DC current measurements.

Parameter

Item	Type	Range of values	Default value
state	Boolean	{OFF 0 ON 1} OFF or 0: Disables the autozero mode ON or 1: Enables the autozero mode	ON

Remarks

- The autozero mode is reset to the default (**ON**) at power up, or after a factory reset (**\*RST** command) or an Instrument Preset (**SYST:PRES** command).

Examples

CURR:ZERO:AUTO ON

//Sets autozero for DC current measurements to **ON**

CURR:ZERO:AUTO?

//Queries the autorange mode for DC current measurements

Typical Response: 1

See Also

CONFigure:CURRent[:DC]

## [SENSe:]FREQuency:APERture

## Syntax

[SENSe:]FREQuency:APERture <value>

This command sets the aperture time (also called gate time) for frequency measurements.

[SENSe:]FREQuency:APERture?

This command queries the aperture setting for frequency measurements.

## Parameter

Item	Type	Range of values	Default value
value	Numeric	{0.1 s} 1 s}	1

## Examples

FREQ:APER 0.1

```
//Sets the U2741A to measure frequency
//at 0.1 s aperture setting
```

FREQ:APER?

```
//Queries the aperture
```

Typical Response: +1.00000E-01

## See Also

## CONFiGure:FREQuency



# [SENSe:]FRESistance:NPLC

## Syntax

[SENSe:]FRESistance:NPLC <PLC|MIN|MAX|DEF>

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).

[SENSe:]FRESistance:NPLC?

This command queries the NPLC settings for resistance measurements.

## Parameter

Item	Type	Range of values	Default value
PLC	Numeric	{0 0.025 1 2 10 20} MIN = 0 PLC MAX = 20 PLC	20

## Remarks

- Only those integration times set to an integral number of power line cycles (1, 2, 10, or 20 PLCs) provides a normal mode (line frequency noise) rejection.
- The U2741A sets the integration time to 20 PLCs after a factory reset (\*RST command) or an Instrument Preset (SYST:PRES command).

## Examples

FRES:NPLC 1//Sets the NPLC for resistance measurements to 1 PLC

FRES:NPLC?//Queries the NPLC setting for resistance measurements

Typical Response: +1.00000E+00

## See Also

CONFigure:FRESistance

## [SENSe:]FREStistance:RANGe

## Syntax

```
[SENSe:]FRESistance:RANGe <range|MIN|MAX|AUTO>
```

This command sets the measurement range for four-wire resistance measurements.

[SENSe:]FRESiistance:RANGe?

This command queries the measurement range for four-wire resistance measurements.

## Parameter

Item	Type	Range of values	Default value
range	Numeric	100 $\Omega$ , 1 k $\Omega$ , 10 k $\Omega$ , 100 k $\Omega$ , 1 M $\Omega$ , 10 M $\Omega$ , 100 M $\Omega$ MIN = 100 $\Omega$ MAX = 100 M $\Omega$	1 k $\Omega$

## Remarks

- Selecting a fixed range will disable autorange.
- If the input signal is greater than can be measured on the selected range (manual range), the U2741A gives an overload indication of **+9.9E+37** from the remote interface.
- The U2741A is set to 1 **k $\Omega$** , with autorange enabled, after a factory reset (**\*RST** command).

## Examples

```
FRES:RANG 100 //Configures the U2741A to measure
                 resistance at 100  $\Omega$  range
```

```
FRES:RANG? //Queries the resistance range
```

Typical Response: +1.00000E+02

## See Also

### CONFigure:FRESistance

[SENSe:]FRESi stance:RANGe:AUTO

# [SENSe:]FRESistance:RANGe:AUTO

## Syntax

[SENSe:]FRESistance:RANGe:AUTO <state>

This command disables or enables autorange for four-wire resistance measurements. Autorange is convenient because the U2741A automatically selects the range for each measurement based on the input signal detected.

[SENSe:]FRESistance:RANGe:AUTO?

This command queries the autorange mode for four-wire resistance measurements.

## Parameter

Item	Type	Range of values	Default value
state	Boolean	{OFF 0 ON 1} OFF or 0: Disables the auto mode ON or 1: Enables the auto mode	ON

## Remarks

- Autorange thresholds:

Lower range at:	<10% of range
Upper range at:	>120% of range

- With autorange enabled, the U2741A selects the appropriate range based on the input signal detected.
- Selecting a fixed range (see [SENSe:]FRESistance:NPLC command) will disable autorange.
- The U2741A enables autorange after a factory reset (\*RST command).

### Examples

`FRES:RANG:AUTO ON` //Sets autorange for resistance measurement to **ON**

`FRES:RANG:AUTO?` //Queries the autorange mode

Typical Response: **1**

### See Also

`CONFigure:RESistance`

`[SENSe:]FRESistance:NPLC`

# [SENSe:]FRESistance:RESolution

## Syntax

```
[SENSe:]FRESistance:RESolution <range|MIN|MAX|AUTO>
[SENSe:]FRESistance:RESolution?
```

## 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*.

## Parameter

Item	Type	Range of values	Default value
range	Numeric	3.00e-5, 2.00e-5, 1.00e-5, 5.00e-6, 2.00e-6, 1.50e-6	1.50e- 6

## Remarks

- For the **<resolution>** parameter, you can substitute **MIN** or **MAX** for a numeric value. **MIN** selects the smallest value accepted, which gives the highest resolution; **MAX** selects the largest value accepted, which gives the least resolution.
- The U2741A sets the resolution to 5.5 digits after a factory reset (**\*RST** command).

## Examples

```
FRES:RES 3e-5 //Sets the measurement resolution to 30 μΩ
FRES:RES? //Queries the selected resolution
Typical Response: +3.00000E-05
```

## See Also

**CONFigure:FRESistance**



# [SENSe:]RESistance:RANGe

## Syntax

[SENSe:]RESistance:RANGe <range|MIN|MAX|AUTO>

This command sets the measurement range for resistance measurements.

[SENSe:]RESistance:RANGe?

This command queries the measurement range for resistance measurements.

## Parameter

Item	Type	Range of values	Default value
range	Numeric	100 $\Omega$ , 1 k $\Omega$ , 10 k $\Omega$ , 100 k $\Omega$ , 1 M $\Omega$ , 10 M $\Omega$ , 100 M $\Omega$ MIN = 100 $\Omega$ MAX = 100 M $\Omega$	1 k $\Omega$

## Remarks

- Selecting a discrete range will disable autorange.
- If the input signal is greater than can be measured on the selected range (manual range), the U2741A gives an overload indication of **+9.9E+37** from the remote interface.
- The U2741A is set to 1 k $\Omega$ , with autorange enabled, after a factory reset (\*RST command)

## Examples

RES:RANG 100 //Configures the U2741A to measure resistance at 100  $\Omega$  range

RES:RANG? //Queries the resistance range

Typical Response: **+1.00000E+02**

## See Also

CONFigure:RESistance  
[SENSe:]RESistance:RANGe:AUTO

## [SENSe:]RESistance:RANGe:AUTO

## Syntax

[SENSe:]RESistance:RANGe:AUTO &lt;state&gt;

This command disables or enables autorange for resistance measurements. Autorange is convenient because the U2741A automatically selects the range for each measurement based on the input signal detected.

[SENSe:]RESistance:RANGe:AUTO?

This command queries the autorange mode for resistance measurements.

## Parameter

Item	Type	Range of values	Default value
state	Boolean	{OFF 0 ON 1} OFF or 0: Disables the auto mode ON or 1: Enables the auto mode	ON

## Examples

```
RES:RANG:AUTO ON //Sets autorange for resistance measurement to ON
```

```
RES:RANG:AUTO? //Queries the autorange mode
```

Typical Response: **1**

## See Also

## CONFigure:RESistance

[SENSe:]FRESistance:NPLC



# [SENSe:]RESistance:RESolution

## Syntax

```
[SENSe:]RESistance:RESolution <range|MIN|MAX|AUTO>
[SENSe:]RESistance:RESolution?
```

## 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*.

## Parameter

Item	Type	Range of values	Default value
range	Numeric	3.00e-5, 2.00e-5, 1.00e-5, 5.00e-6, 2.00e-6, 1.50e-6	1.50e- 6

## Remarks

- For the **<resolution>** parameter, you can substitute **MIN** or **MAX** for a numeric value. **MIN** selects the smallest value accepted, which gives the highest resolution; **MAX** selects the largest value accepted, which gives the least resolution.
- The U2741A sets the resolution to 5.5 digits after a factory reset (**\*RST** command).

## Examples

```
RES:RES 3e-5 //Sets the measurement resolution to 30 μΩ
RES:RES? //Queries the selected resolution
Typical Response: +3.00000E-05
```

## See Also

**CONFigure:RESistance**

# [SENSe:]RESistance:ZERO:AUTO

## Syntax

[SENSe:]RESistance:ZERO:AUTO <state>

[SENSe:]RESistance:ZERO:AUTO?

## Description

This command disables or enables the autozero mode for resistance measurements.

- When autozero is **ON** (default), the U2741A 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 U2741A input circuitry from affecting measurement accuracy.
- When autozero is **OFF**, the U2741A 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.

## Parameter

Item	Type	Range of values	Default value
state	Boolean	{OFF 0 ON 1} OFF or 0: Disables the autozero mode ON or 1: Enables the autozero mode	OFF

## Remarks

- This command does not affect four-wire resistance measurements. All four-wire measurements are made with autozero **ON**, regardless of the state set or returned by this command or query.
- 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 (**OFF**) at power up, or after a factory reset (**\*RST** command) or an Instrument Preset (**SYST:PRES** command).

## Examples

The following command disables autozero. With autozero disabled, a new zero measurement is not issued until the next configuration change (function, range, or NPLC).

**RES:ZERO:AUTO OFF**

The following query returns the autozero setting.

**RES:ZERO:AUTO?**

Typical Response: 0

## See Also

**CONFigure:RESistance**

## [SENSe:]TEMPerature:RJUNction?

### Syntax

[SENSe:]TEMPerature:RJUNction?

This command queries the internal reference junction temperature. It will return the reference temperature in °C regardless of the selected temperature unit.

### Example

TEMP:RJUN?

//Queries the internal reference junction temperature

Typical Response: +2.89753E+01

### See Also

**UNIT:TEMPerature**

# [SENSe:]TEMPerature:ZERO:AUTO

## Syntax

[SENSe:]TEMPerature:ZERO:AUTO <state>

This command disables or enables the autozero mode for temperature measurements.

- When autozero is **ON** (default), the U2741A 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 U2741A input circuitry from affecting measurement accuracy.
- When autozero is **OFF**, the U2741A 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.

[SENSe:]TEMPerature:ZERO:AUTO?

This command queries the autozero mode for temperature measurements.

## Parameter

Item	Type	Range of values	Default value
state	Boolean	{OFF 0 ON 1} OFF or 0: Disables the autozero mode ON or 1: Enables the autozero mode	OFF

## Remarks

- The autozero mode is set indirectly when you set the resolution and integration time using the **CONF** or **MEAS?** commands.
- The autozero mode is reset to the default (**OFF**) at power-up, or after a factory reset (**\*RST** command) or an Instrument Preset (**SYST:PRES** command).

### Examples

**TEMP:ZERO:AUTO ON**

//Sets autozero for temperature measurements to **ON**

**TEMP:ZERO:AUTO?**

//Queries the autorange mode for temperature measurements

Typical Response: **1**

### See Also

**CONFigure:TEMPerature**

# [SENSe:]VOLTage:AC:RANGe

## Syntax

[SENSe:]VOLTage:AC:RANGe <range|MIN|MAX|AUTO>

This command sets the measurement range for AC voltage measurements.

[SENSe:]VOLTage:AC:RANGe?

This command queries the measurement range for AC voltage measurements.

## Parameter

Item	Type	Range of values	Default value
range	Numeric	100 mV, 1 V, 10 V, 100 V, 1 kV MIN = 100 mV MAX = 1 kV	10 V

## Remarks

- Selecting a discrete range will disable autorange.
- The U2741A is set to 10 V, with autorange enabled, after a factory reset (\*RST command)

## Examples

VOLT:AC:RANG 1 //Configures the U2741A to measure AC voltage at 1 V range

VOLT:AC:RANG? //Queries the voltage range

Typical Response: +1.00000E+00

## See Also

CONFigure[:VOLTage]:AC

[SENSe:]VOLTage:AC:RANGe:AUTO

# [SENSe:]VOLTage:AC:RANGe:AUTO

## Syntax

[SENSe:]VOLTage:AC:RANGe:AUTO <state>

This command disables or enables autorange for AC voltage measurements. Autorange is convenient because the U2741A automatically selects the range for each measurement based on the input signal detected.

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

This command queries the autorange mode for AC voltage measurements.

## Parameter

Item	Type	Range of values	Default value
state	Boolean	{OFF 0 ON 1} OFF or 0: Disables the auto mode ON or 1: Enables the auto mode	ON

## Remarks

- Autorange thresholds:

Lower range at:	<10% of range
Upper range at:	>120% of range

- With autorange enabled, the U2741A selects the appropriate range based on the input signal detected.
- Selecting a discrete range (see [SENSe:]VOLTage:AC:RANGe command) will disable autorange.
- The U2741A enables autorange after a factory reset (\*RST command).



### Examples

**VOLT:RANG:AC:AUTO ON**

//Sets autorange for AC voltage measurement to **ON**

**VOLT:RANG:AC:AUTO?**

//Queries the autorange mode

Typical Response: **1**

### See Also

**CONFigure[:VOLTage]:AC**  
**[SENSe:]VOLTage:AC:RANGe**

## [SENSe:]VOLTage[:DC]:NPLC

## Syntax

[SENSe:]VOLTage[:DC]:NPLC &lt;PLC|MIN|MAX|DEF&gt;

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).

[SENSe:]VOLTage[:DC]:NPLC?

This command queries the NPLC settings for DC voltage measurements.

## Parameter

Item	Type	Range of values	Default value
PLC	Numeric	{0 0.025 1 2 10 20} MIN = 0 PLC MAX = 20 PLC	20

## Remarks

- Selecting a fixed range will disable autorange.
- The U2741A is set to 20 PLCs, with autorange enabled, after a factory reset (\*RST command)

## Examples

```
VOLT:NPLC 10 //Configures the NPLC of the
               U2741A to 10
```

```
VOLT:NPLC? //Queries the NPLC settings
```

Typical Response: +1.00000E+01

## See Also

```
CONFigure[:VOLTage][:DC]
```

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

# [SENSe:]VOLTage[:DC]:RANGe

## Syntax

[SENSe:]VOLTage[:DC]:RANGe <range|MIN|MAX|AUTO>

This command sets the measurement range for DC voltage measurements.

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

This command queries the measurement range for DC voltage measurements.

## Parameter

Item	Type	Range of values	Default value
range	Numeric	100 mV, 1 V, 10 V, 100 V, 1 kV MIN = 10 mV MAX = 1 kV	10 V

## Remarks

- Selecting a fixed range will disable autorange.
- If the input signal is greater than can be measured on the selected range (manual range), the U2741A gives an overload indication of **+9.9E+37** from the remote interface.
- The U2741A is set to 10 V, with autorange enabled, after a factory reset (**\*RST** command)

## Examples

VOLT:RANG 1 //Configures the U2741A to measure DC voltage at 1 V range

VOLT:RANG? //Triggers a measurement and read

Typical Response: **+1.00000E+00**

## See Also

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

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

## Syntax

[SENSe:]VOLTage[:DC]:RANGe:AUTO <state>

This command disables or enables autorange for DC voltage measurements. Autorange is convenient because the U2741A automatically selects the range for each measurement based on the input signal detected.

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

This command queries the autorange mode for DC voltage measurements.

## Parameter

Item	Type	Range of values	Default value
state	Boolean	{OFF 0 ON 1} OFF or 0: Disables the auto mode ON or 1: Enables the auto mode	OFF

## Remarks

- Autorange thresholds:

Lower range at:	<10% of range
Upper range at:	>120% of range

- With autorange enabled, the U2741A selects the appropriate range based on the input signal detected.
- Selecting a fixed range (see [SENSe:]VOLTage[:DC]:NPLC command) will disable autorange.
- The U2741A enables autorange after a factory reset (\*RST command).

### Examples

**VOLT:RANG:AUTO 1**

//Sets autorange for DC voltage to **ON**

**VOLT:RANG:AUTO?**

//Queries the autorange mode

Typical Response: **1**

### See Also

**CONFigure[:VOLTage][:DC]  
[SENSe:]VOLTage[:DC]:NPLC**

# [SENSe:]VOLTage[:DC]:RESolution

## Syntax

```
[SENSe:]VOLTage[:DC]:RESolution <range|MIN|MAX|DEF>
[SENSe:]VOLTage[:DC]:RESolution?
```

## 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*.

## Parameter

Item	Type	Range of values	Default value
range	Numeric	3.00e-5, 2.00e-5, 1.00e-5, 5.00e-6, 2.00e-6, 1.50e-6	1.50e- 6

## Remarks

- For the **<resolution>** parameter, you can substitute **MIN** or **MAX** for a numeric value. **MIN** selects the smallest value accepted, which gives the highest resolution; **MAX** selects the largest value accepted, which gives the least resolution.
- The U2741A sets the resolution to 5.5 digits after a factory reset (**\*RST** command).

## Examples

```
VOLT:DC:RES 0.00003           //Sets the measurement resolution
                                to 30 µV
VOLT:DC:RES?                   //Query returns the selected resolution
Typical Response: +3.00000E-05
```

## See Also

```
CONFigure[:VOLTage][:DC]
```

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

Syntax

[SENSe:]VOLTage[:DC]:ZERO:AUTO <state>

This command disables or enables the autozero mode for DC voltage measurements.

- When autozero is **ON**, the U2741A 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 U2741A input circuitry from affecting measurement accuracy.
- When autozero is **OFF**, the U2741A 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.

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

This command queries the autozero mode for DC voltage measurements.

Parameter

Item	Type	Range of values	Default value
state	Boolean	{OFF 0 ON 1} OFF or 0: Disables the autozero mode ON or 1: Enables the autozero mode	OFF

Remarks

- The autozero mode is reset to the default (**OFF**) after a factory reset (**\*RST** command) or an Instrument Preset (**SYST:PRES** command).

Examples

VOLT:ZERO:AUTO ON//Sets autozero for DC voltage measurements to **ON**

VOLT:ZERO:AUTO?//Queries the autorange mode for DC voltage measurements

Typical Response: 1

See Also

CONFigure[:VOLTage][:DC]

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# 7 STATUS Subsystem

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This chapter explains how the STATus command subsystem functions.

# STATus:OPERation:CONDition?

## Syntax

### STATus:OPERation:CONDition?

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, see [Chapter 2](#).

## 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	U2741A is performing a calibration
1 to 3	Not Used	Not Used	0 is returned
4	Measuring	16	U2741A is initiated, and is making, or about to make a measurement
5	Waiting for Trigger	32	U2741A is waiting for a trigger
6 to 7	Not Used	Not Used	0 is returned
8	Configuration Change	256	U2741A configuration has been changed
9	Not Used	Not Used	0 is returned
10	Not Used	Not Used	0 is returned
11 to 15	Not Used	Not Used	0 is returned

**Example****STAT:OPER:COND?**//Reads the condition register  
(bit 5 is set)Typical Response: **+32****See Also****STATus:QUEStionable:ENABle****STATus:QUEStionable[:EVENT]?**

# STATus:OPERation:ENABle

## Syntax

**STATus:OPERation:ENABle** <enable\_value>

This command enables bits in the enable register for the Standard Operation Register group. The selected bits are then reported to the Status Byte.

**STATus:OPERation:ENABle?**

This command queries the Questionable Data enable register. The U2741A returns a binary-weighted decimal representing the bits set in the enable register.

## Parameter

Item	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)	0

## NOTE

For more information on the SCPI Status System, see [Chapter 2](#).

## Remarks

- The following table lists the bit definitions for the Standard Operation Register.

Bit number		Decimal value	Definition
0	Calibration in Progress	1	U2741A is performing a calibration
1 to 3	Not Used	Not Used	0 is returned
4	Measuring	16	U2741A is initiated, and is making, or about to make a measurement
5	Waiting for Trigger	32	U2741A is waiting for a trigger
6 to 7	Not Used	Not Used	0 is returned
8	Configuration Change	256	U2741A configuration has been changed
9	Not Used	Not Used	0 is returned
10	Not Used	Not Used	0 is returned
11 to 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 8 (decimal value = 256), the corresponding decimal value would be 288 (32 + 256).
- The clear status (**\*CLS**) command will not clear the enable register but it does clear all the bits in the event register.
- The **STAT:PRES** command will clear all the bits in the enable register.
- The **\*RST** command has no effect on this register.

## Examples

**STAT:OPER:ENAB 32** //Sets the enable register (bit 5 is set)

**STAT:OPER:ENAB?** //Queries the enable register

Typical Response: **+32**

## See Also

**STATus:OPERation[:EVENT]?**

**STATus:PRESet**

# STATus:OPERation[:EVENT]?

## Syntax

**STATus:OPERation[:EVENT]?**

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, see [Chapter 2](#).

## 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	U2741A is performing a calibration
1 to 3	Not Used	Not Used	0 is returned
4	Measuring	16	U2741A is initiated, and is making, or about to make a measurement
5	Waiting for Trigger	32	U2741A is waiting for a trigger
6 to 7	Not Used	Not Used	0 is returned
8	Configuration Change	256	U2741A configuration has been changed
9	Not Used	Not Used	0 is returned
10	Not Used	Not Used	0 is returned
11 to 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 clear status (**\*CLS**) command.
- The **\*RST** command has no effect on this register.

### Example

**STAT:OPER?**

//Reads the event register

Typical Response: **+32**

### See Also

**STATus:OPERation:ENABle**

**STATus:OPERation:CONDition?**

## STATus:PRESet

### Syntax

#### STATus:PRESet

This command clears all the bits in the Questionable Data enable register and the Standard Operation enable register.

#### NOTE

For more information on the SCPI Status System, see [Chapter 2](#).

---

### Example

STAT:PRES

//The following command clears all the enable register bits.



## STATus:QUEStionable:CONDition?

### Syntax

**STATus:QUEStionable:CONDition?**

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.

### Description

This query returns the value of the Questionable Data condition register. The condition register is a read-only register, which holds the live (unlatched) questionable status of the U2741A. Reading the Questionable condition register does not clear it. This query returns the binary-weighted sum of all bits set in the register.

### Remarks

For more information on the Questionable condition register, refer to [Chapter 2, “SCPI Status Registers”](#) on page 19.

### Example

The following query reads the Questionable condition register.

**STAT:QUES:COND?**

Typical Response: **+512**

### See Also

**STATus:QUEStionable:ENABle**

**STATus:QUEStionable[:EVENT]?**

## STATus:QUEStionable:ENABle

## Syntax

```
STATUS:QUESTIONABLE:ENABLE <enable_value>
```

STATUS:QUESTIONABLE:ENABLE?

### Description

This command and its query set and read the value of the Questionable Data enable register. The enable register is a mask for enabling specific bits from the Questionable event register to set the questionable summary bit (QUES) of the Status Byte register. This bit (bit 3) is the logical OR of all the Questionable event register bits that are enabled by the Questionable enable register. This query returns the binary-weighted sum of all bits set in the register.

## Parameter

Item	Type	Range of values	Default value
enable_value	Numeric	0 to 65535	0

## Remarks

- The **STATUS:PRESet** command will clear all bits in the enable register.
- For more information on the Questionable enable register, refer to **Chapter 2, “SCPI Status Registers”** on page 19.

## Examples

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

```
STAT:QUES:ENAB 16 //Sets the enable register (bit 4 is set)
```

The following query returns the bits enabled in the register.

```
STAT:QUES:ENAB? //Queries the enable register
```

Typical Response: **+16**

## See Also

## STATus:PRESet

STATUS:QUESTIONABLE:CONDITION?

STATUS:QUESTIONABLE[:EVENT]?

## STATus:QUEStionable[:EVENT]?

### Syntax

**STATus:QUEStionable[:EVENT]?**

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, see [Chapter 2](#).

---

### 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 *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	Not Used	Not Used	0 is returned
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 to 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 resistance
10	Not Used	Not Used	0 is returned
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

- Once a bit is set, it remains set until cleared by reading the event register or the clear status (**\*CLS**) command.
- The **\*RST** command has no effect on this register.
- The **STAT:QUES?** 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****STAT:QUES?**//Reads the questionable register (bit 9  
is set)Typical Response: **+512****See Also****STATus:QUESTionable:CONDition?****STATus:QUESTionable:ENABle**

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## 8 SYSTem Subsystem

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This chapter explains how the SYSTem command subsystem functions.

## SYSTem:CDEscription?

### Syntax

**SYSTem:CDEscription?**

### Description

This query identifies which slot and chassis that the U2741A is plugged into the U2781A, and returns the slot and chassis number respectively.

### Remarks

- If the U2741A is in standalone mode, then this query would return **+7,+0**.
- Please refer to the *U2781A Modular Instrument Chassis User's Guide* for the details.

### Example

**SYST:CDES?**

//Queries the U2741A slotted in the  
chassis (assume slot 5 of chassis #12)

Typical Response: **+5,+12**



## SYSTem:ERRor?

### Syntax

**SYSTem:ERRor?**

### Description

This query returns the next error number and its corresponding message string from the error queue. The queue is a first-in, first-out (FIFO) buffer that stores errors as they occur. As it is read, each error is removed from the queue.

### Remarks

- If more than 20 errors have occurred, the last error stored in the queue (the most recent error) is replaced with **–350, “Queue overflow”**.
- If no errors have occurred when you read the error queue, the U2741A responds with **+0, “No error”**.
- The error queue is cleared by the clear status (**\*CLS**) command and when power is cycled.
- Please refer to [Chapter 12, “SCPI Error Messages”](#) on page 155 for the error messages.

### Example

**SYST:ERR?**

//Queries for any system errors (assume  
that an invalid command is specified)

Typical Response: **–113, “Undefined header”**

SYSTEM:LFRequency

## Syntax

SYSTem:LFRequency <value>

It sets the line frequency.

SYSTem:LFRequency?

It queries for the line frequency.

## Parameter

Item	Type	Range of values	Default value
value	Numeric	50 Hz, 60 Hz	50 Hz

## Examples

SYST:LFR 50 //Sets the line frequency to 50 Hz

**SYST:LFR?** //Queries the line frequency

Typical response: 50

## SYSTem:PRESet

### Syntax

**SYSTem:PRESet**

It resets the hardware and set it to the factory default settings.

### Remarks

It does the same function as a **\*RST** command would do.

### Example

**SYST:PRESet**

### See Also

**\*RST**

## SYSTem:VERSion?

### Syntax

**SYSTem:VERSion?**

### Description

This query returns the version of the SCPI standard in which the U2741A complies with. The version is in a numeric form YYYY.V, where YYYY represents the year of the version and V represents a version for that year.

### Example

**SYST:VERS?**

//This query will return the SCPI version

Typical Response: **1997.0**

# 9 TRIGger Subsystem

TRIGger:SOURce 134

This chapter explains how the TRIGger command subsystem functions.

# TRIGger:SOURce

## Syntax

**TRIGger:SOURce** <source>

This command selects the trigger source for measurements. The U2741A will accept a software (bus) command, immediate (continuous) trigger, or a star trigger.

**TRIGger:SOURce?**

This command queries the trigger source setting.

## Parameter

Item	Type	Range of values	Default value
source	Discrete	{IMMediate BUS STRG}	IMM

## Remarks

- After selecting the trigger source, you must place the U2741A in the “wait-for-trigger” state using the **INIT** command. A trigger will not be accepted from the selected trigger source until the U2741A is in the “wait-for-trigger” state. The **INIT** command only initiates the measurement and needs a trigger (**BUS** or **IMMediate**) to make the actual measurement.
- For the **IMMediate** (continuous) source, the trigger signal is always present. When you place the U2741A in the “wait-for-trigger” state, the trigger is issued immediately.
- For the **BUS** (software) source, the U2741A is triggered by the **\*TRG** command received over the remote interface. The **\*TRG** command will not be accepted unless the multimeter is in the “wait-for-trigger” state.
- A **CONF** or **MEAS?** command overwrites the **BUS** trigger and sets the trigger source to **IMMediate**.
- The U2741A selects the immediate trigger source after a factory reset (**\*RST** command).
- The bus trigger mode is initiated by sending a bus trigger command (**\*TRG**), after selecting **BUS** as the trigger source.
- The star trigger is only applicable when the U2741A is used in the U2781A chassis. It is use for triggering multiple units in the chassis.

### Examples

TRIG:SOUR BUS

//Sets the trigger source to bus

TRIG:SOUR?

//Queries the source setting

Typical Response: BUS

### See Also

**\*TRG**

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# 10 Other Commands

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INITiate[:IMMediate]	140
READ?	141
UNIT:TEMPerature	142

This chapter explains the operation of the other system commands that are not categorized under major subsystems.

## ABORt

### Syntax

#### ABORt

This command aborts a measurement in progress.

### Remarks

- This command may be useful to abort a measurement when the U2741A is waiting for a trigger.
- The **\*RST** command will abort a measurement and set all measurement parameters to their factory settings.
- When trigger source is set to **BUS**, the **INIT** command will change the state of the triggering system from the “idle” state to the “wait-for-trigger” state. At this time, if the **ABOR** command is issued, **\*TRG** is not allowed, the U2741A will return a system error **-211, “Trigger ignored”**.

### Example

```
ABOR                                //Aborts the measurement in progress
```

### See Also

**\*RST**

## FETCh?

### Syntax

#### FETCh?

This command transfers the reading to the U2741A output buffer where you can read it into your PC.

### Remarks

- The **FETCh?** command will wait until the measurement is complete to terminate.
- The U2741A clears any reading from volatile memory after a factory reset (**\*RST** command) when mainframe power is cycled, when the configuration is changed (see [Chapter 4, “CONFigure Subsystem”](#)), or on an **INIT** command.

### Examples

<b>CONF 10, 0.00003</b>	//Configures to measure DC voltage at 10 V range and 30 $\mu$ V resolution
<b>TRIG:SOUR IMM</b>	//Sets the trigger source to immediate
<b>INIT</b>	//Places the U2741A in wait-for-trigger state
<b>FETC?</b>	//Transfers the reading from memory to the U2741A output buffer

Typical Response: **+1.45341E+00**

### See Also

**INITiate[:IMMEDIATE]**

**READ?**

## INITiate[:IMMediate]

### Syntax

#### INITiate[:IMMediate]

This command changes the state of the triggering system from the “idle” state to the “wait-for-trigger” state. Measurements will begin when the specified trigger conditions are satisfied following the receipt of the **INIT** command.

#### NOTE

The **INIT** command also clears the previous reading from the memory.

### Remarks

- To retrieve the reading, use the **FETC?** command.
- The **ABOR** command may be used to set the U2741A to idle state.
- The **INIT** command only initiates the measurement and needs a trigger (**BUS** or **IMMediate**) to make the actual measurement.

### Examples

<b>CONF 10, 0.00003</b>	//Configures to measure DC voltage at 10 V range and 30 $\mu$ V resolution
<b>TRIG:SOUR IMM</b>	//Sets the trigger source to immediate
<b>INIT</b>	//Places the U2741A in wait-for-trigger state
<b>FETC?</b>	//The FETCh? command transfers the reading from memory to the U2741A output buffer

Typical Response: **+1.45341E+00**

### See Also

**FETCh?**

**READ?**

**ABORt**

# READ?

## Syntax

### READ?

This command changes the U2741A 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. The reading is then sent immediately to volatile memory and the U2741A output buffer.

## Remarks

- When the trigger source is **IMMediate**, sending the **READ?** command is similar to sending the **INIT** command followed immediately by the **FETC?** command. When the trigger source is **BUS**, sending the **READ?** command is similar to sending the following commands.

**INIT**

**\*TRG**

**FETC?**

- The U2741A clears reading memory after a factory reset (**\*RST** command), when the power is cycled, when the configuration is changed (see [Chapter 4, “CONFigure Subsystem”](#)), or on an **INIT** command.

## Examples

**CONF 10, 0.00003**

//Configures to measure DC voltage at  
10 V range and 30  $\mu$ V resolution

**TRIG:SOUR IMM**

//Sets the trigger source to immediate

**READ?**

//Places the U2741A in wait-for-trigger  
state and when triggered, transfers the  
reading from memory to the U2741A  
output buffer

Typical Response: **+1.45341E+00**

## See Also

**INITiate[:IMMediate]**

**FETCh?**

# UNIT:TEMPerature

## Syntax

**UNIT:TEMPerature <unit>**

This command selects the units (°C, °F, or K) to be used for temperature measurements.

**UNIT:TEMPerature?**

This command queries the unit for temperature measurement. It will return either C, F, or K.

## Parameter

Item	Type	Range of values	Default value
unit	Discrete	{C CEL F FAR K} C, CEL = Celcius F, FAR = Fahrenheit K = Kelvin	C

## Remarks

- The temperature unit selection is stored in nonvolatile memory. The selection is set to °C after a factory reset (\*RST command).

## Examples

**UNIT:TEMP C** //Sets the temperature unit to Celcius

**UNIT:TEMP?** //Queries the temperature unit setting

Typical Response: C

# 11 IEEE Common Commands

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This chapter gives an introduction to the IEEE-488.2 common commands. It defines a set of common commands that perform functions such as reset, self-test, and status operations.

## \*CLS

### Syntax

**\*CLS**

This command is used to clear the event registers in all register groups and also clears the error queue.

### Example

```
*CLS                                     //This will clear the event register bits
```



\*ESE/\*ESE?

Syntax

\*ESE <value>

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.

\*ESE?

This will query the Standard Event register group and returns a decimal value that corresponds to the binary-weighted sum of all bits set in the register.

Parameter

Item	Type	Range of values	Default value
value	Numeric	0 to 65535	0

Remarks

For more information on the Standard Event registers, refer to [Chapter 2, “SCPI Status Registers”](#) on page 19.

Examples

\*ESE 16

//This command enables bit 4 (decimal value = 16) in the enable register

\*ESE?

//This query returns the bits that are enabled in the register

Typical Response: **+16**

\*ESR?

Syntax

\*ESR?

This query returns the value of the event register of the Standard Event group as a decimal value that corresponds to the binary-weighted sum of all bits set in the register.

Parameter

Item	Type	Range of values	Default value
value	Numeric	0 to 65535	0

Remarks

- Once a bit is set, it will remain set until cleared by reading the event register or the clear status (\*CLS) command.
- For more information on the Standard Event registers, refer to Chapter 2, “SCPI Status Registers” on page 19.

Example

```
*ESE 16 //This command enables bit 4 (decimal value = 16) in the enable register
*ESR? //The query will return the bits enabled in the register
```

Typical Response: +16

## \*IDN?

### Syntax

#### \*IDN?

This query reads the U2741A identification string which contains four comma-separated fields. The first field is the manufacturer's name, the second is the model number of the U2741A, the third is the serial number, and the fourth is the firmware revision number. This query returns a string with the following format.

KEYSIGHT TECHNOLOGIES,U2741A,<Serial Number>,m.mm-f.ff-b.bb

m.mm = main firmware revision number

f.ff = I/O processor firmware revision number

b.bb = boot loader firmware revision number

### Example

#### \*IDN

//This query returns the U2741A  
identification string

Typical Response:

**KEYSIGHT TECHNOLOGIES,U2741A,MY12345678,1.00-1.00-1.00**

## \*OPC/\*OPC?

### Syntax

#### \*OPC

Sets the “Operation Complete” bit (bit 0) in the Standard Event register after all of the previous commands have been completed.

#### \*OPC?

This query always returns 1 to the output buffer after the previous commands have been completed. Other commands cannot be executed until this command completes.

### Examples

#### \*OPC

//This command sets the “Operation Complete” bit (bit 0)

#### \*OPC?

//The following query returns 1 after the operation has completed

Typical Response: **1**

## \*RST

### Syntax

\*RST

This command resets the U2741A to its factory default state.

#### NOTE

Refer to [Chapter 13, “Factory Default Settings”](#) on page 165 for a complete listing of the U2741A default settings.

---

### Example

\*RST

//This command resets the U2741A

\*SRE/\*SRE?

Syntax

**\*SRE <value>**

This command enables the bits in the Status Byte enable register. The selected enabled bits are summarized in the “Master Summary” bit (bit 6) of the Status Byte Register. If any of the selected bit condition change from 0 to 1, a Service Request is generated.

**\*SRE?**

The query command reads the enable register and returns a decimal value that corresponds to the binary-weighted sum of all bits set in the register.

Parameters

Item	Type	Range of values	Default value
value	Numeric	0 to 65535	0

Remarks

For more information on the Status Byte registers, refer to [Chapter 2, “SCPI Status Registers”](#) on page 19.

Examples

**\*SRE 16** //This command enables bit 4 (decimal value = 16) in the enable register

**\*SRE?** //This query returns the bits enabled in the register

Typical Response: **+16**

## \*STB?

### Syntax

#### \*STB?

This query reads the summary (condition) of the Status Byte register. This command is similar to a Serial Poll but it is processed like any other instrument command. This command returns the same result as a Serial Poll but the “Master Summary” bit (bit 6) is not cleared by the **\*STB?** command.

### Example

#### \*STB?

//This query reads the Status Byte register  
(assume that bits 3 and 4 are set)

Typical Response: **+24**

## \*TRG

### Syntax

#### \*TRG

This command triggers a measurement from the remote interface only if the bus (software) trigger source is currently selected.

### Remarks

After setting the trigger source, you must set the U2741A to the “wait-for-trigger” state using the **INITiate** command. The **\*TRG** command will not be accepted unless the U2741A is in the “wait-for-trigger” state.

### Examples

The following command performs a trigger.

```
TRIG:SOUR BUS
```

```
INIT
```

```
*TRG
```



## \*TST?

### Syntax

**\*TST?**

This query command performs a self-test of the U2741A and returns a pass/fail indication.

### Remarks

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

### Example

**\*TST**

//This query command performs a self-test and returns a pass/fail indication

Typical Response: **+0**

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# 12 SCPI Error Messages

SCPI Error Messages 156

This chapter lists down all the SCPI command errors.

# SCPI Error Messages

Error messages are created once a command error or an erroneous condition has been detected.

- Errors are retrieved in first-in-first-out (FIFO) order using the **SYSTem:ERRor?** command. The first error returned is the first error that was stored. Errors are cleared as you retrieve them.
- If more than 20 errors have occurred, the last error stored in the queue (the most recent error) is replaced with **-350, "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 U2741A responds with **+0, "No error"**.
- The error queue is also cleared by the clear status (**\*CLS**) command or when the power is cycled. The error queue is not cleared by an instrument reset (**\*RST**) command.

## Command Errors

The following table shows the list of command errors.

**Table 12-1** Command Errors (these errors set Standard Event Status register bit #5)

Error number	Command errors
-100	<b>Command error</b> Generic syntax error
-101	<b>Invalid character</b> An invalid character was found in the command string. You may have inserted a character such as #, \$, or % in a command keyword or within a parameter.
-102	<b>Syntax error</b> Invalid syntax was found in the command string. You may have inserted a blank space before or after a colon in the command header, or before a comma.
-103	<b>Invalid separator</b> An invalid separator was found in the command string. Check for proper usage of , ; :
-104	<b>Data type error</b> The wrong parameter type was found in the command string. You may have specified a number where a string was expected, or vice versa.

**Table 12-1** Command Errors (these errors set Standard Event Status register bit #5) (continued)

Error number	Command errors
-105	<b>GET not allowed</b> A group execute trigger is not allowed in a command string
-108	<b>Parameter not allowed</b> More parameters were received than expected for the command. You may have entered an extra parameter, or you added a parameter to a command that does not accept a parameter.
-109	<b>Missing parameter</b> Fewer parameters were received than expected for the command. You omitted one or more parameters that are required for this command.
-110	<b>Command header error</b> An error was detected in the header
-111	<b>Header separator error</b> A character that was not a valid header separator was found in the command string
-112	<b>Program mnemonic too long</b> The header contains more than 12 characters
-113	<b>Undefined header</b> A command was received that is not valid. You may have misspelled the command or it may not be a valid command. If you are using the short form of the command, remember that it may contain up to four letters.
-114	<b>Header suffix out of range</b> The value of the numeric suffix is not valid
-120	<b>Numeric data error</b> Generic numeric data error
-121	<b>Invalid character in number</b> An invalid character was found in the number specified for a parameter value Example: *ESE #2
-123	<b>Exponent too large</b> A numeric parameter was found whose exponent was larger than 32,000
-124	<b>Too many digits</b> The mantissa of a numeric parameter contained more than 255 digits, excluding leading zeros
-128	<b>Numeric data not allowed</b> A numeric parameter was received but a character string was expected

**Table 12-1** Command Errors (these errors set Standard Event Status register bit #5) (continued)

Error number	Command errors
-130	<b>Suffix error</b> Generic suffix error
-131	<b>Invalid suffix</b> A suffix was incorrectly specified for a numeric parameter
-134	<b>Suffix too long</b> The suffix contains more than 12 characters
-138	<b>Suffix not allowed</b> A suffix is not supported for this command
-140	<b>Character data error</b> Generic character data error
-141	<b>Invalid character data</b> Either the character data element contains an invalid character, or the element is not valid
-144	<b>Character data too long</b> The character data element contains more than 12 characters
-148	<b>Character data not allowed</b> A discrete parameter was received, but a string or numeric parameters was expected
-150	<b>String data error</b> Generic string data error
-151	<b>Invalid string data</b> An invalid character string was received. Check that the string is enclosed in quotation marks
-158	<b>String data not allowed</b> A character string was received, but is not allowed for this command
-160	<b>Block data error</b> Generic block data error
-161	<b>Invalid block data</b> The number of data bytes sent does not match the number of bytes specified in the header
-168	<b>Block data not allowed</b> Data was sent in arbitrary block format but is not allowed for this command

**Table 12-1** Command Errors (these errors set Standard Event Status register bit #5) (continued)

Error number	Command errors
-170	<b>Expression error</b> Generic expression error
-171	<b>Invalid expression</b> The expression data element was invalid
-178	<b>Expression data not allowed</b> Expression data element was sent but is not allowed for this command
-180	<b>Macro error</b> An error was encountered when defining a macro or executing a macro
-181	<b>Invalid outside macro definition</b> A macro parameter placeholder was encountered outside of a macro definition
-183	<b>Invalid inside macro definition</b> The program message unit sequence, sent with a *DDT or a *DMC command, is syntactically invalid
-184	<b>Macro parameter error</b> A command inside the macro definition had the wrong number or type of parameters

## Execution Errors

The execution errors are listed in the table below.

**Table 12-2** Execution Errors (these errors set Standard Event Status register bit #4)

Error number	Execution errors
-200	<b>Execution error</b> Generic syntax error
-201	<b>Invalid while in local</b> A command is not executable while the device is in local mode due to a hard local control
-202	<b>Settings lost due to RTL</b> A setting associated with a hard local control was lost when the device changed to LOCS from REMS or to LWLS from RWLS
-210	<b>Trigger error</b> Generic trigger error

**Table 12-2** Execution Errors (these errors set Standard Event Status register bit #4) (continued)

Error number	Execution errors
-211	<b>Trigger ignored</b> A Group Execute Trigger (GET) or *TRG was received but the trigger was ignored
-212	<b>Arm ignored</b> An arming signal was received and recognized by the device but was ignored
-213	<b>Init ignored</b> A request for a measurement initiation was ignored as another measurement was already in progress
-214	<b>Trigger deadlock</b> A trigger source for the initiation of a measurement is set to GET and a subsequent measurement query is received. The measurement cannot begin until a GET is received, but the GET would cause an INTERRUPTED error.
-215	<b>Arm deadlock</b> The arm source for the initiation of a measurement is set to GET and a subsequent measurement query is received. The measurement cannot begin until a GET is received, but the GET would cause an INTERRUPTED error.
-220	<b>Parameter error</b> A data element related error occurred
-221	<b>Settings conflict</b> A data element could not be executed because of the present instrument state
-222	<b>Data out of range</b> A data element could not be executed because the value was outside the valid range
-223	<b>Too much data</b> A data element was received that contains more data than the U2741A can handle
-224	<b>Illegal parameter value</b> An exact value was expected but not received
-230	<b>Data corrupt or stale</b> Possibly an invalid data. A new reading was started but not completed
-231	<b>Data questionable</b> The measurement accuracy is suspect
-240	<b>Hard ware error</b> The command could not be executed because of a hardware problem with the U2741A
-241	<b>Hard ware missing</b> The command could not be executed because of missing hardware, such as an option



**Table 12-2** Execution Errors (these errors set Standard Event Status register bit #4) (continued)

Error number	Execution errors
-260	<b>Expression error</b> An expression program data element related error occurred
-261	<b>Math error in expression</b> An expression program data element could not be executed due to a math error
-270	<b>Macro error</b> A macro-related execution error occurred. This error message is used when the device cannot detect the more specific errors described for errors -271 through -278.
-271	<b>Macro syntax error</b> A syntactically legal macro program data sequence, written in accordance with IEEE 488.2, 10.7.2, could not be executed due to a syntax error within the macro definition
-272	<b>Macro execution error</b> A syntactically legal macro program data sequence could not be executed due to an error within the macro definition
-273	<b>Illegal macro label</b> The macro label defined in the *DMC command was a legal string syntax, but could not be accepted by the device. For example, the label was too long, the same as a common command header, or contained invalid header syntax.
-274	<b>Macro parameter error</b> The macro definition improperly used a macro parameter placeholder
-275	<b>Macro definition too long</b> A syntactically legal macro program data sequence could not be executed because the string or block contents were too long for the device to handle
-276	<b>Macro recursion error</b> A syntactically legal macro program data sequence could not be executed because the device found it to be recursive
-277	<b>Macro redefinition not allowed</b> The macro label defined in the *DMC command could not be executed because the macro label was already defined
-278	<b>Macro header not found</b> A syntactically legal macro label in the *GMC? query could not be executed because the header was not previously defined

## Device Dependent Errors

The table below contains the device-dependent errors.

**Table 12-3** Device Dependent Errors (these errors set Standard Event Status register bit #3)

Error number	Device dependent errors
-310	<b>System error</b> This indicates that some error, termed as “system error” by the device, has occurred. The U2741A internal operation has not completed properly, possibly due to an abnormal hardware or firmware condition.
-313	<b>Calibration memory lost</b> The nonvolatile memory used to store the U2741A calibration constants has detected a checksum error which may be caused by a device failure or extreme conditions such as lightning or strong magnetic fields
-315	<b>Configuration memory lost</b> The nonvolatile memory used to store the U2741A configuration settings has detected a checksum error which may be caused by a device failure or extreme conditions such as lightning or strong magnetic fields
-321	<b>Out of memory</b> There is insufficient working memory available
-330	<b>Self-test failed</b> An executed self-test failed
-350	<b>Queue overflow</b> The error queue is full because more than 20 errors have occurred. No additional errors are stored until you remove the errors from the queue.

## Query Errors

The list of query errors is shown in the following table.

**Table 12-4** Query Errors (these errors set Standard Event Status register bit #2)

Error number	Query errors
-400	<b>Query error</b> Generic error query
-410	<b>Query INTERRUPTED</b> A condition causing an interrupted query error occurred
-420	<b>Query UNTERMINATED</b> A condition causing an unterminated query error occurred
-430	<b>Query DEADLOCKED</b> A condition causing a deadlocked query error occurred
-440	<b>Query UNTERMINATED after indefinite response</b> A query was received in the same program message after a query indicating an indefinite response was executed

## Self-Test Errors

The self-test errors are listed in the following table.

**Table 12-5** Self-Test Errors

Error number	Self-test errors
601	<b>Calibration constant corrupted</b> This indicates that the U2741A has failed to retrieve the valid calibration constants from the nonvolatile memory
605	<b>A/D &amp; FE measure zero</b> This indicates that the U2741A has failed to communicate with A/D converter or has front end switching error

# Calibration Errors

The calibration errors are listed in the following table.

**Table 12-6** Calibration Errors

Error number	Calibration errors
702	<b>Cal secured</b> The multimeter is secured against calibration
703	<b>Invalid secure code</b> An invalid calibration security code was received when attempting to unsecure or secure the multimeter. You must use the same security code to unsecure the multimeter as was used to secure it, and vice versa. The security code may contain up to 12 alphanumeric characters. The first character must be a letter.
704	<b>Secure code too long</b> A security code was received which contained more than 12 characters
705	<b>Cal aborted</b> A calibration in progress is aborted when you send a device clear, or change the local/remote state of the multimeter
706	<b>Cal value out of range</b> The specified calibration value ( <b>CALibration:VALue</b> ) is invalid for the present function and range

# 13 Factory Default Settings

This chapter will list the factory default settings.

### Remarks

- The U2741A is shipped with the factory default settings.
- It is set once the **\*RST** or **SYST:PRES** command is sent to the U2741A.
- Below are the factory default settings.

Measurement configuration	Factory settings
Function	DC volts
Range	Autorange (for all functions)
Resolution	5.5 digits (1.50e-6)
NPLC	20
Autozero	OFF
Frequency	OFF
Line frequency	50

Triggering operations	Factory settings
Trigger source	Immediate
<b>CONFigure:SSI</b>	NONE
Fetch buffer	CLEAR

### Details

DCV parameters	Factory settings
Range	AUTO (10 V)
Autozero	OFF
Resolution	1.50e-6
NPLC	20

DCI parameters	Factory settings
Range	AUTO (1 A)
Autozero	OFF

DCI parameters	Factory settings
Resolution	1.50e-6
NPLC	20

ACV parameters	Factory settings
Range	AUTO (10 V)

ACI parameters	Factory settings
Range	AUTO (1 A)

RES parameters	Factory settings
Range	AUTO (1 k $\Omega$ )
Autozero	OFF
Resolution	1.50e-6
NPLC	20

FRES parameters	Factory settings
Range	AUTO (1 k $\Omega$ )
Resolution	1.50e-6
NPLC	20

TEMP parameters	Factory settings
Probe type	THER
Autozero	OFF
Resolution	1.50e-6
NPLC	20
Unit temperature	°C

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