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This Help file contains reference information to help you program the Keysight 34970A/34972A over a remote interface using the programming language.

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ABORt

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

Syntax

ABORt

Description

This command aborts a measurement in progress from a scan.

Remarks

- If a scan is in progress when the command is received, the scan will not be completed and you cannot resume the scan from where it left off. Note that if you initiate a new scan, all readings are cleared from memory.
- The *RST command will abort a measurement, clear the scan list, and set all measurement parameters to their factory settings. The Instrument Preset (SYSTem:PRESet command) also aborts a measurement but it does not clear the scan list.

Example

The following command aborts the measurement in progress.

ABOR

See Also

*RST

SYSTem:PRESet

FETCh?

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

Syntax

FETCh?

Description

This command transfers readings stored in non-volatile memory to the instrument's output buffer, where you can read them into your computer. The readings stored in memory *are not* erased when you read them with FETCh?. The format of the readings can be changed using FORMat:READing commands.

Remarks

- The FETCh? command will wait until the measurement is complete to terminate.
- Readings can be acquired during a scan using the multiplexer and digital modules.
- You can store at least 50,000 readings in memory and all readings are automatically time stamped. If memory overflows, the new readings will overwrite the first (oldest) readings stored; the most recent readings are always preserved.
- Each time you start a new scan, the instrument clears all readings (including alarm data) stored in reading memory from the previous measurement. Therefore, the contents of memory are always from the most recent measurement.
- When you abort a measurement (see ABORt command), the instrument will terminate any reading in progress (readings are not cleared from memory). The readings remain in memory and can be read until you clear them or initiate a new scan.
- The output from this command is affected by the settings of the FORMat:READing commands. Depending on the formats selected, each reading may or may not be stored with measurement units, time stamp, channel number, and alarm status information.
- The *RST command will clear the scan list and set all measurement parameters to their factory settings. The Instrument Preset (SYSTem:PRESet command) will not clear the scan list; however, this command will clear reading memory and all stored statistical data.
- The instrument clears all readings from memory when a new scan is initiated, when any measurement parameters are changed

(CONFigure and SENSe commands), and when the triggering configuration is changed (TRIGger commands).

• The instrument clears all readings from memory after a Factory Reset (*RST command) or after an Instrument Preset (SYSTem:PRESet command).

Return Format

The command transfers all readings from memory (with formatting as set by the FORMat:READing commands) but does not erase them. Multiple responses are separated by commas.

Example

The following program segment shows how to use the FETCh? command with the CONFigure and INITiate commands. The ROUTe:SCAN command puts the two channels into the scan list (and redefines the scan list). The INITiate command places the instrument in the "wait-for-trigger" state, scans the specified channels when the rear-panel *Ext Trig Input* line is pulsed low, and then sends the readings to memory. The FETCh? command transfers the readings from memory to the instrument's output buffer.

CONF:VOLT:DC 10,0.003,(@103,108) ROUT:SCAN (@103,108) TRIG:SOUR EXT INIT FETC?

Typical Response: +4.27150000E-03,+1.32130000E-03

See Also

INITiate

ROUTe:SCAN

INITiate

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

Syntax

INITiate

Description

This command changes the state of the triggering system from the "idle" state to the "wait-for-trigger" state. Scanning will begin when the specified trigger conditions are satisfied following the receipt of the INITiate command. Readings are stored in the instrument's internal reading memory. Note that the INITiate command also clears the previous set of readings from memory.

If a scan list is currently defined (see **ROUTe:SCAN** command), the INITiate command performs a scan of the specified channels.

If a scan list is <u>not</u> currently defined, the INITiate command fails.

Remarks

- Storing readings in memory using the INITiate command is generally faster than sending readings to memory using the READ? command. The INITiate command is also an "overlapped" command. This means that after executing the INITiate command, you can send other commands that do not affect the measurements.
- You can store up to 50,000 readings in memory and all readings are automatically time stamped. If memory overflows, the new readings will overwrite the first (oldest) readings stored; the most recent readings are always preserved. In addition, bit 9 is set in the Questionable Data Register's condition register (see Status System Introduction).
- For scanning measurements using the multiplexer modules, an error is generated if the internal DMM is disabled (see INSTrument:DMM command) or not installed in the mainframe. The internal DMM is *not* required for operations on the digital modules.
- If a scan list containing multiplexer channels is currently defined (see ROUTe:SCAN command), the INITiate command performs a scan of the specified channels. When the scan is initiated, the instrument will open all channels in banks that contain one or more channels in the scan list.
- The instrument scans the list of channels in ascending order from slot 100 through slot 300 (channels are re-ordered as needed).When you specify a range of channels in the <scan_list>, the channels are always sorted in ascending order. Therefore, (@109:101) will always be interpreted as 101, 102, 103, etc.
- Once you initiate a scan, an error will be generated if you attempt to change any measurement parameters (CONFigure and SENSe

commands) or the triggering configuration (TRIGger commands). To abort a scan in progress, send the ABORt command.

• To retrieve the readings from memory, use the FETCh? command. The readings are not erased from memory when you read them. You can send the command multiple times to retrieve the same data in reading memory.

Example

The following program segment shows how to use the INITiate command with the CONFigure and FETCh? commands. The ROUTe:SCAN command puts the two channels into the scan list (and redefines the scan list). The INITiate command places the instrument in the "wait-fortrigger" state, scans the specified channels when the rear-panel *Ext Trig Input* line is pulsed low, and then sends the readings to memory. The FETCh? command transfers the readings from memory to the instrument's output buffer.

CONF:VOLT:DC 10,0.003,(@103,108) ROUT:SCAN (@103,108) TRIG:SOUR EXT INIT FETC?

Typical Response: +4.27150000E-03,+1.32130000E-03

See Also

FETCh?

READ?

ROUTe:SCAN

INPut:IMPedance:AUTO

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

Syntax

INPut:IMPedance:AUTO <state>[,(@<ch_list>)]

INPut:IMPedance:AUTO? [(@<ch_list>)]

Description

This command enables or disables the automatic input resistance mode for DC voltage measurements on the specified channels.

Parameters

Name	Туре	Range of Values	Default Value
<state></state>	Boolean	{OFF 0 ON 1}	This is a required parameter.
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- With AUTO OFF (default), the input resistance is fixed at 10 $\mbox{M}\Omega$ for all ranges.
- With AUTO ON, the input resistance is set to >10 G Ω for the 100 mV, 1 V, and 10 V ranges.

Return Format

The query returns the input resistance setting as 0 (OFF) or 1 (ON) on the specified channels.

Examples

The following command sets the impedance to >10 G Ω for two channels.

```
INP:IMP:AUTO ON (@105,109)
```

The following queries for the impedance on two channels.

```
INP:IMP:AUTO? (@105,109)
```

Typical Response: 1,1

See Also

CONFigure:VOLTage:DC

MEASure:VOLTage:DC?

R?

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

Syntax

R? [<max_count>]

Description

This query reads and erases readings from volatile memory up to the specified *<max_count>*. The readings are erased from memory starting with the oldest reading first. The purpose of this command is to allow you to periodically remove readings from memory that would normally cause reading memory to overflow (for example, during a scan with an infinite scan count).

Parameters

Name	Туре	Range of Values	Default Value
<max_count></max_count>	Numeric	Maximum number of readings to be read and erased from memory, from 1 to 50,000.	Erase all stored readings, up to 50,000

Remarks

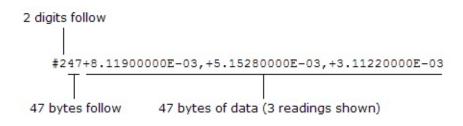
- This command is a special version of the DATA:REMove? command with faster execution time. You can read memory at any time using the R? command, even during a scan.
- Readings can be acquired during a scan using the multiplexer and digital modules. For scanning measurements using the multiplexer modules, an error is generated if the internal DMM is disabled (see INSTrument:DMM command) or not installed in the mainframe. The internal DMM is *not* required for operations on the digital modules.
- You can store up to 50,000 readings in memory and all readings are automatically time stamped. If memory overflows, the new readings will overwrite the first (oldest) readings stored; the most recent readings are always preserved. In addition, bit 9 is set in the Questionable Data Register's condition register (see Status System Introduction).
- Each reading is returned with some combination of measurement units, time stamp, channel number, and alarm status information, depending on the settings set by the FORMat:READing commands. The time stamp is either in relative format (time in seconds since the beginning of the scan) or absolute format (time of day with date, based on the instrument's clock as set by the SYSTem:DATE and SYSTem:TIME commands). The choice of absolute and relative time is determined by the FORMat:READing:TIME:TYPE command.
- The instrument clears all readings from memory when a new scan is initiated, when any measurement parameters are changed (CONFigure and SENSe commands), and when the triggering configuration is changed (TRIGger commands).
- The instrument clears all readings from memory after a Factory

Reset (*RST command) or after an Instrument Preset (SYSTem:PRESet command).

Return Format

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

For example:



Example

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

R? 2

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

See Also

DATA:REMove?

READ?

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

Syntax

34970A Syntax: READ?

34972A Syntax: READ? [(@<scan_list>)]

Description

This command changes the instrument's triggering system from the "idle" state to the "wait-for-trigger" state. Scanning will begin when the specified trigger conditions are satisfied following the receipt of the READ? command. Readings are then sent *immediately* to reading memory and the instrument's output buffer. On the 34970A, you must then receive the readings into your computer or the instrument will stop scanning when the output buffer becomes full. Readings are not stored in the instrument's internal memory when using READ?. On the 34972A, the readings are always sent to memory and they will still be available after READ? finishes.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34907A Multifunction Module (digital input and totalizer)
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<scan_list></scan_list>	Scan List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	This is a required parameter.

Remarks

- Sending the READ? command is similar to sending the INITiate command followed immediately by the FETCh? command.
- You can store up to 50,000 readings in memory and all readings are automatically time stamped. If memory overflows, the new readings will overwrite the first (oldest) readings stored; the most recent readings are always preserved. In addition, bit 9 is set in the Questionable Data Register's condition register (see Status System Introduction).
- For scanning measurements using the multiplexer modules, an error is generated if the internal DMM is disabled (see INSTrument:DMM command) or not installed in the mainframe. The internal DMM is *not* required for operations on the digital modules.
- The instrument scans the list of channels in ascending order from slot 100 through slot 300 (channels are re-ordered as needed).When you specify a range of channels in the <scan_list>, the channels are always sorted in ascending order. Therefore, (@109:101) will always be interpreted as 101, 102, 103, etc.
- Once you initiate a scan, an error will be generated if you attempt to change any measurement parameters (CONFigure and SENSe commands) or the triggering configuration (TRIGger commands). To abort a scan in progress, send the ABORt command.
- Each reading is returned with some combination of measurement units, time stamp, channel number, and alarm status information, depending on the settings set by the FORMat:READing commands. The time stamp is either in relative format (time in seconds since the beginning of the scan) or absolute format (time of day with date, based on the instrument's clock as set by the SYSTem:DATE and SYSTem:TIME commands). The choice of

absolute and relative time is determined by the FORMat:READing:TIME:TYPE command.

- The READ? query is not valid with the ***TRG** command (used with **TRIGger:SOURce BUS** command for software triggering).
- The instrument clears all readings from memory after a Factory Reset (*RST command) or after an Instrument Preset (SYSTem:PRESet command).
- If you specify a <*scan_list*> with this query (34972A only), it will overwrite the current scan list.

Return Format

The command sends readings directly to reading memory and the instrument's output buffer (with formatting as set by the FORMat:READing commands). Multiple responses are separated by commas.

Examples

The following program segment shows how to use the READ? command with the CONFigure command. The ROUTe:SCAN command puts the two channels into the scan list (and redefines the scan list). The READ? command places the instrument in the "wait-for-trigger" state, scans the specified channels when the rear-panel *Ext Trig Input* line is pulsed low, sends the readings to reading memory and the instrument's output buffer.

CONF:VOLT:DC 10,0.003,(@103,108) !Configure channels ROUT:SCAN (@103,108) !Define the scan list TRIG:SOUR EXT **READ?** !Applies to the present scan list

Typical Response: +4.27150000E-03,+1.32130000E-03

See Also

FETCh?

INITiate

ROUTe:SCAN

UNIT:TEMPerature

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

Syntax

UNIT:TEMPerature <units>[,(@<ch_list>)]

UNIT:TEMPerature? [(@<ch_list>)]

Description

This command selects the temperature units (°C, °F, or Kelvin) on the specified channels. If you omit the optional *<ch_list>* parameter, this command applies to the currently defined scan list.

The following table shows which temperature transducers are supported by each of the multiplexer modules.

Module	Thermocouple	RTD 2- Wire	RTD 4- Wire	Thermistor
34901A Armature Multiplexer	Yes	Yes	Yes	Yes
34902A Reed Multiplexer	Yes	Yes	Yes	Yes
34908A Armature Multiplexer (1-Wire)	Not Recommended ¹	Yes	No	Yes

¹With a one-wire multiplexer, even very small ground currents can introduce substantial measurement error.

Parameters

Name	Туре	Range of Values	Default Value	
<units></units>	Discrete	{C F K}, for Celsius, Fahrenheit or Kelvin	This is a required parameter. The factory default is C.	
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.	

Remarks

- You can mix temperature units on different channels within the instrument and on the same module.
- If the corresponding channels are not configured for temperature measurements prior to the sending of the UNIT:TEMPerature command, the instrument will dispatch an error message.
- Setting the Mx+B (see CALCulate:SCALe:UNIT command) measurement label to °C, °F, or K has no effect on the temperature measurement units currently selected.
- The CONFigure and MEASure? commands automatically select °C.
- The instrument sets the temperature units to °C after a Factory Reset (*RST command). An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does not change the setting.

Return Format

The query returns C, F, or K for each channel specified. Multiple responses are separated by commas.

Examples

The following command sets the temperature units to $^\circ F$ on channels 12 and 13 in slot 300.

```
CONF:TEMP TC,B, (@312,313)
UNIT:TEMP F,(@312,313)
```

The following query returns the temperature units selected on channels 12 and 13 in slot 300.

UNIT:TEMP? (@312,313)

Typical Response: F,F

See Also

CALCulate:SCALe:UNIT

CONFigure:TEMPerature

MEASure:TEMPerature?

CALCulate Subsystem Introduction

The internal DMM is required to store readings in memory and perform calculations. Readings can be acquired during a scan using the 34970A/34972A multiplexer modules listed below.

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34907A Multifunction Module
- 34908A 40 Channel Single-Ended Multiplexer Module

Command Summary

CALCulate:AVERage:AVERage? CALCulate:AVERage:CLEar CALCulate:AVERage:COUNt? CALCulate:AVERage:MAXimum? CALCulate:AVERage:MAXimum:TIME? CALCulate:AVERage:MINimum? CALCulate:AVERage:MINimum:TIME?

CALCulate:COMPare:DATA CALCulate:COMPare:DATA? CALCulate:COMPare:MASK CALCulate:COMPare:MASK? CALCulate:COMPare:STATe CALCulate:COMPare:STATe? CALCulate:COMPare:TYPE CALCulate:COMPare:TYPE?

CALCulate:LIMit:LOWer CALCulate:LIMit:LOWer? CALCulate:LIMit:LOWer:STATe CALCulate:LIMit:LOWer:STATe? CALCulate:LIMit:UPPer CALCulate:LIMit:UPPer? CALCulate:LIMit:UPPer:STATe CALCulate:LIMit:UPPer:STATe?

CALCulate:SCALe:GAIN CALCulate:SCALe:GAIN? CALCulate:SCALe:OFFSet CALCulate:SCALe:OFFSet? CALCulate:SCALe:OFFSet:NULL CALCulate:SCALe:STATe CALCulate:SCALe:STATe? CALCulate:SCALe:UNIT CALCulate:SCALe:UNIT?

CALCulate:AVERage:MINimum? CALCulate:AVERage:AVERage? CALCulate:AVERage:MAXimum?

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

Syntax

CALCulate:AVERage:MINimum? [(@<ch_list>)]

CALCulate:AVERage:AVERage? [(@<ch_list>)]

CALCulate:AVERage:MAXimum? [(@<ch_list>)]

Description

These queries return the minimum, average (arithmetic mean) and maximum values found on each of the specified channels during the scan. Each channel should be a multiplexer, digital or totalizer channel that has been configured to be part of the scan list. If it is not part of the scan list, no error will be generated, but the value returned will be a meaningless value of 0.

Parameters

Name	Туре	Range of Values	Default Value
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- You can read the values at any time, even during a scan. An error is generated if the internal DMM is disabled (see INSTrument:DMM command) or not installed in the mainframe.
- The calculation starts when the internal DMM is triggered. The instrument clears the stored statistical data on all channels when a new scan is started, when the CALCulate:AVERage:CLEar command is executed, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

The query returns a number in the form "+2.61920000E+01". Multiple responses are separated by commas. If no data is available for the specified channels, it returns +0.0000000E+00.

Example

The following query returns the minimum values found on channels 05 through 08 on the module in slot 100.

In this example, you can replace the MIN node with MAX or AVER.

CALC:AVER:MIN? (@105:108)

Typical Response:

+3.13830293E+01,+1.98732123E+01,9.38293055E+00,1.20393822E+01

See Also

CALCulate Subsystem Introduction

CALCulate:AVERage:CLEar

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

Syntax

CALCulate:AVERage:CLEar [(@<ch_list>)]

Description

This command clears all values from the statistics registers for the specified channels. Each channel should be a multiplexer, digital or totalizer channel that has been configured to be part of the scan list. If it is not part of the scan list, no error will be generated, but the value returned will be a meaningless value of 0. The minimum, maximum, average, count, and peak-to-peak values are cleared. The values for all scanned channels are also cleared at the start of a new scan.

Parameters

Name	Туре	Range of Values	Default Value
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- Although this command clears the minimum, maximum, average, count, and peak-to-peak values, no readings are cleared from memory.
- The instrument generates an error if the internal DMM is disabled (see INSTrument:DMM) or not installed in the mainframe.
- The instrument clears the stored statistical data on all channels when a new scan is started, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Example

The following command clears the stored statistical data on channels 1 through 10 in slot 200.

CALC:AVER:CLEar (@201:210)

See Also

CALCulate Subsystem Introduction

CALCulate:AVERage:MINimum?

CALCulate:AVERage:MAXimum?

CALCulate:AVERage:AVERage?

CALCulate:AVERage:COUNt?

CALCulate:AVERage:PTPeak?

CALCulate:AVERage:COUNt?

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

Syntax

CALCulate:AVERage:COUNt? [(@<ch_list>)]

Description

This query returns the number of readings taken on each of the specified channels during the scan. Each channel should be a multiplexer, digital or totalizer channel that has been configured to be part of the scan list. If it is not part of the scan list, no error will be generated, but the value returned will be a meaningless value of 0.

Parameters

Name	Туре	Range of Values	Default Value
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- You can read the values at any time, even during a scan. An error is generated if the internal DMM is disabled (see INSTrument:DMM command) or not installed in the mainframe.
- The calculation starts when the internal DMM is triggered. The instrument clears the stored statistical data on all channels when a new scan is started, when the CALCulate:AVERage:CLEar command is executed, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

The query returns a number in the form "+7.9000000E+01". Multiple responses are separated by commas. If no data is available for the specified channels, it returns 0.

Example

The following query returns the number of readings taken on channels 05 through 08 on the module in slot 100.

CALC:AVER:COUNt? (@105:108)

Typical Response:

+2.0000000E+01,1.9000000E+01,2.10000000E+01,2.0000000E+01

See Also

CALCulate Subsystem Introduction

CALCulate:AVERage:MINimum?

CALCulate:AVERage:MAXimum?

CALCulate:AVERage:AVERage?

CALCulate:AVERage:MINimum:TIME? CALCulate:AVERage:MAXimum:TIME?

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

Syntax

CALCulate:AVERage:MINimum:TIME? [(@<ch_list>)]

CALCulate:AVERage:MAXimum:TIME? [(@<ch_list>)]

Description

These queries return the time that the minimum or maximum reading was taken on the specified channels during the scan (in full time and date format). Each channel must be a multiplexer, digital input or totalizer channel that has been configured to be part of the scan list.

Parameters

Name	Туре	Range of Values	Default Value
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- You can read the values at any time, even during a scan. An error is generated if the internal DMM is disabled (see INSTrument:DMM command) or not installed in the mainframe.
- The calculation starts when the internal DMM is triggered. The instrument clears the stored statistical data on all channels when a new scan is started, when the CALCulate:AVERage:CLEar command is executed, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).
- This command is not affected by the FORMat:READing:TIME:TYPE command, which selects the time format for storing scanned data in memory (absolute time versus relative time).

Return Format

For each channel, the query returns the time in the form yyyy,mm,dd,hh,mm,ss.sss. For example, 2009,10,03,14,35,06.215 would mean October 3, 2009 at 2:35:06.215 PM.

Example

The following query returns the time of the minimum reading on channels 03 and 04 on the module in slot 100.

CALC:AVER:MIN:TIME? (@103:104)

Typical Response: 2009,12,20,08,39,27.283,2009,12,20,08,39,28.011

See Also

CALCulate Subsystem Introduction

CALCulate:AVERage:PTPeak?

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

Syntax

CALCulate:AVERage:PTPeak? [(@<ch_list>)]

Description

This query returns the peak to peak value (maximum minus minimum) found on each of the specified channels during the scan. Each channel should be a multiplexer, digital or totalizer channel that has been configured to be part of the scan list. If it is not part of the scan list, no error will be generated, but the value returned will be a meaningless value of 0.

Parameters

Name	Туре	Range of Values	Default Value
<ch_list></ch_list>	Channel list	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- You can read the values at any time, even during a scan. An error is generated if the internal DMM is disabled (see INSTrument:DMM command) or not installed in the mainframe.
- The calculation starts when the internal DMM is triggered. The instrument clears the stored statistical data on all channels when a new scan is started, when the CALCulate:AVERage:CLEar command is executed, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

The query returns a number in the form "+2.61920000E+01". Multiple responses are separated by commas. If no data is available for the specified channels, it returns +0.0000000E+00.

Example

The following query returns the peak to peak values found on channels 05 through 08 on the module in slot 100.

CALC:AVER:PTP? (@105:108)

Typical Response:

+3.13830293E+01,+1.98732123E+01,9.38293055E+00,1.20393822E+01

See Also

CALCulate Subsystem Introduction

CALCulate:AVERage:MINimum?

CALCulate:AVERage:MAXimum?

CALCulate:AVERage:AVERage?

CALCulate:COMPare:DATA

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

Syntax

CALCulate:COMPare:DATA <data>[,(@<ch_list>)]

CALCulate:COMPare:DATA? [(@<ch_list>)]

Description

This command sets the digital data for pattern comparisons on the specified digital input channels. You can use the pattern comparison feature to generate an alarm when a specific digital pattern is detected.

Used With:

• 34907A Multifunction Module (digital input channels only)

Parameters

Name	Туре	Range of Values	Default Value
<data></data>	Numeric	An 8-bit digital pattern for comparison, specified as an integer from 0 to 255.	This is a required parameter.
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@301) - channel 01 on the module in slot 300. (@301:302) - channels 01 and 02 on the module in slot 300. (@101,201:202,302) - channel 01 on the module in slot 100, channels 01 and 02 on the module in slot 200, and channel 02 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- Note that the specified channels do not have to be part of the scan list to generate an alarm. Alarms are evaluated continuously as soon as you enable them. Alarms are evaluated constantly on the multifunction module, but alarm data is stored in reading memory only during a scan.
- The channel width takes precedence over the specified digital pattern. If the specified pattern is greater than the channel width, additional bits will be ignored. For example, if you set the channel width to "BYTE" and then specify a pattern of "256" (1 0000 0000), the pattern will be truncated to "0000 0000" (the leading "1" will be ignored).
- After specifying the desired digital pattern, use the CALCulate:COMPare:STATe command to enable pattern comparisons on the specified channels. If you want to monitor the state of specific bits, use the CALCulate:COMPare:DATA command in conjunction with the CALCulate:COMPare:MASK command to specify a *mask* pattern.
- Use the CALCulate:COMPare:TYPE command to specify whether an alarm or hardware interrupt condition is generated when a specific bit pattern or bit pattern change is detected.
- A Factory Reset (*RST command) clears the digital pattern and turns off the pattern comparison mode. An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does *not* clear the data and does *not* turn off the pattern comparison mode.

Return Format

The query returns the comparison pattern as a decimal value (binary and hexadecimal values are converted to their decimal equivalents). Multiple responses are separated by commas.

Examples

The following query returns the comparison pattern selected for channel 01 of the 34907A multifunction module in slot 300.

CALC:COMP:DATA? (@301) !Always returns decimal equivalent

Typical Response: 140

The following program segment sets the digital pattern for the 34907A multifunction module in slot 100 and then enables the pattern comparison mode. When the data read from the bank is equal to the comparison pattern, an alarm will be generated on Alarm 2.

CALC:COMP:DATA #HF6,(@101) !Set comparison pattern
(1111 0110)
CALC:COMP:TYPE EQUAL,(@101) !Generate alarm on
pattern match
OUTP:ALARM2:SOUR (@101) !Enable alarms
CALC:COMP:STAT ON,(@101) !Enable pattern comparison
mode

The following query returns the comparison pattern selected for the 34907A multifunction module in slot 100.

CALC:COMP:DATA? (@101) !Always returns decimal equivalent

Typical Response: +246

See Also

CALCulate Subsystem Introduction CALCulate:COMPare:MASK

CALCulate:COMPare:STATe

CALCulate:COMPare:TYPE

OUTPut:ALARm{1|2|3|4}:SOURce

CALCulate:COMPare:MASK

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

Syntax

CALCulate:COMPare:MASK <mask>[,(@<ch_list>)]

CALCulate:COMPare:MASK? [(@<ch_list>)]

Description

This command is used in conjunction with the CALCulate:COMPare:DATA command to set the digital *mask* data for pattern comparisons on the specified digital input channels. You can use the pattern comparison feature to generate an alarm when a specific digital pattern is detected.

Used With:

• 34907A Multifunction Module (digital input channels only)

Parameters

Name	Туре	Range of Values	Default Value
<mask></mask>	Numeric	An 8-bit mask pattern for comparison, specified as an integer from 0 to 255. Active bits are specified as 1's, and "don't care" bits are specified as 0's.	This is a required parameter.
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@301) - channel 01 on the module in slot 300. (@301:302) - channels 1 and 2 on the module in slot 300. (@101,201:202,302) - channel 1 on the module in slot 100, channels 01 and 02 on the module in slot 200, and channel 02 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- Note that the specified channels do not have to be part of the scan list to generate an alarm. Alarms are evaluated continuously as soon as you enable them. Alarms are evaluated constantly on the multifunction module, but alarm data is stored in reading memory only during a scan.
- The channel width takes precedence over the specified digital pattern. If the specified pattern is greater than the channel width, additional bits will be ignored. For example, if you set the channel width to "BYTE" and then specify a pattern of "256" (1 0000 0000), the pattern will be truncated to "0000 0000" (the leading "1" will be ignored).
- After specifying the desired digital pattern, use the CALCulate:COMPare:STATe command to enable pattern comparisons on the specified channels.
- A Factory Reset (*RST command) clears the mask and turns off the pattern comparison mode. An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does *not* clear the mask and does *not* turn off the pattern comparison mode.

Return Format

The query returns the mask as a decimal value (binary and hexadecimal values are converted to their decimal equivalents). Multiple responses are separated by commas.

Examples

To illustrate how the calculations are performed, see the example below which assumes that a decimal 146 was read from the channel. Since the calculations produce a non-zero result (decimal 16), an interrupt is not generated.

MSB LSE	3
1001 0010	Data read from port (decimal 146)
1000 1100	CALC:COMP:DATA command (decimal 140)
0001 1110	X-OR result
1111 0000	CALC:COMP:MASK command (decimal 240)
0001 0000	AND result (decimal 16, no interrupt generated)

The following query returns the comparison pattern selected for the module in slot 300.

CALC:COMP:MASK? (@301) !Always returns decimal equivalent

Typical Response: 240

The following program segment sets the digital pattern for the 34907A multifunction module in slot 100, applies a mask to the lower byte, and then enables the pattern comparison mode. When the data read from the lower byte is equal to the comparison pattern, an alarm will be generated on Alarm 2.

```
CALC:COMP:DATA:WORD #HF6F6,(@101) !Set comparison
pattern (1111 0110 1111 0110)
CALC:COMP:MASK #H00FF,(@101) !Set mask pattern (0000
0000 1111 1111)
CALC:COMP:TYPE EQUAL,(@101) !Generate alarm on
pattern match
```

OUTP:ALARM2:SOUR (@101) !Enable alarms CALC:COMP:STAT ON,(@101) !Enable pattern comparison mode

To illustrate how the calculations are performed, see the example below which assumes that a decimal 37595 was read from the channel. Since the calculations produce a non-zero result (decimal 13), an alarm is not generated.

 MSB
 LSB

 1001 0010 1101 1011
 Data read from port (decimal 37595)

 1111 0110 1111 0110
 CALC:COMP:DATA command (decimal 63222)

 0110 0100 0010 1101
 X-OR result

 0000 0000 1111 1111
 CALC:COMP:MASK command (decimal 255)

 0000 0000 0000 1101
 AND result (decimal 13, no alarm generated)

The following query returns the comparison pattern selected for channel 01 of the 34907A multifunction module in slot 100.

CALC:COMP:MASK? (@101) !Always returns decimal equivalent

Typical Response: + 255

See Also

CALCulate Subsystem Introduction CALCulate:COMPare:DATA CALCulate:COMPare:STATe CALCulate:COMPare:TYPE OUTPut:ALARm{1|2|3|4}:SOURce

CALCulate:COMPare:STATe

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

Syntax

CALCulate:COMPare:STATe <state>[,(@<ch_list>)]

CALCulate:COMPare:STATe? [(@<ch_list>)]

Description

This command disables or enables the pattern comparison mode on the specified digital input channels. You can use the pattern comparison feature to generate an alarm when a specific digital pattern is detected.

Used With:

• 34907A Multifunction Module (digital input channels only)

Parameters

Name	Туре	Range of Values	Default Value
<state></state>	Boolean	{OFF 0 ON 1}	This is a required parameter.
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@301) - channel 01 on the module in slot 300. (@301:302) - channels 01 and 02 on the module in slot 300. (@101,201:202,302) - channel 01 on the module in slot 100, channels 01 and 02 on the module in slot 200, and channel 02 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- Note that the specified channels do not have to be part of the scan list to generate an alarm. Alarms are evaluated continuously as soon as you enable them. Alarms are evaluated constantly on the multifunction module, but alarm data is stored in reading memory only during a scan.
- A Factory Reset (*RST command) turns off the pattern comparison mode. An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does *not* turn off the pattern comparison mode.

Return Format

The query returns the state of the comparison mode as 0 (OFF) or 1 (ON) for the specified bank. Multiple responses are separated by commas.

Examples

The following command sets the comparison mode ON for the three specified channels.

CALC:COMP:STAT 1, (@201, 202, 301)

The following query returns the state of the pattern comparison mode for channel 01 on the modules in slot 200 and 300.

CALC:COMP:STAT? (@201,301)

Typical Response: 1,1

See Also

CALCulate Subsystem Introduction CALCulate:COMPare:DATA CALCulate:COMPare:MASK

CALCulate:COMPare:TYPE

OUTPut:ALARm{1|2|3|4}:SOURce

CALCulate:COMPare:TYPE

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

Syntax

CALCulate:COMPare:TYPE < mode>[,(@<ch_list>)]

CALCulate:COMPare:TYPE? [(@<ch_list>)]

Description

This command configures the specified digital input channels to generate an alarm when a specific bit pattern or bit pattern change is detected. This command is used in conjunction with the CALCulate:COMPare:DATA command which sets the *data* bit pattern and the CALCulate:COMPare:MASK command which sets the *mask* bit pattern.

Used With:

• 34907A Multifunction Module (digital input channels only)

Parameters

Name	Туре	Range of Values	Default Value
<mode></mode>	Discrete	{EQUal NEQual}	This is a required parameter. The power-on value is NEQual.
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@301) - channel 01 on the module in slot 300. (@301:302) - channels 01 and 02 on the module in slot 300. (@101,201:202,302) - channel 01 on the module in slot 100, channels 01 and 02 on the module in slot 200, and channel 02 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- Note that the specified channels do not have to be part of the scan list to generate an alarm. Alarms are evaluated continuously as soon as you enable them. Alarms are evaluated constantly on the multifunction module, but alarm data is stored in reading memory only during a scan.
- Select EQUal to generate an alarm or interrupt when the data read from the specified channel is equal to CALCulate:COMPare:DATA, after being masked by CALCulate:COMPare:MASK.
- Select NEQual (not equal) to generate an alarm or interrupt when the data read from the bank is not equal to CALCulate:COMPare:DATA after being masked by CALCulate:COMPare:MASK.
- Bits masked off as 0 ("don't care") by CALCulate:COMPare:MASK are ignored.
- The channel width takes precedence over the specified digital pattern. If the specified pattern is greater than the channel width, additional bits will be ignored. For example, if you set the channel width to "BYTE" and then specify a pattern of "256" (1 0000 0000), the pattern will be truncated to "0000 0000" (the leading "1" will be ignored).
- A Factory Reset (*RST command) clears the pattern compare setting and turns off the pattern comparison mode. An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does not clear the pattern compare setting and does not turn off the pattern comparison mode.

Return Format

The query returns EQU or NEQ for the specified bank. Multiple responses are separated by commas.

Examples

The following command sets the comparison mode for the specified channels to EQUal.

CALC:COMP:TYPE EQU, (@301:302)

The following query returns the comparison mode for the two specified channels.

CALC:COMP:TYPE? (@301:302)

Typical Response: EQU, EQU

See Also

CALCulate:COMPare:DATA

CALCulate:COMPare:MASK

CALCulate:COMPare:STATe

OUTPut:ALARm{1|2|3|4}:SOURce

CALCulate:LIMit:LOWer CALCulate:LIMit:UPPer

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

Syntax

CALCulate:LIMit:LOWer <*lo_limit*>[,(@<*ch_list*>)] CALCulate:LIMit:LOWer? [(@<*ch_list*>)]

CALCulate:LIMit:UPPer <*hi_limit*>[,(@<*ch_list*>)] CALCulate:LIMit:UPPer? [(@<*ch_list*>)]

Description

The instrument has four alarms which you can configure to alert you when a reading exceeds specified limits on a multiplexer channel during a scan. These commands set the lower and upper limits for alarms on the specified channels.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34907A Multifunction Module (totalizer channel only)
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<lo_limit></lo_limit>	Numeric	Any numeric value	0
<hi_limit></hi_limit>	Numeric	Any numeric value; for totalizer channels, the <i><hi_limit></hi_limit></i> refers to a maximum count.	0
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- Alarms are evaluated during a scan or a monitor measurement on channels of a multiplexer module. For scanning using a multiplexer module, an error is generated if the internal DMM is disabled (see INSTrument:DMM command) or not installed in the mainframe. The internal DMM is *not* required for operations on the digital modules and the specified channels do *not* have to be part of the active scan list to generate an alarm.
- You can assign a lower limit, an upper limit, or both to any configured channel in the scan list. The lower limit *must always* be less than or equal to the upper limit.
- Once you have defined the lower limits, use the CALCulate:LIMit:LOWer:STATe command to enable alarms on the specified channels. Similarly, use CALCulate:LIMit:UPPer:STATe after setting the upper limits.
- The alarms are evaluated by the internal DMM from the time the CALCulate:LIMit:LOWer:STATe ON and CALCulate:LIMit:UPPer:STATe ON commands are executed.
- You must configure the channel (function, transducer type, etc.) before setting any alarm limits. If you change the measurement configuration, alarms are turned off and the limit values are cleared. Alarms are also turned off when you change the temperature probe type, temperature units, or disable the internal DMM.
- You can assign multiple channels to any of the four available alarms (numbered 1 through 4, see OUTPut:ALARm<n>:SOURce command). For example, you can configure the instrument to generate an alarm on the Alarm 1 output when a limit is exceeded on any of channels 103, 205, or 310. You cannot, however, assign alarms on a specific channel to more than one alarm number.

- If you plan to use alarms on a channel which will also use Mx+B scaling, be sure to *configure the scaling values first*. If you attempt to assign the alarm limits first, the instrument will turn off alarms and clear the limit values when you enable scaling on that channel. If you specify a custom measurement label with scaling, it is automatically used when alarms are logged on that channel.
- If you redefine the scan list, alarms are no longer evaluated on those channels (during a scan) but the limit values are not cleared. If you decide to add a channel back to the scan list (without changing the function), the original limit values are restored and alarms are turned back on. This makes it easy to temporarily remove a channel from the scan list without entering the alarm values again.
- To generate an alarm when a specific count is reached on a totalizer channel, see the CALCulate:LIMit:UPPer command. To generate an alarm when a specific bit pattern or bit pattern change is detected on a digital input channel, see the CALCulate:COMPare commands.
- The instrument clears all alarm limits and turns off all alarms after a Factory Reset (*RST command), Instrument Preset (SYSTem:PRESet command), or Card Reset (SYSTem:CPON command).

Return Format

The query returns the upper or lower limit in the form "-1.0000000E+15" for each channel specified. Multiple responses are separated by commas.

Examples

In the following examples, you can substitute the node name UPP for LOW.

The following command sets the lower limit to -0.25 on channels 03 and 13 in slot 100.

CALC:LIM:LOW -0.25, (@103,113)

The following query returns the lower limit settings on channels 03 and 13 in slot 100.

CALC:LIM:LOW? (@103,113)

Typical Response: -2.5000000E-01,-2.5000000E-01

See Also CALCulate Subsystem Introduction CALCulate:LIMit:LOWer:STATe

CALCulate:LIMit:LOWer:STATe CALCulate:LIMit:UPPer:STATe

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

Syntax

CALCulate:LIMit:LOWer:STATe <mode>,(@<ch_list>) CALCulate:LIMit:LOWer:STATe? (@<ch_list>)

CALCulate:LIMit:UPPer:STATe <mode>,(@<ch_list>) CALCulate:LIMit:UPPer:STATe? (@<ch_list>)

Description

These commands disable or enable the lower and upper alarm limits on the specified multiplexer channels.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<mode></mode>	Boolean	{OFF 0 ON 1}	OFF
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- Alarm data can be stored in one of two locations depending on whether a scan list is running when the alarm occurs.
- a. If an alarm event occurs on a channel as it is being scanned, then that channel's alarm status is stored in *reading memory* as the readings are taken. Each reading that is outside the specified alarm limit is logged in memory. You can store at least 50,000 readings in memory during a scan.
- b. As alarm events are generated, they are also logged in an *alarm queue*, which is separate from reading memory. This is the only place that non-scanned alarms get logged (alarms during a channel monitor, alarms generated by the digital modules, etc.). Up to 20 alarms can be logged in the alarm queue. If more than 20 alarm events are generated, they will be lost (only the first 20 alarms are saved). Even if the alarm queue is full, the alarm status is stored in reading memory during a scan.
 - Alarms are evaluated during a scan or a monitor measurement on channels of a multiplexer module. For scanning using a multiplexer module, an error is generated if the internal DMM is disabled (see INSTrument:DMM command) or not installed in the mainframe. The internal DMM is *not* required for operations on the digital modules and the specified channels do *not* have to be part of the active scan list to generate an alarm.
 - When an alarm occurs, the instrument stores relevant information about the alarm in the queue. This includes the reading that caused the alarm, the time of day and date of the alarm, and the channel number on which the alarm occurred. The information stored in the alarm queue is always in absolute time and is *not* affected by the FORMat:READing:TIME:TYPE command setting.
 - Alarms are logged in the alarm queue only when a reading

crosses a limit, not while it remains outside the limit and not when it returns to within limits.

• In addition to being stored in reading memory, alarms are also recorded in their own SCPI Status System. You can configure the instrument to use the status register to generate a Service Request (SRQ) when alarms are generated. For more information on the Status System for the instrument, see Status System Introduction.

On the digital modules, you can set an upper limit for the totalizer channels (no lower limit is allowed). These channels do *not* have to be part of the active scan list to generate an alarm, but alarm data is stored in reading memory *only* as part of a scan.

- To generate an alarm when a specific count is reached on a totalizer channel, see the CALCulate:LIMit:UPPer command. To generate an alarm when a specific bit pattern or bit pattern change is detected on a digital input channel, see the CALCulate:COMPare commands.
- The instrument clears all alarm limits and turns off all alarms after a Factory Reset (*RST command), Instrument Preset (SYSTem:PRESet command), or Card Reset (SYSTem:CPON command).

Return Format

The query returns 0 (OFF) or 1 (ON) for each channel specified. Multiple responses are separated by commas.

Examples

In the examples below, you can replace the node name UPP with LOW.

The following program segment sets an upper limit on channels 03 and 13 in slot 100 and then enables alarms on these channels.

CALC:LIM:UPP 10.25, (@103,113) CALC:LIM:UPP:STAT ON, (@103,113)

The following query returns the state of upper limits on channels 03 and 13 in slot 100.

CALC:LIM:UPP:STAT? (@103,113)

Typical Response: 1,1

The following command sets the upper limit to 4095 on totalizer channels 01 and 02 in slot 300 and then enables alarms on these channels.

CALC:LIM:UPP 4.095E+03,(@301,302) CALC:LIM:UPP:STAT ON,(@301,302) See Also

CALCulate Subsystem Introduction CALCulate:LIMit:UPPer OUTPut:ALARm{1|2|3|4}:SOURce SYSTem:ALARm?

CALCulate:SCALe:GAIN CALCulate:SCALe:OFFSet

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

Syntax

CALCulate:SCALe:GAIN <*gain*>[,(@<*ch_list*>)] CALCulate:SCALe:GAIN? [(@<*ch_list*>)]

CALCulate:SCALe:OFFSet <offset>[,(@<ch_list>)] CALCulate:SCALe:OFFSet? [(@<ch_list>)]

Description

These commands set the gain ("M") and offset ("B") for scaled readings on the specified multiplexer channels.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<gain></gain>	Numeric	Any value between -1E15 to +1E15	This is a required parameter.
			The factory default is 1.
<offset></offset>	Numeric	Any value between -1E+15 and +1E+15.	This is a required parameter.
			The factory default is 0.
_	Channel List	One or more channels, as shown:	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.
		(@310) - channel 10 on the module in slot 300.	
		(@305:310) - channels 05 through 10 on the module in slot 300.	
		(@202:207,209,302:308) - channels 02 through 07 and 09 on the module in	

	slot 200 and channels 02 through 08 on the module in slot 300.	
--	--	--

Remarks

• Scaling is applied using the following equation:

Scaled Reading = (Gain x Measurement) + Offset

- After setting the gain and offset values, use the CALCulate:SCALe:STATe command to enable the scaling function.
- Readings can be acquired during a scan using the multiplexer. For scanning measurements using the multiplexer modules, an error is generated if the internal DMM is disabled (see INSTrument:DMM command) or not installed in the mainframe.
- You must configure the channel (function, transducer type, etc.) before applying any scaling values. If you change the measurement configuration, scaling is turned off on that channel and the gain and offset values are reset (M=1 and B=0). Scaling is also turned off when you change the temperature probe type, temperature units, or disable the internal DMM.
- If you change the measurement configuration (function, transducer type, etc.) on a channel or the internal DMM, scaling is turned off on those channels and the gain and offset values are cleared.
- If you plan to use scaling on a channel which will also use alarms, *be sure to configure the scaling values first*. If you attempt to assign the alarm limits first, the instrument will turn off alarms and clear the limit values when you enable scaling on that channel. If you specify a custom measurement label with scaling, it is automatically used when alarms are logged on that channel.
- If you redefine the scan list, no change will be made to the scaling state or the gain and offset values. If you decide to add a channel back to the scan list, the original gain and offset values are restored.

- You can use scaling to make a "null" measurement on a channel and store it as the offset ("B") for subsequent measurements. This allows you to adjust for voltage or resistive offsets through your wiring to the point of the measurement. See CALCulate:SCALe:OFFSet:NULL.
- The CONFigure and MEASure? commands automatically set the gain ("M") to 1 and offset ("B") to 0.
- A Factory Reset (*RST command) turns off scaling and clears the scaling values on all channels (gain = 1, offset = 0). An Instrument Preset (SYSTem:PRESet command) *does not* clear the scaling values and *does not* turn off scaling.

Return Format

The query returns the gain or offset value for each channel specified. Multiple responses are separated by commas.

Examples

The following command sets the gain to +1.25 on channels 03 and 13 in slot 100.

CALC:SCAL:GAIN 1.25, (@103,113)

The following query returns the gain settings on channels 03 and 13 in slot 100.

CALC:SCAL:GAIN? (@103,113)

Typical Response: +1.25000000E+00,+1.25000000E+00

The following command sets the offset to +10.125 on channels 03 and 13 in slot 100.

CALC:SCAL:OFFS 10.125, (@103,113)

The following query returns the offset values on channels 03 and 13 in slot 100.

CALC:SCAL:OFFS? (@103,113)

Typical Response: +1.01250000E+01,+1.01250000E+01

See Also

CALCulate Subsystem Introduction

CALCulate:SCALe:OFFSet:NULL

CALCulate:SCALe:STATe

CALCulate:SCALe:UNIT

CALCulate:SCALe:OFFSet:NULL

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

Syntax

CALCulate:SCALe:OFFSet:NULL [(@<ch_list>)]

Description

This command makes an immediate null measurement on the specified channels and stores it as the offset ("B") for subsequent measurements. This allows you to adjust for voltage or resistive offsets through your wiring to the point of the measurement.

Parameters

Name	Туре	Range of Values	Default Value
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Example

The following command makes an immediate null measurement on channels 206 through 210.

CALC:SCAL:OFFS:NULL (@206:210)

See Also

CALCulate Subsystem Introduction

CALCulate:SCALe:GAIN

CALCulate:SCALe:OFFSet

CALCulate:SCALe:STATe

CALCulate:SCALe:UNIT

CALCulate:SCALe:STATe

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

Syntax

CALCulate:SCALe:STATe <*state*>[,(@<*ch_list*>)]

CALCulate:SCALe:STATe? [(@<ch_list>)]

Description

This command disables or enables Mx+B scaling on the specified channels. If you omit the optional *<ch_list>* parameter, this command applies to the currently defined scan list.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<state></state>	Boolean	{OFF 0 ON 1}	This is a required parameter.
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

• Scaling is applied using the following equation:

Scaled Reading = (Gain x Measurement) + Offset

- Readings can be acquired during a scan using the multiplexer. For scanning measurements using the multiplexer modules, an error is generated if the internal DMM is disabled (see INSTrument:DMM command) or not installed in the mainframe.
- You must configure the channel (function, transducer type, etc.) before applying any scaling values. If you change the measurement configuration, scaling is turned off on that channel and the gain and offset values are reset (M=1 and B=0). Scaling is also turned off when you change the temperature probe type, temperature units, or disable the internal DMM.
- If you change the measurement configuration (function, transducer type, etc.) on a channel, scaling is turned off on those channels and the gain and offset values are cleared.
- If you plan to use scaling on a channel which also uses alarms, *be sure to configure the scaling values first*. If you attempt to assign the alarm limits first, the instrument will turn off alarms and clear the limit values when you enable scaling on that channel. If you specify a custom measurement label with scaling, it is automatically used when alarms are logged on that channel.
- If you redefine the scan list, no change will be made to the scaling state or the gain and offset values. If you decide to add a channel back to the scan list, the original gain and offset values are restored.
- The CONFigure and MEASure? commands automatically disable scaling on the specified channels.

• A Factory Reset (*RST command) turns off scaling and clears the scaling values on all channels (gain = 1, offset = 0). An Instrument Preset (SYSTem:PRESet command) *does not* clear the scaling values and *does not* turn off scaling.

Return Format

The query returns 0 (OFF) or 1 (ON) for each channel specified. Multiple responses are separated by commas.

Examples

The following program segment sets gain and offset values on channels 03 and 13 in slot 100 and then enables scaling on these channels.

CALC:SCAL:GAIN 1.25,(@103,113) CALC:SCAL:OFFS 10.125,(@103,113) CALC:SCAL:STAT ON,(@103,113)

The following query returns the scaling settings on channels 03 and 13 in slot 100.

CALC:SCAL:STAT? (@103,113)

Typical Response: 1,1

See Also

CALCulate Subsystem Introduction

CALCulate:SCALe:GAIN

CALCulate:SCALe:OFFSet

CALCulate:SCALe:OFFSet:NULL

CALCulate:SCALe:UNIT

CALCulate:SCALe:UNIT

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

Syntax

CALCulate:SCALe:UNIT <quoted_string>[,(@<ch_list>)]

CALCulate:SCALe:UNIT? [(@<ch_list>)]

Description

This command allows you to specify the custom label of up to three characters (for example, RPM, PSI) for scaled measurements on the specified channels. If you omit the optional *<ch_list>* parameter, this command applies to the currently defined scan list.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<quoted_string></quoted_string>	Quoted ASCII String	A quoted ASCII string of up to three characters. You can use letters (A-Z), numbers (0-9), an underscore (_), or the "#" character which displays a degree symbol (°) on the front panel (displayed as a blank space in an output string from the remote interface). The first character must be a letter or the "#" character (the "#" character is allowed only as the leftmost character in the label). The remaining two characters can be letters, numbers, or an underscore.	This is a required parameter.
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

slot 200 and channels 02 through 08 on the module in slot 300.	
	through 08 on the

Remarks

- Readings can be acquired during a scan using the multiplexer. For scanning measurements using the multiplexer modules, an error is generated if the internal DMM is disabled (see INSTrument:DMM command) or not installed in the mainframe.
- If you set the measurement label to °C, °F, or K, note that this has no effect the temperature units set using the UNIT:TEMPerature command.
- The CONFigure and MEASure? commands automatically reverts the unit to the natural units for the function.
- A Factory Reset (*RST command) turns off scaling, clears the scaling values (gain = 1, offset = 0), and automatically reverts the unit to the natural units for the function. An Instrument Preset (SYSTem:PRESet command) *does not* clear the scaling values or measurement labels and *does not* turn off scaling.

Return Format

The query reads the measurement units for each channel specified and returns an ASCII string enclosed in double quotes. Multiple responses are separated by commas.

Examples

The following command adds the measurement label "RPM" (Revolutions Per Minute) to channels 03 and 13 in slot 100.

CALC:SCAL:UNIT "RPM", (@103,113) or CALC:SCAL:UNIT 'RPM', (@103,113)

The following query returns the measurement labels assigned to channels 03 and 13 in slot 100.

CALC:SCAL:UNIT? (@103,113)

Typical Response: "RPM", "RPM"

See Also

CALCulate Subsystem Introduction

CALCulate:SCALe:GAIN

CALCulate:SCALe:OFFSet

CALCulate:SCALe:OFFSet:NULL

CALCulate:SCALe:STATe

CALibration Subsystem Introduction

The CALibration commands are used to calibrate the Keysight 34970A/34972A. Please note that the use of these commands requires a detailed knowledge of the appropriate calibration procedures, which are described in the *Keysight 34970A/34972A Service Guide*. Please refer to that guide before attempting to calibrate the instrument as improper use of the CALibration commands can adversely affect the accuracy and reliability of the instrument.

Command Summary

CALibration?

CALibration:COUNt?

CALibration:SECure:CODE

CALibration:SECure:STATe

CALibration:SECure:STATe?

CALibration:STRing

CALibration:STRing?

CALibration:VALue

CALibration:VALue?

CALibration?

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

Syntax

CALibration?

Description

This command performs a calibration of the internal DMM or DAC channel on the 34907A multifunction module using the specified calibration value (CALibration:VALue command). Before you can calibrate the instrument, you must unsecure it by entering the correct security code.

NOTE

For a more detailed discussion of the calibration procedures, see the *Keysight 34970A/34972A Service Guide*. Please refer to that guide before attempting to calibrate the instrument as improper use of the CALibration commands can adversely affect the accuracy and reliability of the instrument.

Remarks

- If a calibration fails, the instrument returns 1 and generates an error message. For a complete listing of the error messages related to calibration failures, see SCPI Error Messages.
- The internal DMM is an optional assembly for the Keysight 34970A/34972A. The instrument generates an error with this command if the internal DMM is disabled (see INSTrument:DMM command) or not installed in the mainframe.
- This command increments the calibration count by one count for the DMM and DAC channels (see CALibration:COUNt? command).

Return Format

The query returns 0 (calibration passed) or 1 (calibration failed).

Example

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

CAL?

Typical Response: 0

See Also

CALibration:SECure:STATe

CALibration:VALue

CALibration:COUNt?

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

Syntax

CALibration:COUNt?

Description

This command queries the instrument to determine the number of times it has been calibrated. Note that your instrument was calibrated before it left the factory. When you receive your instrument, be sure to read the various counts to determine its initial value.

NOTE For a more detailed discussion of the calibration procedures, see the *Keysight 34970A/34972A Service Guide*. Please refer to that guide before attempting to calibrate the instrument as improper use of the CALibration commands can adversely affect the accuracy and reliability of the instrument.

Used With:

Internal DMM

Remarks

- The calibration count increments up to a maximum of 65,535, after which it rolls over to 0. Because the value increments by one for each calibration point, a complete calibration may increase the value by many counts.
- The mainframe calibration count is incremented by the CALibration? command (the mainframe must be unsecured; see CALibration:SECure:STATe OFF command). You can read the calibration count regardless of whether the instrument is secured.
- The calibration count is also incremented by calibrations of the DAC channels on the 34907A multifunction module.
- The calibration count is stored in non-volatile memory, and does not change when power has been off, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

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

Example

The following query returns the calibration count.

CAL:COUN?

Typical Response: +273

See Also

CALibration Subsystem Introduction

CALibration?

CALibration:SECure:STATe

CALibration:SECure:CODE

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

Syntax

CALibration:SECure:CODE <new_code>

Description

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

NOTE

For a more detailed discussion of the calibration procedures, see the *Keysight 34970A/34972A Service Guide*. Please refer to that guide before attempting to calibrate the instrument as improper use of the CALibration commands can adversely affect the accuracy and reliability of the instrument.

Used With:

Internal DMM

Parameters

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

Remarks

- The security code is set to "**HP034970**" or "**AT034972**", depending on the product number, when the instrument is shipped from the factory. Note that the third character of the security code is a zero (0) and not a capital O.
- If you forget your security code, you can override the security feature. See the *Keysight 34970A/34972A Service Guide* for more information.
- The security code is stored in non-volatile memory, and does not change when power has been off, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Example

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

CAL:SEC:CODE T3ST_DUT165

See Also CALibration Subsystem Introduction CALibration:SECure:STATe

CALibration:SECure:STATe

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

Syntax

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

CALibration:SECure:STATe?

Description

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

NOTE For a more detailed discussion of the calibration procedures, see the *Keysight 34970A/34972A Service Guide*. Please refer to that guide before attempting to calibrate the instrument as improper use of the CALibration commands can adversely affect the accuracy and reliability of the instrument.

Used With:

Internal DMM

Parameters

Name	Туре	Range of Values	Default Value
<state></state>	Boolean	$\{OFF 0 ON 1\}$	ON
<code></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- Z). The remaining 11 characters can be letters, numbers (0- 9), or the underscore character ("_"). Blank spaces are not allowed.	This is a required parameter.

Remarks

- When you first receive your instrument, it is secured, and the security code is set to "HP034970" or "AT034972", depending on the product number. Note that the third character of the security code is a zero (0) and not a capital O.
- Once you enter a security code, that code must be used for both front-panel and remote operation. For example, if you secure the instrument from the front panel, you must use that same code to unsecure it from the remote interface.
- Unsecuring the instrument using this command enables the internal DMM to be calibrated.
- To calibrate the internal DMM, use the CALibration? command.
- The calibration security setting is stored in nonvolatile memory, and does not change when power has been off, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

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

Examples

The following command unsecures the instrument. Note that the "HP034970" string applies to the 34970A; the "AT034972" string applies to the 34972A.

CAL:SEC:STAT OFF, HP034970

The following query returns the current calibration security setting. In this case, it is OFF.

CAL:SEC:STAT?

Typical Response: 0

See Also CALibration Subsystem Introduction CALibration:SECure:CODE

CALibration:STRing

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

Syntax

CALibration:STRing <quoted_string>

CALibration:STRing?

Description

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

NOTE

For a more detailed discussion of the calibration procedures, see the *Keysight 34970A/34972A Service Guide*. Please refer to that guide before attempting to calibrate the instrument as improper use of the CALibration commands can adversely affect the accuracy and reliability of the instrument.

Used With:

Internal DMM

Parameters

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

Remarks

- You can record a calibration message only from the remote interface and only when the instrument is unsecured (see CALibration:SECure:STATe OFF command). You can read the message from either the front-panel or over the remote interface. You can read the calibration message whether the instrument is secured or unsecured.
- The calibration message may contain up to 40 characters. From the front panel, you can view only 13 characters of the message at a time.
- From the front panel, commas, periods, and semicolons share a display space with the preceding character, and are not considered individual characters.
- Storing a calibration message will overwrite any message previously stored in memory.
- The calibration message is stored in nonvolatile memory, and does not change when power has been off, after a Factory Reset (*RST command), or after an Instrument Preset

(SYSTem:PRESet command).

Return Format

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

Examples

The following command stores a message in calibration memory in the mainframe.

CAL:STR "CAL: 18 Aug 2009" or CAL:STR 'CAL: 18 Aug 2009'

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

CAL:STR?

Typical Response: "CAL: 18 Aug 2009"

See Also CALibration Subsystem Introduction CALibration:SECure:STATe

CALibration:VALue

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

Syntax

CALibration:VALue <value>

CALibration:VALue?

Description

This command specifies the value of the known calibration signal as outlined in the calibration procedures in the *Keysight 34970A/34972A Service Guide*. This command is used for internal DMM calibrations.

NOTE For a more detailed discussion of the calibration procedures, see the *Keysight 34970A/34972A Service Guide*. Please refer to that guide before attempting to calibrate the instrument as improper use of the CALibration commands can adversely affect the accuracy and reliability of the instrument.

Parameters

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

Remarks

 The internal DMM is an optional assembly for the Keysight 34970A/34972A. The instrument generates an error with this command if the internal DMM is disabled (see INSTrument:DMM command) or not installed in the mainframe.

Return Format

The query returns the calibration value in the form +1.0000000E-01.

Examples

The following command sets calibration value to +10.001010 volts.

CAL:VAL 10.001010

The following query returns the present calibration value.

CAL:VAL?

Typical Response: +1.00101000E+01

See Also

CALibration Subsystem Introduction

CALibration?

CONFigure Subsystem Introduction

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

NOTE

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

A MEASure command is simply a CONFigure command followed by a READ?

If you specify a *<ch_list>* with one of these commands, that *<ch_list>* overwrites the current scan list.

The CONFigure commands are valid only with the following Keysight 34970A/34972A plug-in modules which can be configured to be part of a scan. If the internal DMM is not installed or is disabled, then no DMM-related configurations are allowed. However, scanning is allowed on the digital input and totalizer channels even without the internal DMM.

34901A	20-Channel Armature Multiplexer (2-wire
	or 4-wire)
34902A	16-Channel Reed Multiplexer (2-wire or 4-
	wire)
34907A	Multifunction Module (digital input and
	totalizer channels only)
34908A	40-Channel Armature Multiplexer (2-wire
	only)

Command Summary

CONFigure?

CONFigure:CURRent:AC

CONFigure:CURRent:DC

CONFigure:DIGital:BYTE

CONFigure:FREQuency

CONFigure:FRESistance

CONFigure:PERiod

CONFigure:RESistance

CONFigure:TEMPerature

CONFigure:TOTalize

CONFigure:VOLTage:AC

CONFigure:VOLTage:DC

CONFigure?

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

Syntax

CONFigure? [(@<ch_list>)]

Description

This query returns the present configuration on the specified channels and returns a series of quoted strings.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34907A Multifunction Module (digital I/O only)
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

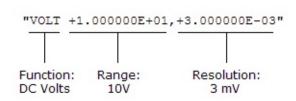
Remarks

- If the internal DMM is not installed or is disabled, then no DMMrelated configurations are allowed. However, scanning is allowed on the digital input and totalizer channels even without the internal DMM.
- The *RST command will clear the scan list and set all measurement parameters to their factory settings. The Instrument Preset (SYSTem:PRESet command) will not clear the scan list; however, this command will clear reading memory and all stored statistical data.

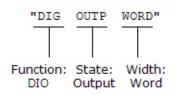
Return Format

The query returns a series of comma-separated fields indicating the present function, range, and resolution for the specified channels. Multiple responses are separated by commas. The short form of the function name is always returned (e.g., "CURR:AC", "FREQ", etc.).

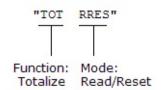
Example: Multiplexer Channel



Example: Digital I/O Channel



Example: Totalizer Channel



Examples

The following program segment configures multiplexer channels 03 and 08 in slot 100 and then reads back the configuration (the quotes are also returned).

```
CONF:RES 1000,1,(@103)
CONF:TEMP THER,5000,1,0.1,(@108)
CONF? (@103,108)
```

```
Typical Response: "RES +1.000000E+03,+1.000000E-01","TEMP
THER,5000,+1.000000E+00,+1.000000E-04"
```

The following query returns the present configuration of every channel in the scan list.

CONF?

See Also

CONFigure Subsystem Introduction

CONFigure:CURRent:AC CONFigure:CURRent:DC

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

Syntax

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

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

Description

These commands configure the channels for AC or DC current measurements but *do not* initiate the scan.

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

Used With:

• 34901A 20 Channel Multiplexer (2/4-wire) Module (channels 21 and 22 only)

Parameters

Name	Туре	Range of Values	Default Value
<range></range>	Numeric	Expected value in amps (ranges shown below). 10 mA (MIN) 100 mA 1 A (MAX)	AUTO
<resolution></resolution>	Numeric	Desired resolution in amps.	Fixed at 6½ digits
<scan_list></scan_list>	Scan List	One or more channels, as shown:	This is a required parameter.
		(@321) - channel 21 on the module in slot 300.	
		(@221:222) - channels 21 through 22 on the module in slot 200.	
		(@121:122,222,321:322) - channels 21 and 22 on the module in slot 100, channel 22 on the module in slot 200, and channels 21-22 on the module in slot 300.	
		Note that the channels must be of the form s 21 and s 22, where s is the	

	first digit of the slot number.	

Remarks

- When you specify a range of channels with this command, any channels that are invalid will be ignored (no error will be generated) but the first and last channel in the range must be valid for the selected function.
- You can allow the instrument to automatically select the measurement range using *autoranging* or you can select a fixed range using manual ranging. Autoranging is convenient because the instrument decides which range to use for each measurement based on the input signal. For fastest scanning operation, use manual ranging on each measurement (some additional time is required for autoranging since the instrument has to make a range selection).
- If you select autoranging (by specifying "AUTO" or "DEF"), an error will be generated if you specify a discrete value for the *<resolution>* parameter. When autoranging is combined with a discrete resolution, the instrument cannot accurately resolve the integration time (especially if the input signal is continuously changing). If your application requires autoranging, be sure to specify "AUTO" for the *<resolution>* parameter or omit the parameter from the command.
- Autorange thresholds: Down range at: <10% of range Up range at: >120% of range
- Because this command resets all measurement parameters on the specified channels to their default values, be sure to send the CONFigure command *before* setting any other measurement parameters.
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload

indication: " \pm OVLD" from the front panel or " \pm 9.9E+37" from the remote interface.

- For AC measurements, the resolution is fixed at 6½ digits. The only way to control the reading rate for AC measurements is by changing the channel delay or by setting the AC filter to the highest frequency limit. The *<resolution>* parameter only affects the number of digits shown on the front panel.
- The *RST command will clear the scan list and set all measurement parameters to their factory settings. The Instrument Preset (SYSTem:PRESet command) will not clear the scan list; however, this command will clear reading memory and all stored statistical data.

Examples

These commands show the CONFigure:CURRent:AC command. In each case, you could substitute the CONFigure:CURRent:DC command and the example would be valid.

The following program segment configures the instrument for AC current measurements on channel 21 in slot 100. The READ? command places the instrument in the "wait-for-trigger" state, scans the channel once, and then sends the reading to reading memory and the instrument's output buffer. The default range (autorange) and resolution (fixed at $6\frac{1}{2}$ digits) are used for the measurement.

CONF:CURR:AC (@121) ROUT:SCAN (@121) READ?

Typical Response: +8.54530000E-02

The following program segment configures the instrument for an AC current measurement on channels 21 and 22 in slot 100. The INITiate command places the instrument in the "wait-for-trigger" state, scans the channels once, and stores the readings in memory. The FETCh? command transfers the readings from reading memory to the instrument's output buffer. The 1 A range is selected with 200 mA resolution.

CONF:CURR:AC 1,0.2,(@121,122) ROUT:SCAN (@121,122) INIT FETC?

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

See Also

CONFigure?

FETCh?

INITiate

READ?

MEASure:CURRent:AC?

MEASure:CURRent[:DC]?

ROUTe:CHANnel:DELay

ROUTe:SCAN

[SENSe:]CURRent:AC:BANDwidth

CONFigure:DIGital:BYTE

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

Syntax

CONFigure:DIGital:BYTE (@<scan_list>)

Description

This command configures the instrument to scan the specified digital input channels on the multifunction module as byte data, but *does not* initiate the scan. This command redefines the scan list.

Used With:

• 34907A Multifunction Module (digital input only)

Parameters

Name	Туре	Range of Values	Default Value
<scan_list></scan_list>	Scan list	One or more digital I/O channels, as shown: (@301) - channel 01 on the module in slot 300. (@101:102,201,302) - channels 01 and 02 on the modules on slot 100, channel 01 on the module in slot 200, and channel 02 on the module in slot 300.	This is a required parameter.

Remarks

- The digital input channels are numbered "**s**01" (LSB) and "**s**02" (MSB), where **s** is the first digit of the slot number.
- Note that if you include both digital input channels in the scan list, the instrument will read data from both ports simultaneously with the same time stamp. This allows you to externally combine the two 8-bit value into one 16-bit value.

Example

The following command configures the instrument to scan channels 01 and 02 on slot 100 as byte data.

CONF:DIG:BYTE (@101:102)

See Also

CONFigure Subsystem Introduction

CONFigure:FREQuency CONFigure:PERiod

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

Syntax

CONFigure:FREQuency [{<*range*>|AUTO|MIN|MAX|DEF}], {<*resolution*>|MIN|MAX|DEF}],] (@<*scan_list*>)

CONFigure:PERiod [{<*range*>|AUTO|MIN|MAX|DEF}[, {<*resolution*>|MIN|MAX|DEF}],] (@<*scan_list*>)

Description

These commands configure the channels for frequency or period measurements, but they *do not* initiate the scan.

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

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<range></range>	Numeric	Expected value in Hz (frequency) or seconds (period). Valid values range from 3 Hz to 300 kHz, and their inverses (for period).	AUTO
		measurements, this parameter is only used in conjunction with the <i><resolution></resolution></i> parameter to set the gate time. It is otherwise unnecessary for frequency and period measurements.	
<resolution></resolution>	Numeric	Desired resolution in Hz (frequency) or seconds (period).	0.000003 x Range (1 PLC)
<scan_list></scan_list>	Scan List	One or more channels, as shown:	This is a required parameter.
		(@310) - channel 10 on the module in slot 300.	
		(@305:310) - channels 05 through 10 on the module in slot 300.	

	(@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.		
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Remarks

- When you specify a range of channels with this command, any channels that are invalid will be ignored (no error will be generated) but the first and last channel in the range must be valid for the selected function.
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication: "±OVLD" from the front panel or "±9.9E+37" from the remote interface.
- The *RST command will clear the scan list and set all measurement parameters to their factory settings. The Instrument Preset (SYSTem:PRESet command) will not clear the scan list; however, this command will clear reading memory and all stored statistical data.

Examples

The following program segment configures the instrument for frequency measurements on channel 04 in slot 300. The READ? command places the instrument in the "wait-for-trigger" state, scans the channel once, and then sends the reading to reading memory and the instrument's output buffer. The default range (autorange) and resolution (fixed at 6¹/₂ digits) are used for the measurement.

CONF:FREQ (@304) ROUT:SCAN (@304) READ?

Typical Response: +1.32130000E+03

The following program segment configures the instrument for frequency measurements on channels 03 and 08 in slot 100. The INITiate command places the instrument in the "wait-for-trigger" state, scans the channels once, and stores the readings in memory. The FETCh? command transfers the readings from reading memory to the instrument's output buffer.

```
CONF:FREQ 100,(@103,108)
ROUT:SCAN (@103,108)
INIT
FETC?
```

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

The following program segment configures channel 10 on the module in slot 300 for a frequency measurement. The READ? command places the instrument in the "wait-for-trigger" state, initiates a trigger, and then

sends the reading to reading memory and the instrument's output buffer. The default range (autorange) and resolution (fixed at $6\frac{1}{2}$ digits) are used for the measurement.

CONF:FREQ (@310) READ?

Typical Response: +10.13240000E+03

See Also

CONFigure?

FETCh?

INITiate

MEASure:FREQuency?

MEASure:PERiod?

READ?

ROUTe:SCAN

[SENSe:]FREQuency:RANGe:LOWer

[SENSe:]FREQuency:VOLTage:RANGe:AUTO

CONFigure:RESistance CONFigure:FRESistance

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

Syntax

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

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

Description

These commands configure the channels for 2-wire (RESistance) or 4wire (FRESistance) resistance measurements but *do not* initiate the scan.

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

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34908A 40 Channel Single-Ended Multiplexer Module (does not support 4-wire measurement)

Parameters

Name	Туре	Range of Values	Default Value
<range></range>	Numeric	Expected value in ohms, up to 100 MW.	AUTO
<resolution></resolution>	Numeric	Desired resolution in ohms.	0.000003 x Range (1 PLC)
<scan_list></scan_list>	Scan List	One or more channels, as shown:	This is a required parameter.
		(@310) - channel 10 on the module in slot 300.	
		(@305:310) - channels 05 through 10 on the module in slot 300.	
		(@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	

Remarks

- For the FRESistance version of this command, channel *n* is paired with channel *n*+10 (34901A) or *n*+8 (34902A) to provide source and sense connections.
- When you specify a range of channels with this command, any channels that are invalid will be ignored (no error will be generated) but the first and last channel in the range must be valid for the selected function.
- You can allow the instrument to automatically select the measurement range using *autoranging* or you can select a fixed range using manual ranging. Autoranging is convenient because the instrument decides which range to use for each measurement based on the input signal. For fastest scanning operation, use manual ranging on each measurement (some additional time is required for autoranging since the instrument has to make a range selection).
- If you select autoranging (by specifying "AUTO" or "DEF"), an error will be generated if you specify a discrete value for the <*resolution>* parameter. When autoranging is combined with a discrete resolution, the instrument cannot accurately resolve the integration time (especially if the input signal is continuously changing). If your application requires autoranging, be sure to specify "AUTO" for the <*resolution>* parameter, or omit the parameter from the command and use the [SENSe:]VOLTage[:DC]NPLC command to specify the desired integration time.
- Autorange thresholds: Down range at: <10% of range Up range at: >120% of range
- Since these commands reset all measurement parameters on the

specified channels to their default values, be sure to send the CONFigure command before setting any other measurement parameters.

- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication: "±OVLD" from the front panel or "±9.9E+37" from the remote interface.
- The *RST command will clear the scan list and set all measurement parameters to their factory settings. The Instrument Preset (SYSTem:PRESet command) will not clear the scan list; however, this command will clear reading memory and all stored statistical data.

Examples

The following program segment configures the instrument for 2-wire resistance measurements on channel 04 in slot 300. The READ? command places the instrument in the "wait-for-trigger" state, scans the channel once, and then sends the reading to reading memory and the instrument's output buffer. The default range (autorange) and resolution (1 PLC) are used for the measurement.

CONF:RES (@304) ROUT:SCAN (@304) READ?

Typical Response: +1.32130000E+04

The following program segment configures the instrument for 2-wire resistance measurements on channels 03 and 08 in slot 100. The INITiate command places the instrument in the "wait-for-trigger" state, scans the channels once, and stores the readings in memory. The FETCh? command transfers the readings from reading memory to the instrument's output buffer. The 1 k Ω range is selected with 1 Ω resolution.

```
CONF:RES 1000,1,(@103,108)
ROUT:SCAN (@103,108)
INIT
FETC?
```

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

The following program segment configures the instrument for 4-wire resistance measurements on channels 03 and 08 in slot 100. The INITiate command places the instrument in the "wait-for-trigger" state,

scans the channels once, and stores the readings in memory. The FETCh? command transfers the readings from reading memory to the instrument's output buffer. The 1 k Ω range is selected with 1 Ω resolution.

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

See Also

CONFigure Subsystem Introduction

CONFigure?

FETCh?

INITiate

MEASure:RESistance?

MEASure:FRESistance?

READ?

ROUTe:SCAN

[SENSe:]RESistance:OCOMpensated

CONFigure:TEMPerature

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

Syntax

CONFigure:TEMPerature {<probe_type>|DEF},{<type>|DEF}[,1[, {<resolution>|MIN|MAX|DEF}]],(@<scan_list>)

Description

These commands configure the channels for temperature measurements but *do not* initiate the scan. If you omit the optional *<ch_list>* parameter, this command applies to the currently defined scan list.

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

The following table shows which temperature transducers are supported by each of the multiplexer modules.

Module	Thermocouple	RTD 2- Wire	RTD 4- Wire	Thermistor
34901A Armature Multiplexer	Yes	Yes	Yes	Yes
34902A Reed Multiplexer	Yes	Yes	Yes	Yes
34908A Armature Multiplexer (1-Wire)	Not Recommended ¹	Yes	No	Yes

¹With a one-wire multiplexer, even very small ground currents can introduce substantial measurement error.

Parameters

Name	Туре	Range of Values	D
<probe_type></probe_type>	Discrete	{TCouple RTD FRTD THERmistor DEF}	ТСо
<type></type>	Discrete	{B E J K N R S T} For TCouple: For RTD {85 91} For FRTD {85 91} For THERmistor {2252 5000 10000}	For TCc For For For THE
<resolution></resolution>	Numeric	The resolution in degrees Celsius, Fahrenheit, or Kelvin. The temperature scale in use is specified by the UNIT:TEMPerature command.	1 PL
<scan_list></scan_list>	Scan List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	This parai

Remarks

- For temperature measurements, the instrument internally selects the range; you cannot select which range is used. In the command syntax, be sure to include "1" as shown for the *<range>* parameter (preceding the *<resolution>* parameter).
- For RTD and FRTD measurements, use "85" to specify a = 0.00385 or "91" to specify a = 0.00391. Note that this command also redefines the scan list. The default (DEF) type is "85" (a = 0.00385).
- When you specify a range of channels with this command, any channels that are invalid will be ignored (no error will be generated) but the first and last channel in the range must be valid for the selected function.
- For thermocouple measurements, the instrument internally selects the 100 mV range. For thermistor and RTD measurements, the instrument autoranges to the correct range for the transducer resistance measurement. Specify the paired channel in the lower bank (source) as the *<ch_list>* channel.
- Thermocouple measurements require a reference junction temperature (see [SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction:TYPE command). For the reference junction temperature, you can use an internal measurement on the module's terminal block (34901A only), an external thermistor or RTD measurement, or a known fixed junction temperature. If you select an external reference, the instrument makes thermocouple measurements relative to a previously-stored RTD or thermistor measurement stored in the reference register.
- By default, a fixed reference junction temperature of 0.0 °C is used (see [SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction

command).

- If you select autoranging (by specifying "AUTO" or "DEF"), an error will be generated if you specify a discrete value for the <*resolution>* parameter. When autoranging is combined with a discrete resolution, the instrument cannot accurately resolve the integration time (especially if the input signal is continuously changing). If your application requires autoranging, be sure to specify "DEF" for the <*resolution>* parameter, or omit the parameter from the command and use the [SENSe:]TEMPerature:NPLC command to specify the desired integration time.
- Since this command resets all measurement parameters on the specified channels to their default values, be sure to send the CONFigure command before setting any other measurement parameters.
- For 4-wire resistance measurements, the instrument automatically pairs channel *n* in Bank 1 with channel *n+10* in Bank 2 (34901A) or *n+8* (34902A) to provide the source and sense connections. For example, make the source connections to the HI and LO terminals on channel 02 in Bank 1 and the sense connections to the HI and LO terminals on channel 12 (34901A) or 10 (34902A) in Bank 2.Specify the paired channel in Bank 1 (source) as the <*ch_list*> channel (channels in Bank 2 are not allowed in the <*ch_list*>).
- Because channels are automatically paired for 4-wire resistance measurements (see previous Remark), attempts to re-configure the paired channel in Bank 2 will result in an error. For example:

```
CONF:VOLT:DC (@105) !Configure Bank 2 channel for
DC voltage measurements
ROUT:SCAN (@101:110) !Add channels to scan list
CONF:FRES (@101) !Generates error and clears
scan list
```

- For 4-wire RTD measurements, the instrument automatically enables the autozero function.
- The *RST command will clear the scan list and set all measurement parameters to their factory settings. The Instrument Preset (SYSTem:PRESet command) will not clear the scan list; however, this command will clear reading memory and all stored statistical data.

Examples

The following program segment configures the instrument for B-type thermocouple measurements on channel 04 in slot 300. The READ? command places the instrument in the "wait-for-trigger" state, scans the channel once, and then sends the reading to reading memory and the instrument's output buffer. The default resolution (fixed at 6½ digits) is used for the measurement (assumes default temperature units).

```
CONF:TEMP TC,B,(@304)
ROUT:SCAN (@304)
READ?
```

Typical Response: +3.65640000E+01

The following program segment configures the instrument for 5 k Ω thermistor measurements on channels 03 and 08 in slot 100. The INITiate command places the instrument in the "wait-for-trigger" state, scans the channels once, and stores the readings in memory. The FETCh? command transfers the readings from reading memory to the instrument's output buffer. This 2-wire measurement is made with 0.1 °C resolution (assumes default temperature units).

```
CONF:TEMP THER,5000,1,0.1,(@103,108)
ROUT:SCAN (@103,108)
INIT
FETC?
```

Typical Response: +2.47150000E+01,+3.12130000E+01

The following program segment configures the current scan list for a 2wire RTD measurement (no *<ch_list>* is specified). The READ? command places the instrument in the "wait-for-trigger" state, initiates a trigger, and then sends the reading to reading memory and the instrument's output buffer. The default resolution (fixed at 6½ digits) is used for the measurement (assumes default temperature units).

CONF:TEMP RTD,85 (@203) READ?

Typical Response:+2.12320000E+01

See Also

CONFigure?

FETCh?

INITiate

MEASure: TEMPerature?

READ?

ROUTe:SCAN

[SENSe:]TEMPerature:NPLC

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

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

UNIT:TEMPerature

CONFigure:TOTalize

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

Syntax

CONFigure:TOTalize <mode>,(@<scan_list>)

Description

This command configures the instrument to read the specified totalizer channels on the multifunction module but *does not* initiate the scan. To read the totalizer during a scan without resetting the count, set the *<mode>* to READ. To read the totalizer during a scan and reset the count to 0 after it is read, set the *<mode>* to RRESet (this means "read and reset").

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

Used With:

• 34907A Multifunction Module (totalize channel only)

Parameters

Name	Туре	Range of Values	Default Value
<mode></mode>	Discrete	{READ RRESet}	READ
<scan_list></scan_list>	Scan List	One or more totalizer channels, as shown: (@303) - channel 03 on the module in slot 300. (@103,203,303) - channel 03 on the modules on slot 100, 200, and 300.	This is a required parameter.

Remarks

- The totalizer channel is always of the form **s**03, where **s** is the first digit of the slot number.
- The maximum count is 67,108,863 (2²⁶ 1). The count rolls over to 0 after reaching the maximum allowed value.
- If the count rolls over to 0, the "Totalizer Overflow" bit (bit 11) is set in the Questionable Data register. For more information on the Status System for the instrument, see Status System Introduction.
- Selecting the RRESet mode performs a synchronized read and reset operation on the specified totalizer channels. If you were to use discrete commands, such as READ? and [SENSe:]TOTalize:CLEar:IMMediate, you would likely lose counts occurring between the two commands.
- The *RST command will clear the scan list and set all measurement parameters to their factory settings. The Instrument Preset (SYSTem:PRESet command) will not clear the scan list; however, this command will clear reading memory and all stored statistical data.

Examples

The following command configures totalizer channel 03 on the module in slot 200 to be read without resetting its count.

CONF:TOT READ, (@203)

The following command configures totalizer channel 03 on the module in slot 300 to be reset to 0 after it is read.

```
CONF:TOT RRES, (@303)
```

See Also

CONFigure Subsystem Introduction

CONFigure?

FETCh?

INITiate

READ?

[SENSe:]TOTalize:DATA?

CONFigure:VOLTage:AC CONFigure:VOLTage:DC

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

Syntax

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

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

Description

These commands configure the channels in the *<scan_list>* for AC or DC voltage measurements but *do not* initiate the scan.

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

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<range></range>	Numeric	Expected value in volts	AUTO
<resolution></resolution>	Numeric	Desired resolution in volts.	0.000003 x Range (1 PLC)
<scan_list></scan_list>	Scan List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the	This is a required parameter.
		module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	

Remarks

- When you specify a range of channels with this command, any channels that are invalid will be ignored (no error will be generated) but the first and last channel in the range must be valid for the selected function.
- You can allow the instrument to automatically select the measurement range using *autoranging* or you can select a fixed range using manual ranging. Autoranging is convenient because the instrument decides which range to use for each measurement based on the input signal. For fastest scanning operation, use manual ranging on each measurement (some additional time is required for autoranging since the instrument has to make a range selection).
- If you select autoranging (by specifying "AUTO" or "DEF"), an error will be generated if you specify a discrete value for the *<resolution>* parameter. When autoranging is combined with a discrete resolution, the instrument cannot accurately resolve the integration time (especially if the input signal is continuously changing). If your application requires autoranging, be sure to specify "AUTO" for the *<resolution>* parameter or omit the parameter from the command.
- Autorange thresholds: Down range at: <10% of range Up range at: >120% of range
- Because this command resets all measurement parameters on the specified channels to their default values, be sure to send the CONFigure command *before* setting any other measurement parameters.
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload

indication: " \pm OVLD" from the front panel or " \pm 9.9E+37" from the remote interface.

- For AC measurements, the resolution is fixed at 6½ digits. The only way to control the reading rate for AC measurements is by changing the channel delay or by setting the AC filter to the highest frequency limit. The *<resolution>* parameter only affects the number of digits shown on the front panel.
- The *RST command will clear the scan list and set all measurement parameters to their factory settings. The Instrument Preset (SYSTem:PRESet command) will not clear the scan list; however, this command will clear reading memory and all stored statistical data.

Examples

These commands show the CONFigure:VOLTage:AC command. In each case, you could substitute the CONFigure:VOLTage:DC command and the example would be valid.

The following program segment configures the instrument for AC voltage measurements on channel 04 in slot 300. The READ? command places the instrument in the "wait-for-trigger" state, scans the channel once, and then sends the reading to reading memory and the instrument's output buffer. The default range (autorange) and resolution (fixed at 6½ digits) are used for the measurement.

CONF:VOLT:AC (@304) ROUT:SCAN (@304) READ?

Typical Response: +1.86850000E-03

The following program segment configures the instrument for AC voltage measurements on channels 03 and 08 in slot 100. The INITiate command places the instrument in the "wait-for-trigger" state, scans the channels once, and stores the readings in memory. The FETCh? command transfers the readings from reading memory to the instrument's output buffer. The 1 V range is selected.

CONF:VOLT:AC 1,(@103,108) ROUT:SCAN (@103,108) INIT FETC?

Typical Response: +4.27150000E-03,+1.32130000E-03

The following program segment configures channel 10 on the module in slot 300 for an AC voltage measurement. The READ? command places the instrument in the "wait-for-trigger" state, initiates a trigger, and then sends the reading to reading memory and the instrument's output buffer. The default range (autorange) and resolution (fixed at 6½ digits) are used for the measurement.

CONF:VOLT:AC (@310) READ?

Typical Response: +1.26360000E-02

See Also

CONFigure Subsystem Introduction

CONFigure:CURRent:AC

CONFigure?

FETCh?

INITiate

MEASure[:VOLTage]:AC?

MEASure[:VOLTage][:DC]?

READ?

ROUTe:CHANnel:DELay

ROUTe:SCAN

[SENSe:]VOLTage:AC:BANDwidth

DATA Subsystem Introduction

Command Summary DATA:LAST? DATA:POINts? DATA:POINts:EVENt:THReshold DATA:POINts:EVENt:THReshold? DATA:REMove?

DATA:LAST?

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

Syntax

DATA:LAST? [<num_rdgs>,](@<channel>)

Description

This query returns the most recent reading or readings taken on the specified channel during the scan.

Parameters

Name	Туре	Range of Values	Default Value
<num_rdgs></num_rdgs>	Numeric	An integer from 1 to the number of readings stored in memory for the specified <i><channel></channel></i> .	1
<channel></channel>	Channel	A single channel, specified as in the following examples. (@310) - channel 10 on the module in slot 300. (@214) - channel14 on the module in slot 200.	This is a required parameter.

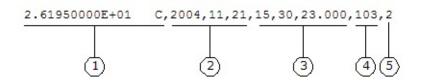
Remarks

- The query returns the readings in order, starting with the earliest reading in the group of recent readings. If you specify more readings than are currently stored in memory, the instrument generates an error message.
- Readings can be acquired during a scan using the multiplexer or digital modules.
- Each reading is returned with some combination of measurement units, time stamp, channel number, and alarm status information, depending on the settings set by the FORMat:READing commands. The time stamp is either in relative format (time in seconds since the beginning of the scan) or absolute format (time of day with date, based on the instrument's clock as set by the SYSTem:DATE and SYSTem:TIME commands). The choice of absolute and relative time is determined by the FORMat:READing:TIME:TYPE command.

Return Format

The query returns the specified number of readings for the specified channel (or the internal DMM). If no data is available for the specified channel, the query returns 0 for each field.

For example:



1 Reading with Units (26.195 °C)

2 Date (November 21, 2004)

- **3** Time of Day (3:30:23.000 PM)
- **4** Channel Number
- **5** Alarm Limit Threshold Crossed (0
- = No Alarm, 1 = LO, 2 = HI)

Example

The following query returns the last reading on channel 08 in slot 100.

DATA:LAST? (@108)

Typical Response: +1.84280000E-05 VDC,2004,11,21,14,54,33.104,108,0 See Also

DATA Subsystem Introduction FORMat Subsystem Introduction SYSTem:DATE SYSTem:TIME

DATA:POINts?

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

Syntax

DATA:POINts?

Description

This query returns the total number of readings currently stored in reading memory from a scan.

Remarks

- You can read the count at any time, even during a scan.
- You can store at least 50,000 readings in memory and all readings are automatically time stamped. If memory overflows, a bit in the STATUS:QUEStionable:CONDition? register is set and new readings will overwrite the first (oldest) readings stored. The most recent readings are always preserved. Reading memory is not cleared when you read it.
- The questionable status bit will be cleared when memory is cleared. The questionable status bit will not be cleared if memory is emptied with DATA:REMove? or R?.
- The instrument clears all readings from memory when a new scan is initiated, when any measurement parameters are changed (CONFigure and SENSe commands), and when the triggering configuration is changed (TRIGger commands).
- The instrument clears all readings from memory after a Factory Reset (*RST command) or after an Instrument Preset (SYSTem:PRESet command).

Return Format

The query returns a value between 0 and 50,000 as a signed integer, indicating the number of readings currently stored in reading memory.

Example

The following query returns the number of readings in memory.

DATA: POIN?

Typical Response: +320

See Also

DATA Subsystem Introduction

DATA:REMove?

DATA:POINts:EVENt:THReshold

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

Syntax

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

DATA:POINts:EVENt:THReshold?

Description

This command sets a bit in the *Standard Operation Register* group event register when the specified number of readings have been stored in reading memory from a scan. The "Memory Threshold" bit (bit 9) is set to a "1" in the event register when the number of stored readings is greater than or equal to the specified memory threshold.

NOTE

For more information on the Status System for the instrument, see Status System Introduction.

Parameters

Name	Туре	Range of Values	Default Value
<num_rdgs></num_rdgs>	Numeric	An integer from 1 to 50,000	This is a required parameter. The factory default value is 1.

Remarks

- To report any subsequent events, the reading count must first drop below the programmed memory threshold before reaching the threshold again. Use the R? or DATA:REMove command to remove readings from memory.
- To enable the "Memory Threshold" bit (bit 9) to be reported to the Status Byte, use the STATus:OPERation:ENABle command.
- Once the "Memory Threshold" bit is set, it will remain set until cleared by the STATus:OPERation[:EVENt]? command or *CLS (clear status) command.
- The instrument resets the memory threshold to "1" after a Factory Reset (*RST command) or when mainframe power is cycled. The memory threshold value is *not* reset by the SYSTem:PRESet, *CLS, or STATus:PRESet command.

Return Format

The query returns the number of readings currently specified as the memory threshold as a signed integer.

Examples

The following command sets the memory threshold to 125 readings.

DATA: POIN: EVEN: THR 125

The following query reads the memory threshold setting.

DATA: POIN: EVEN: THR?

Typical Response: +125

See Also
DATA Subsystem Introduction

STATus:OPERation:ENABle

DATA:REMove?

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

Syntax

DATA:REMove? <num_rdgs>

Description

This query reads and clears the specified number of readings from the non-volatile memory. This allows you to continue a scan without losing data stored in memory (if memory becomes full, new readings will overwrite the first readings stored). The specified number of readings are cleared from memory, starting with the oldest reading.

Parameters

Name	Туре	Range of Values	Default Value
<num_rdgs></num_rdgs>	Numeric	An integer representing the number of readings to be read and erased from memory.	This is a required parameter.

Remarks

- You can remove readings from memory at any time, even during a scan.
- You can store at least 50,000 readings in memory during a scan. Readings are stored only during a scan. If memory overflows, the new readings will overwrite the first (oldest) readings stored; the most recent readings are always preserved. In addition, bit 9 is set in the Questionable Data Register's condition register (see Status System Introduction).
- If fewer than the specified number of readings are currently in memory, an error will be generated. You can use the DATA:POINts? query to determine the total number of readings currently in memory.
- Each reading is returned with some combination of measurement units, time stamp, channel number, and alarm status information, depending on the settings set by the FORMat:READing commands. The time stamp is either in relative format (time in seconds since the beginning of the scan) or absolute format (time of day with date, based on the instrument's clock as set by the SYSTem:DATE and SYSTem:TIME commands). The choice of absolute and relative time is determined by the FORMat:READing:TIME:TYPE command.
- The instrument clears all readings from memory when a new scan is initiated, when any measurement parameters are changed (CONFigure and SENSe commands), and when the triggering configuration is changed (TRIGger commands).
- The instrument clears all readings from memory after a Factory Reset (*RST command), after an Instrument Preset (SYSTem:PRESet command), or when mainframe power is cycled.

Return Format

The query returns the specified number of readings (with formatting as set by the FORMat:READing commands) and then erases them from memory. Multiple responses are separated by commas.

Example

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

DATA:REM? 3

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

DATA Subsystem Introduction

DATA:POINts?

FORMat Subsystem Introduction

R?

DIAGnostic Subsystem Introduction

Command Summary DIAGnostic:DMM:CYCLes? DIAGnostic:DMM:CYCLes:CLEar DIAGnostic:PEEK:SLOT:DATA? DIAGnostic:POKE:SLOT:DATA DIAGnostic:RELay:CYCLes? DIAGnostic:RELay:CYCLes:CLEar

DIAGnostic:DMM:CYCLes?

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

Syntax

DIAGnostic:DMM:CYCLes?

Description

This query returns the cycle count of the three backplane relays on the internal DMM. These relays open or close when a function or range is changed on a module. The query returns three numbers indicating the cycle count on relays 1, 2, and 3 (which correspond to relays K102, K103, and K104 respectively).

Remarks

- The internal DMM is an optional assembly for the Keysight 34970A/34972A. The instrument generates an error with this command if the internal DMM is disabled (see INSTrument:DMM command) or not installed in the mainframe.
- To read the cycle count on the multiplexer and switch modules, use the DIAGnostic:RELay:CYCLes? command.
- See the *Keysight 34970A/34972A Service Guide* for information on replacing relays.

Return Format

The query returns the cycle count on the specified internal DMM relay.

Example

The following query returns the cycle count on the three relays.

DIAG:DMM:CYCL?

Typical Response: +58023,+57291,+66239

See Also DIAGnostic Subsystem Introduction DIAGnostic:DMM:CYCLes:CLEar DIAGnostic:RELay:CYCLes?

DIAGnostic:DMM:CYCLes:CLEar

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

Syntax

DIAGnostic:DMM:CYCLes:CLEar {1|2|3}

Description

This command resets the relay cycle count on the specified internal DMM relay.

Remarks

• You must unsecure the instrument with CALibration:SECure:STATe to reset the cycle count.

Example

The following command resets the relay cycle count on internal DMM relay 2.

DIAGnostic:DMM:CYCLes:CLEar 2

See Also DIAGnostic Subsystem Introduction DIAGnostic:DMM:CYCLes?

DIAGnostic:PEEK:SLOT:DATA? DIAGnostic:POKE:SLOT:DATA

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

Syntax

DIAGnostic:PEEK:SLOT:DATA? {100|200|300}

DIAGnostic:POKE:SLOT:DATA {100|200|300}, <quoted_string>

Description

The POKE command allows you to add a custom label of up to 10 characters to the module in the specified slot. Characters beyond the tenth character are truncated, and no error message is generated. The PEEK query returns the label string.

Parameters

Name	Туре	Range of Values	Default Value
<quoted_string></quoted_string>	Quoted ASCII String	A quoted ASCII string of up to 10 characters.	This is a required parameter.

Remarks

- One possible use for this command is to allow you to differentiate between modules of the same type from within your program.
- The custom label is stored in non-volatile memory on the module.
- You must unsecure the instrument with CALibration:SECure:STATe OFF before you can store the custom label.

Return Format

The PEEK query returns the label string.

Examples

The following command adds a label to the module in slot 200.

```
DIAG:POKE:SLOT:DATA 200, "TestMod1"
```

The following query returns the label associated with slot 200.

DIAG:PEEK:SLOT:DATA? 200

Typical Response: TestMod1

See Also

DIAGnostic Subsystem Introduction

DIAGnostic:RELay:CYCLes?

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

Syntax

DIAGnostic:RELay:CYCLes? (@<ch_list>)

Description

This query reads the cycle count on the specified channels. In addition to the channel relays, you can also query the count on the Analog Bus relays and bank relays.

Used With:

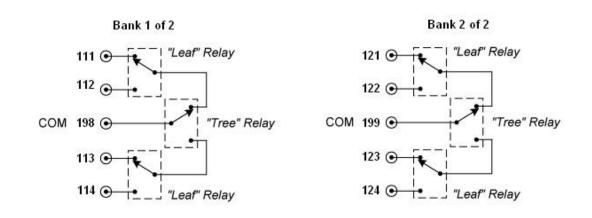
• All modules except for 34907A

Parameters

Name	Туре	Range of Values	Default Value
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@302) - channel 12 on the module in slot 300. (@311:314) - channels 11 through 14 on the module in slot 300. (@201:212,213,322:323,198) - channels 1 through 12 and 13 on the module in slot 200, channels 22 through 23 on the module in slot 300, and tree relay 98 on the module in slot 100.	This is a required parameter.

Remarks

 On the RF Multiplexer modules, each bank consists of two *leaf* relays and one *tree* relay (see diagram below). The module stores the cycle count for each of the three relays on all four banks. The DIAGnostic:RELay:CYCLes? query always returns the same count for channels 111 and 112, 113 and 114, 121 and 122, and 123 and 124.



a. The *reset* state of the three relays is shown above for Bank 1 (a reset operation selects the lowest channel within the bank). The cycle count for any of the three relays is incremented whenever the relay transitions from the reset state. Therefore, the cycle count reflects a complete transition of the relay from, and back to, the reset state. For example, closing Channel 111 will not increment the *leaf* relay cycle count, but closing Channel 112 will increment the cycle count.

- To read the cycle count on the relays associated with function selection and isolation on the internal DMM, use the DIAGnostic:DMM:CYCLes? command.
- See the *Keysight 34970A/34972A Service Guide* for information on replacing relays.

Return Format

The query returns the cycle count for each channel specified. The value returned is between 0 and 4,294,967,294 (32-bit value). Multiple responses are separated by commas.

Example

The following query returns the cycle count on channels 03 and 13 in slot 100.

DIAG:REL:CYCL? (@103,113)

Typical Response: +76289,+11055

See Also

DIAGnostic Subsystem Introduction DIAGnostic:DMM:CYCLes? DIAGnostic:RELay:CYCLes:CLEar

DIAGnostic:RELay:CYCLes:CLEar

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

Syntax

DIAGnostic:RELay:CYCLes:CLEar (@<ch_list>)

Description

This command resets the cycle count on the specified channels.

Parameters

Name	Туре	Range of Values	Default Value
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If this parameter is omitted, the command applies to the current scan list.

Remarks

- The instrument must be unsecured in order to reset the cycle count. See the CALibration:SECure:STATe command for more information on unsecuring the instrument.
- On the RF Multiplexer modules (34905A, 34906A), each bank consists of two *leaf* relays and one *tree* relay (see DIAGnostic:RELay:CYCLes? command). Clearing the cycle count on a specific channel will clear the count on *all three* relays in the corresponding bank.

Example

The following command clears the cycle count on channels 03 and 13 in slot 100.

DIAG:REL:CYCL:CLE (@103,113)

See Also

DIAGnostic Subsystem Introduction CALibration:SECure:STATe DIAGnostic:RELay:CYCLes?

DISPlay Subsystem Introduction

Command Summary DISPlay DISPlay? DISPlay:TEXT DISPlay:TEXT? DISPlay:TEXT:CLEar

DISPlay

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

Syntax

DISPlay <state>

DISPlay?

Description

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

Parameters

Name	Туре	Range of Values	Default Value
<state></state>	Boolean	$\{OFF 0 ON 1\}$	ON

Remarks

- All keys except *Local* are disabled when the display is off.
- You can disable the front-panel display from the remote interface only.
- Sending a text message to the display (see DISPlay:TEXT command) overrides the display state; this means that you can display a message even if the display is turned off.
- The front-panel display is automatically enabled when power is cycled, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command). It is also enabled when you press the *Local* key. The OFF state is remembered if you return to remote.

Return Format

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

Examples

The following command disables the front-panel display.

DISP OFF

The following query returns the front-panel display setting.

DISP?

Typical Response: 0

See Also DISPlay Subsystem Introduction DISPlay:TEXT

DISPlay:TEXT

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

Syntax

DISPlay:TEXT <quoted_string>

DISPlay:TEXT?

Description

This command displays a text message on the instrument's front-panel display. The instrument can display up to 12 characters on the front panel; any additional characters are truncated (no error is generated).

Parameters

Name	Туре	Range of Values	Default Value
<quoted_string></quoted_string>	Quoted ASCII String	A string of up to 12 characters enclosed in quotation marks. You can use letters (A-Z), numbers (0-9), and special characters like "@", "%", "*", and so on. Use "#" character to display a degree symbol (°).	This is a required parameter.

Remarks

- Commas, periods, colons, and semicolons share a display space with the preceding character, and are not considered individual characters.
- While a message is displayed on the front panel, readings from a scan or monitor are not sent to the front-panel display.
- Sending a text message to the display overrides the display state (see DISPlay:STATe command); this means that you can display a message even if the display is turned off.
- The display text is not stored as part of the instrument state by the *SAV command.
- The front-panel display is automatically cleared when power is cycled, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

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

Examples

The following commands display a message on the front panel (the quotes are not displayed).

DISP:TEXT "SCANNING ..." or DISP:TEXT 'SCANNING'

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

DISP:TEXT?

Typical Response: "SCANNING ..."

See Also DISPlay Subsystem Introduction DISPlay:TEXT:CLEar

DISPlay:TEXT:CLEar

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

Syntax

DISPlay:TEXT:CLEar

Description

This command clears the text message displayed on the instrument's front-panel display (see DISPlay:TEXT command).

Remarks

- Clearing the text message does not override the display state (see DISPlay:STATe command); if the display was disabled prior to clearing the text message, the display will remain disabled.
- The front-panel display is automatically cleared when power is cycled, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Example

The following command clears the text message on the front panel.

DISP:TEXT:CLEAR

See Also

DISPlay Subsystem Introduction

DISPlay

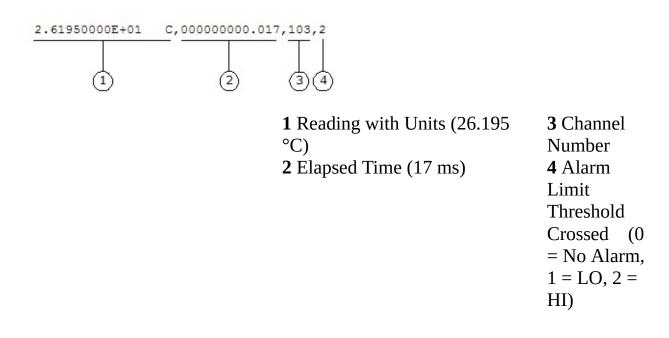
DISPlay:TEXT

FORMat Subsystem Introduction

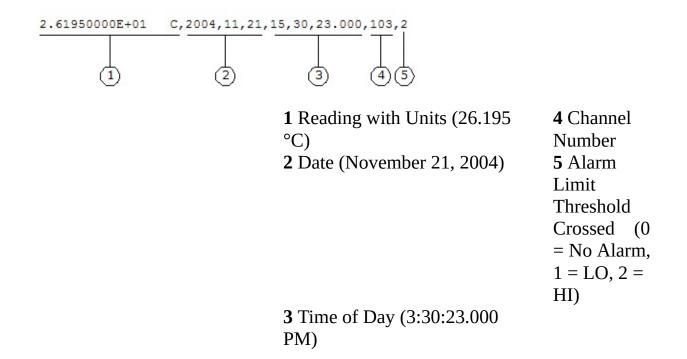
During a scan, the instrument automatically adds a time stamp to all readings and stores them in memory. Each reading is also stored with measurement units, time stamp, channel number, and alarm status information. You can specify which information you want returned with the readings (from the front panel, all of the information is available for viewing). The reading format applies to all readings being removed from the instrument from a scan; you cannot set the format on a per-channel basis. The examples below show a reading in relative and absolute format with all fields enabled.

Note that absolute format shows the time of day with the date, and relative time shows the time since the start of the scan.

Relative Format (Default):



Absolute Format (Default):



The FORMat commands are valid only with the following Keysight 34970A/34972A plug-in modules, which can be configured to be part of a scan. The internal DMM must also be installed and enabled.

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34903A 20 Channel Actuator/GP Switch Module
- 34904A 4 x 8 Two-Wire Matrix Module
- 34905A 2 GHz Dual 1:4 RF Mux, 50 Ohm Module
- 34906A 2 GHz Dual 1:4 RF Mux, 75 Ohm Module
- 34907A Multifunction Module
- 34908A 40 Channel Single-Ended Multiplexer Module

Command Summary

FORMat:READing:ALARm? FORMat:READing:ALARm? FORMat:READing:CHANnel FORMat:READing:CHANnel? FORMat:READing:TIME FORMat:READing:TIME? FORMat:READing:TIME:TYPE FORMat:READing:UNIT?

FORMat:READing:ALARm

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

Syntax

FORMat:READing:ALARm <state>

FORMat:READing:ALARm?

Description

This command disables or enables the inclusion of alarm information with data retrieved by the READ? command, the FETCh? command, and other queries of scan results. This command operates in conjunction with the other FORMat:READing commands (they are not mutually exclusive). See Format Subsystem Introduction for examples of fullyformatted results from a scan.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34907A Multifunction Module (digital input only)
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<state></state>	Boolean	{OFF 0 ON 1}	This is a required parameter. The factory reset value is OFF (disabled).

Remarks

- The reading format applies to all readings being retrieved from the instrument; you cannot set the format on a per-channel basis.
- The CONFigure and MEASure? commands automatically disable the alarm setting.
- The alarm setting is stored in volatile memory and will be disabled (OFF) when power is turned off or after a Factory Reset (*RST command).

Return Format

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

Examples

The following command enables the inclusion of alarm information.

FORM:READ:ALAR ON

The following query returns the alarm setting.

FORM: READ: ALAR?

Typical Response: 1

See Also

FORMat Subsystem Introduction

FORMat:READing:CHANnel

FORMat:READing:CHANnel

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

Syntax

FORMat:READing:CHANnel < mode>

FORMat:READing:CHANnel?

Description

This command disables or enables the inclusion of channel number information with data retrieved by the READ? command, the FETCh? command, or other queries of scan results. This command operates in conjunction with the other FORMat:READing commands (they are not mutually exclusive). See Format Subsystem Introduction for examples of fully-formatted results from a scan.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34907A Multifunction Module (digital input only)
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<mode></mode>	Boolean	{OFF 0 ON 1}	This is a required parameter.
			The factory default value is OFF (disabled).

Remarks

- The reading format applies to all readings being retrieved from the instrument; you cannot set the format on a per-channel basis.
- The CONFigure and MEASure? commands automatically disable the channel setting.
- The channel setting is stored in volatile memory and will be disabled (OFF) when power is turned off or after a Factory Reset (*RST command).

Return Format

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

Examples

The following command enables the inclusion of channel number information.

FORM:READ:CHAN ON

The following query returns the channel number setting.

FORM: READ: CHAN?

Typical Response: 1

See Also

FORMat Subsystem Introduction FORMat:READing:ALARm FORMat:READing:TIME FORMat:READing:UNIT

FORMat:READing:TIME

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

Syntax

FORMat:READing:TIME < mode>

FORMat:READing:TIME?

Description

This command disables or enables the inclusion of a time stamp with data retrieved by the READ? command, the FETCh? command, or other queries of scan results. This command operates in conjunction with the other FORMat:READing commands (they are not mutually exclusive). See Format Subsystem Introduction for examples of fully-formatted results from a scan.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34907A Multifunction Module (digital input only)
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<mode></mode>	Boolean	{OFF 0 ON 1}	This is a required parameter.
			The factory default value is OFF (disabled).

Remarks

- The reading format applies to all readings being retrieved from the instrument; you cannot set the format on a per-channel basis.
- If enabled, the time stamp information is shown either in absolute time (time of day with date) or relative time (time in seconds since start of scan) as set by the FORMat:READing:TIME:TYPE command.
- The CONFigure and MEASure? commands automatically disable the time stamp setting.
- The time stamp setting is stored in volatile memory and will be disabled (OFF) when power is turned off or after a Factory Reset (*RST command).

Return Format

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

Examples

The following command enables the inclusion of a time stamp.

FORM:READ:TIME ON

The following query returns the time stamp setting.

FORM:READ:TIME?

Typical Response: 1

See Also

FORMat Subsystem Introduction FORMat:READing:ALARm FORMat:READing:CHANnel FORMat:READing:TIME:TYPE FORMat:READing:UNIT

FORMat:READing:TIME:TYPE

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

Syntax

FORMat:READing:TIME:TYPE <format>

FORMat:READing:TIME:TYPE?

Description

This command selects the time format for timestamps returned when FORMat:READing:TIME is ON. You can select absolute time (time of day with date) or relative time (time in seconds since start of scan). This command operates in conjunction with the other FORMat:READing commands (they are not mutually exclusive). See Format Subsystem Introduction for examples of fully-formatted results from a scan.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34907A Multifunction Module (digital input only)
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<format></format>	Discrete	{ABSolute RELative}	This is a required parameter.
			The factory default is RELative.

Remarks

- The reading format applies to all readings being retrieved from the instrument; you cannot set the format on a per-channel basis.
- In terms of reading stored data from memory, the relative format is considerably faster than the absolute format.
- The absolute format is based on the instrument's real-time clock as set by the SYSTem:DATE and SYSTem:TIME commands.
- The time format setting is stored in volatile memory and will be disabled (OFF) when power is turned off or after a Factory Reset (*RST command).

Return Format

The query returns ABS or REL.

Examples

The following command enables the absolute time format (readings are stored with time of day and date information).

FORM:READ:TIME:TYPE ABS FORM:READ:TIME ON

The following query returns the time format setting.

FORM:READ:TIME:TYPE?

Typical Response: ABS

See Also

FORMat Subsystem Introduction FORMat:READing:TIME SYSTem:DATE

SYSTem:TIME

FORMat:READing:UNIT

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

Syntax

FORMat:READing:UNIT < mode>

FORMat:READing:UNIT?

Description

This command disables or enables the inclusion of measurement units (VAC, VDC, OHM, etc.) with data retrieved by the READ? command, the FETCh? command, or other queries of scan results. This command operates in conjunction with the other FORMat:READing commands (they are not mutually exclusive). See Format Subsystem Introduction for examples of fully-formatted results from a scan.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34907A Multifunction Module (digital input only)
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<mode></mode>	Boolean	{OFF 0 ON 1}	This is a required parameter.
			The factory default value is OFF (disabled).

Remarks

- The reading format applies to all readings being retrieved from the instrument; you cannot set the format on a per-channel basis.
- The CONFigure and MEASure? commands automatically disable the unit setting.
- The unit setting is stored in volatile memory and will be disabled (OFF) when power is turned off or after a Factory Reset (*RST command).

Return Format

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

Examples

The following command enables the inclusion of measurement units.

FORM:READ:UNIT ON

The following query returns the measurement units setting.

FORM:READ:UNIT?

Typical Response: 1

See Also

FORMat Subsystem Introduction

FORMat:READing:ALARm

FORMat:READing:CHANnel

FORMat:READing:TIME

FORMat:READing:TIME:TYPE

IEEE-488 Common Commands Introduction

Command Summary
*CLS
*ESE
*ESE?
*ESR?
*IDN?
*OPC
*OPC?
*PSC
*PSC?
*RCL
*RST
*SAV
*SRE
*SRE?
*STB?
*TRG
*TST?
*WAI

*CLS

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

Syntax

*CLS

Description

This command, whose name derives from CLear Status, clears the event registers in all register groups. It also clears the error queue and the alarm queue, but it does not clear the enable registers.

Example

The following command clears the event register bits, alarm queue, and error queue.

*CLS

See Also

IEEE-488 Common Commands Introduction

*ESR?

STATus:OPERation[:EVENt]?

STATus:QUEStionable[:EVENt]?

*ESE

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

Syntax

*ESE <enable_val>

*ESE?

Description

This command enables bits in the enable register for the Standard Event Register group. The selected bits are then reported to bit 5 of the Status Byte Register.

NOTE

For more information on the Status System for the instrument, see Status System Introduction.

Parameters

Name	Туре	Range of Values	Default Value
<enable_val></enable_val>	Numeric	The decimal value equal to the binary- weighted sum of the bits in the register (see table below).	This is a required parameter.

Remarks

• The following table lists the bit definitions for the Standard Event Register.

Bit #	Bit Name	Decimal Value	Definition
0	Operation Complete	1	All commands prior to and including *OPC have been executed.
1	Not Used	Not Used	0 is returned.
2	Query Error	4	The instrument tried to read the output buffer but it was empty. Or, a new command line was received before a previous query has been read. Or, both the input and output buffers are full.
3	Device Error	8	A device-specific error has been generated. For a complete listing of the error messages, see Error Messages.
4	Execution Error	16	An execution error occurred. These error codes are in the range -100 to -199.
5	Command	32	

	Error		A command error occurred. These error codes are in the range -200 to -299.
6	Not Used	Not Used	0 is returned.
7	Power On	128	Power has been turned off and on since the last time the event register was read or cleared.

- Use the <enable_val> parameter to specify which bits will be enabled. The decimal value specified corresponds to the binary-weighted sum of the bits you wish to enable in the register. For example, to enable bit 2 (decimal value = 4), bit 3 (decimal value = 8), and bit 7 (decimal value = 128), the corresponding decimal value would be 140 (4 + 8 + 128).
- The *CLS (clear status) command will not clear the enable register but it does clear all bits in the event register.

Return Format

The query reads the enable register and returns a decimal value that corresponds to the binary-weighted sum of all bits set in the register. For example, if bit 3 (decimal value = 8) and bit 7 (decimal value = 128) are enabled, the query will return "+136".

Examples

The following command enables bit 4 (decimal value = 16) in the enable register. If an execution error occurs, this condition will be reported to the Status Byte Register (bit 4 will be set high).

*ESE 16

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

*ESE?

Typical Response: +16

See Also

IEEE-488 Common Commands Introduction

*ESR?

*ESR?

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

Syntax

*ESR?

Description

This command queries the <u>event register</u> for the *Standard Event Register* group. This is a read-destructive register, and the bits are cleared when you read the register.

NOTE

For more information on the Status System for the instrument, see Status System Introduction.

Remarks

• The following table lists the bit definitions for the Standard Event Register.

Bit #	Bit Name	Decimal Value	Definition
0	Operation Complete	1	All commands prior to and including *OPC have been executed.
1	Not Used	Not Used	0 is returned.
2	Query Error	4	The instrument tried to read the output buffer but it was empty. Or, a new command line was received before a previous query has been read. Or, both the input and output buffers are full.
3	Device Error	8	A device-specific error has been generated. For a complete listing of the error messages, see Error Messages.
4	Execution Error	16	An execution error occurred. These error codes are in the range -100 to -199.

5	Command Error	32	An command error occurred. These error codes are in the range -200 to -299.
6	Not Used	Not Used	0 is returned.
7	Power On	128	Power has been turned off and on since the last time the event register was read or cleared.

- In order to be reported to the Status Register, the corresponding bits in the event register must be enabled using the *ESE command.
- Once a bit is set, it remains set until cleared by reading the event register or execution of the *CLS (clear status) command.

Return Format

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

Example

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

*ESR?

Typical Response: +24

See Also

IEEE-488 Common Commands Introduction

*ESE

*CLS

*IDN?

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

Syntax

*IDN?

Description

This query reads the instrument's identification string, which includes the manufacturer name, the model name and firmware version information.

Return Format

For the **34970A**, the query returns a string with the following format:

HEWLETT-PACKARD,34970A,0,XX-Y-Z

where:

- XX Measurement processor firmware version
- Y I/O processor firmware version
- Z Front panel processor firmware version

For the **34972A**, the query returns a string with the following format:

Keysight Technologies,34972A,<serial#>,i.ii-o.oo-fp-fpga

where:

- i.ii I/O processor firmware version
- o.oo Measurement processor firmware version
- **fp** Front panel processor firmware version

fpga FPGA version

Example

The following query returns the instrument's identification string for a **34972A**.

*IDN?

Typical Response: Keysight Technologies,34972A,MY12345678,1.01-1.00-01-0002

The following query returns the instrument's identification string for a **34970A**.

*IDN?

Typical Response: HEWLETT-PACKARD,34970A,0,13-2-2

See Also

IEEE-488 Common Commands Introduction

*OPC *OPC?

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

Syntax

*OPC

*OPC?

Description

The command form starts the OPC state engine and returns. At the end of the current scan, bit 0 of the enable register for the Standard Event Register will be set to 1. The query form returns 1 to the output buffer at the completion of the current operation.

NOTE For more information on the Status System for the instrument, see Status System Introduction. For more information on the Standard Event Register, see *ESE.

Remarks

- This command enables you to synchronize your application with the instrument.
- You can configure SRQ interrupts to notify user applications.
- Note the difference between the *OPC command and the *OPC? query. The *OPC? query sets the output buffer to 1 at the completion of the current operation.

Examples

The following command returns immediately and causes the status system to set the "Operation Complete" bit at the end of the current scan.

*0PC

The following query sends "1" to the output buffer when the current operation completes.

*0PC?

Typical Response: +1

See Also

IEEE-488 Common Commands Introduction

*ESE

*PSC

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

Syntax

*PSC <state>

*PSC?

Description

Power-On Status Clear. This command enables or disables the clearing of certain enable registers at power on. With *PSC 0 specified, these registers are *not* cleared at power on. With *PSC 1 specified, these registers are cleared at power on. The following registers are affected:

Register Name	Command
Questionable	STATus:QUEStionable:ENABle
Data	
Register	
Standard	STATus:OPERation:ENABle
Operation	
Register	
Alarm	STATus:ALARm:ENABle
Register	
Status Byte	*SRE (Service Request Enable)
Register	
Standard	*ESE (Event Status Enable)
Event	
Register	

NOTE

The *PSC command does not affect the clearing of the condition or event registers, just the enable registers. For more information on the Status System for the instrument, see Status System Introduction.

Parameters

Name	Туре	Range of Values	Default Value
<state></state>	Boolean	{OFF 0 ON 1}	ON

Return Format

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

Examples

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

*PSC 0

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

*PSC?

Typical Response: 0

See Also

*SRE

*STB?

*SAV *RCL

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

*RCL {0|1|2|3|4|5}

*SAV {0|1|2|3|4|5}

Syntax

Description

These commands store and recall instrument states into the specified storage location. The *SAV command saves the current instrument state and overwrites any state previously stored in the same location is overwritten (no error is generated).

Remarks

- The instrument has six storage locations in non-volatile memory to store instrument states. You can store the instrument state in location 0, 1, 2, 3, 4, or 5, but you can only recall a state from a location that contains a previously stored state.
- LAN I/O configuration is not stored by a *SAV operation or recalled by a *RCL. Only instrument configuration is recalled.
- When shipped from the factory, all six storage locations are empty.
- State 0 is overwritten at power down.
- A Factory Reset (*RST command) does not affect the configurations stored in memory. Once a state is stored, it remains until it is overwritten.

Example

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

*SAV 1

See Also

IEEE-488 Common Commands Introduction

*RST

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

Syntax

*RST

Description

This command resets the instrument to the Factory configuration. See Factory Reset State for a complete listing of the instrument's Factory configuration.

Remarks

- This command does not affect any previously-stored instrument states (see *SAV command).
- This command does not affect I/O settings, such as IP address.
- The value of CALibration:SECure:STATe is not affected by *RST.

Example

The following command resets the instrument.

*RST

See Also

IEEE-488 Common Commands Introduction

*SRE

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

Syntax

*SRE <enable_val>

*SRE?

Description

This command enables bits in the enable register for the Status Byte Register. Once enabled, the corresponding bits may generate a Request for Service (RQS) in the Status Byte. This RQS event may generate a "call back" to your application as a type of asynchronous interrupt.

NOTE

For more information on the Status System for the instrument, see Status System Introduction.

Parameters

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

Remarks

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

Bit #	Bit Name	Decimal Value	Definition
0	Not Used	1	Always zero.
1	Alarm Summary	2	One or more bits are set in the Alarm Register (bits must be enabled).
2	Error Queue	4	One or more errors have been stored in the Error Queue. Use the SYSTem:ERRor ? query to read and delete errors.
3	Questionable Data Summary	8	One or more bits are set in the Questionable Data Register (bits must be enabled, see STATus:QUEStionable:ENABle command).
4	Message Available	16	Data is available in the instrument's output buffer.
5	Standard Event Summary	32	One or more bits are set in the Standard Event Register (bits must be enabled, see *ESE command).
6	Master Summary	64	One or more bits are set in the Status Byte Register and may generate a Request for Service (RQS). Bits must be enabled using the *SRE command.
7	Standard	128	One or more bits are set in the

Operation Summary	Standard Operation Register (bits must be enabled, see
	STATus:OPERation:ENABle
	command).

- Use the <enable_val> parameter to specify which bits will be enabled. The decimal value specified corresponds to the binaryweighted sum of the bits you wish to enable in the register. For example, to enable bit 3 (decimal value = 8) and bit 5 (decimal value = 32), the corresponding decimal value would be 40 (8 + 32).
- The *CLS (clear status) command will not clear the enable register but it does clear all bits in the event register.
- A *CLS or *RST command does not clear the bits in the Status Byte enable register.
- Be sure to send the decimal value of the bit and not the bit number. For example, to enable bit 4, send *SRE 16, not *SRE 4.

Return Format

The query reads the enable register and returns a decimal value that corresponds to the binary-weighted sum of all bits set in the register. For example, if bit 3 (decimal value = 8) and bit 5 (decimal value = 32) are enabled, the query will return +40.

Examples

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

*SRE 16

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

*SRE?

Typical Response: +16

See Also IEEE-488 Common Commands Introduction

*STB?

*STB?

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

Syntax

*STB?

Description

This command queries the condition register for the *Status Byte 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 Status System for the instrument, see Status System Introduction.

Remarks

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

Bit #	Bit Name	Decimal Value	Definition	
0	Not Used	1	Always zero.	
1	Alarm Summary	2	One or more bits are set in the Alarm Register (bits must be enabled).	
2	Error Queue	4	One or more errors have been stored in the Error Queue. Use the SYSTem:ERRor? query to read and delete errors.	
3	Questionable Data Summary	8	One or more bits are set in the Questionable Data Register (bits must be enabled, see STATus:QUEStionable:ENABle command).	
4	Message Available	16	Data is available in the instrument's output buffer.	
5	Standard Event Summary	32	One or more bits are set in the Standard Event Register (bits must be enabled, see *ESE command).	
6	Master Summary	X	One or more bits are set in the Status Byte Register and may generate a Request for Service (RQS). Bits must be enabled using the *SRE command.	
7	Standard Operation Summary	128	One or more bits are set in the Standard Operation Register (bits must be enabled, see STATus:OPERation:ENABle	

command).

- This query returns the same results as a Serial Poll but the "Master Summary" bit (bit 6) is *not* cleared if a Serial Poll has occurred.
- Unlike how a reset clears the condition register, a factory reset (*RST command) does not clear the Status Byte Register.

Return Format

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

Example

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

*STB?

Typical Response: +40

See Also

IEEE-488 Common Commands Introduction

*SRE

***TRG**

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

Syntax

*TRG

Description

This command sends a software trigger to the instrument when the instrument is configured for TRIGger:SOURce BUS.

Remarks

- The software trigger operation that this command executes is accepted by the instrument only when the instrument is acquiring data (executing INITiate).
- After setting the trigger source, you must place the instrument in the wait-for-trigger state using the INITiate command. Once you have sent the INITiate command, the instrument will buffer one software trigger to be applied at the next wait-for-trigger state, so it is not necessary to verify that the instrument is precisely in the wait-for-trigger state.
- The *TRG command does not work with the READ? command.

Example

The following commands trigger the instrument.

TRIG:SOUR BUS INIT ***TRG** See Also

IEEE-488 Common Commands Introduction

INITiate

*TST?

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

Syntax

*TST?

Description

This command performs a complete self-test of the instrument and returns a pass/fail indication. The self-test runs a series of tests and will take approximately 45 seconds to complete. If all tests pass, you can have a high confidence that the instrument is operational.

Remarks

- When sending the *TST? query, you may need to increase the timeout period for your IO Library read response time to allow the command to complete without causing a timeout error.
- If one or more tests fail, +1 is returned and one or more errors are stored in the error queue. For a complete listing of the error messages related to self-test failures, see Error Messages.
- If one or more tests fail, see the *Keysight 34970A/34972A Service Guide* for instructions on obtaining service.
- Upon completion, *TST? restores the instrument to its factory reset state.

Return Format

The query returns +0 (all tests passed) or +1 (one or more tests failed). For details on possible error returned if tests fail, see Error Messages.

Example

The following command performs a self-test and returns a pass/fail indication. In this case, there are no failures.

*TST?

Typical Response: +0

See Also

IEEE-488 Common Commands Introduction

*WAI

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

Syntax

*WAI

Description

This command waits for all pending operations to complete before executing any additional commands over the interface.

Remarks

- Function and range changes are considered pending operations. Therefore, *WAI will wait for these changes to complete.
- Because this command stops the command parser from operating, it is better to use *OPC? for synchronization purposes.

Examples

The following command waits until all pending operations complete.

See Also

IEEE-488 Common Commands Introduction

*OPC

INSTrument Subsystem Introduction

Command Summary INSTrument:DMM INSTrument:DMM? INSTrument:DMM:INSTalled? **INSTrument:DMM**

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

Syntax

INSTrument:DMM <state>

INSTrument:DMM?

Description

This command disables or enables the internal DMM. When you change the state of the internal DMM, the instrument issues a Factory Reset (*RST command).

Parameters

Name	Туре	Range of Values	Default Value
<state></state>	Boolean	{OFF 0 ON 1}	This is a required parameter.

Return Format

The query returns the state of the internal DMM as 0 (disabled) or 1 (enabled).

Examples

The following command enables the internal DMM.

INST:DMM ON

The following query returns the state of the DMM, which is ON in this case.

INST:DMM?

Typical Response: 1

See Also

INSTrument Subsystem Introduction

INSTrument:DMM:INSTalled?

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

Syntax

INSTrument:DMM:INSTalled?

Description

This query determines whether the internal DMM is installed in the mainframe.

Remarks

• The internal DMM is an optional assembly for the Keysight 34970A/34972A.

Return Format

The query returns 0 (not installed) or 1 (installed).

Example

The following command determines that the internal DMM is present.

INST:DMM:INST?

Typical Response: 1

See Also

INSTrument Subsystem Introduction

INSTrument:DMM

LXI Subsystem Introduction

The following commands support LAN eXtensions for Instrumentation (LXI) functionality.

Command Summary

LXI:IDENtify:STATe LXI:IDENtify:STATe?

LXI:RESet

LXI:RESTart

LXI:IDENtify[:STATe]

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

This functionality is available on the 34972A only.

Syntax

LXI:IDENtify[:STATE] <state>

LXI:IDENtify[:STATE]?

Description

This command turns the LXI Identify Indicator on the front panel display on or off.

Parameters

Name	Туре	Range of Values	Default Value
<state></state>	Boolean	{OFF 0 ON 1}	This is a required parameter.

Remarks

- The LXI Identify Indicator helps you identify which LXI device is associated with the LAN address you are using.
- The instrument turns off the LXI Identify Indicator after a Factory Reset (*RST command).
- You can press the LOCAL key to turn off the LXI Identify Indicator.

Return Format

The query returns the current LXI Identify Indicator state: 0 (OFF) or 1 (ON).

Examples

The following command turns on the LXI Identify Indicator.

LXI:IDEN ON

The following query returns the state of the LXI Identify Indicator.

LXI:IDEN?

Typical Response: 1

See Also

LXI Subsystem Introduction

LXI:RESet

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

This functionality is available on the 34972A only.

Syntax

LXI:RESet

Description

This command resets the instrument's LAN settings to their default values.

Example

The following command resets the LAN settings.

LXI:RES

See Also

LXI Subsystem Introduction

LXI:RESTart

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

This functionality is available on the 34972A only.

Syntax

LXI:RESTart

Description

This command restarts the LAN with the current parameters.

Example

The following command restarts the LAN interface.

LXI:REST

See Also

LXI Subsystem Introduction

MEASure Subsystem Introduction

If you specify a *<ch_list>* with one of these commands, that *<ch_list>* overwrites the current scan list.

Command Summary

MEASure:CURRent:AC?

MEASure:CURRent:DC?

MEASure:DIGital:BYTE?

MEASure:FREQuency?

MEASure:FRESistance?

MEASure:PERiod?

MEASure:RESistance?

MEASure: TEMPerature?

MEASure:TOTalize?

MEASure:VOLTage:AC?

MEASure:VOLTage:DC?

MEASure:CURRent:AC? MEASure:CURRent:DC?

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

Syntax

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

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

Description

These commands are equivalent to CONFigure:CURRent:AC or CONFigure:CURRent:DC followed by a READ?.

See Also

MEASure Subsystem Introduction CONFigure:CURRent:AC CONFigure:CURRent:DC READ?

MEASure:DIGital:BYTE?

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

Syntax

MEASure:DIGital:BYTE? (@<scan_list>)

Description

This command is equivalent to CONFigure:DIGital:BYTE followed by a READ?.

See Also

MEASure Subsystem Introduction

CONFigure:DIGital:BYTE

READ?

MEASure:FREQuency? MEASure:PERiod?

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

Syntax

MEASure:FREQuency? [{<*range*>|AUTO|MIN|MAX|DEF}[, {<*resolution*>|MIN|MAX|DEF}],] (@<*scan_list*>)

MEASure:PERiod? [{<*range*>|AUTO|MIN|MAX|DEF}], {<*resolution*>|MIN|MAX|DEF}],] (@<*scan_list*>)

Description

These commands are equivalent to CONFigure:FREQuency or CONFigure:PERiod followed by a READ?.

See Also

MEASure Subsystem Introduction

CONFigure:FREQuency

CONFigure:PERiod

[SENSe:]FREQuency:RANGe:LOWer

[SENSe:]FREQuency:VOLTage:RANGe

[SENSe:]PERiod:VOLTage:RANGe

READ?

MEASure:RESistance? MEASure:FRESistance?

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

Syntax

MEASure:RESistance? [{<*range*>|AUTO|MIN|MAX|DEF}], {<*resolution*>|MIN|MAX|DEF}],] (@<*scan_list*>)

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

Description

These commands are equivalent to CONFigure:RESistance or CONFigure:FRESistance followed by a READ?.

See Also

MEASure Subsystem Introduction

CONFigure:RESistance

[SENSe:]RESistance:OCOMpensated

CONFigure:FRESistance

[SENSe:]FRESistance:OCOMpensated

READ?

MEASure:TEMPerature?

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

Syntax

MEASure:TEMPerature? {<probe_type>|DEF},{<type>|DEF}[,1[, {<resolution>|MIN|MAX|DEF}]],(@<scan_list>)

Description

This command is equivalent to CONFigure:TEMPerature followed by a READ?.

See Also

MEASure Subsystem Introduction

CONFigure:TEMPerature

READ?

MEASure:TOTalize?

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

Syntax

MEASure:TOTalize? <mode>,(@<scan_list>)

Description

This command is equivalent to CONFigure:TOTalize followed by a READ?.

See Also

MEASure Subsystem Introduction

CONFigure:TOTalize

READ?

MEASure:VOLTage:AC? MEASure:VOLTage:DC?

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

Syntax

MEASure:VOLTage:AC? [{<*range*>|AUTO|MIN|MAX|DEF}], {<*resolution*>|MIN|MAX|DEF}],] (@<*scan_list*>)

MEASure:VOLTage:DC? [{<*range*>|AUTO|MIN|MAX|DEF}[, {<*resolution*>|MIN|MAX|DEF}],] (@<*scan_list*>)

Description

These commands are equivalent to CONFigure:VOLTage:AC or CONFigure:VOLTage:DC followed by a READ?.

See Also

MEASure Subsystem Introduction CONFigure[:VOLTage][:DC] CONFigure[:VOLTage]:AC ROUTe:CHANnel:DELay ROUTe:CHANnel:DELay:AUTO [SENSe:]VOLTage:AC:BANDwidth CONFigure:VOLTage:AC CONFigure:VOLTage:DC READ?

MEMory Subsystem Introduction

Command Summary MEMory:NSTates? MEMory:STATe:DELete MEMory:STATe:NAME MEMory:STATe:NAME? MEMory:STATe:RECall:AUTO MEMory:STATe:RECall:AUTO?

MEMory:NSTates?

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

Syntax

MEMory:NSTates?

Description

This query returns the total number of memory locations available for state storage. For the 34970A/34972A, this command always returns the number 6.

Remarks

• Location 0 is included, but it is reserved for power-down state storage.

Return Format

The query returns the number +6.

Example

The following query returns the number of states.

MEMory:NSTates?

Typical Response: +6

See Also

MEMory Subsystem Introduction

MEMory:STATe:DELete

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

Syntax

MEMory:STATe:DELete </ocation>

Description

This command deletes the contents of the specified storage location.

Parameters

Name	Туре	Range of Values	Default Value
<location></location>	Numeric	An integer from 0 to 5	This is a required parameter.

Remarks

• Note that you cannot recall the instrument state from a storage location that was deleted. An error is generated if you attempt to recall a deleted state (+291,"Not able to recall state: it is empty").

Example

The following command deletes the contents of storage location 1.

MEM:STAT:DEL 1

See Also

MEASure Subsystem Introduction

*SAV

*RCL

MEMory:STATe:NAME

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

Syntax

MEMory:STATe:NAME <location>[,<name>]

MEMory:STATe:NAME? < location>

Description

This command assigns a name to the specified storage location. You can name a location from the front panel or over the remote interface but you can recall a named state *only* from the front panel. From the remote interface, you can only recall a stored state using the *RCL command with a number (0 through 5).

Parameters

Name	Туре	Range of Values	Default Value
<location></location>	Numeric	An integer from 0 to 5	This is a required parameter.
<name></name>	Unquoted ASCII String	A unquoted string of up to 12 characters. The first character must be a letter (A- Z), but the remaining 11 characters can be letters, numbers (0-9), or the underscore character (''_''). Blank spaces are not allowed.	If omitted, the default name is used for the specified storage location.

Remarks

- When shipped from the factory, default names are assigned to storage locations 1 through 5. The default names are "STATE1", "STATE2", and so on.
- If you omit the *<name>* parameter, the default name is assigned to the specified storage location. This provides an easy way to reset the associated name to its factory default; however, the stored state is *not* deleted.
- The instrument generates an error if you specify a name with more than 12 characters.
- Deleting the contents of a storage location (see MEMory:STATe:DELete command) will reset the associated name to its factory default ("STATE1", "STATE2", etc.).
- A Factory Reset (*RST command) does not affect the configurations stored in memory. Once a state is stored, it remains until it is overwritten or specifically deleted.

Return Format

The query reads the name assigned to the specified storage location and returns a quoted ASCII string. If the specified location has no custom assigned, the default name is returned ("STATE1", "STATE2", etc.).

Examples

The following command assigns the name TEST_RACK_1 to storage location 1.

MEM:STAT:NAME 1,TEST_RACK_1

The following query returns the name assigned to storage location 1.

MEM:STAT:NAME? 1

Typical Response: "TEST_RACK_1"

See Also

MEMory Subsystem Introduction

*SAV

*RCL

MEMory:STATe:RECall:AUTO

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

Syntax

MEMory:STATe:RECall:AUTO <mode>

MEMory:STATe:RECall:AUTO?

Description

This command enables or disables (default) the automatic recall of the power-down state (state 0) when power is turned on. Select "ON" to automatically recall the power-down state. Select "OFF" to issue a Factory Reset (*RST) when power is turned on (in this mode, the power-down state is *not* automatically recalled).

Parameters

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

Remarks

- When the instrument is shipped from the factory, the automatic recall mode is disabled.
- State 0 gets stored every time the power is turned off.

Return Format

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

Examples

The following command enables the automatic recall mode.

MEM:STAT:REC:AUTO ON

The following query returns the automatic recall setting.

MEM:STAT:REC:AUTO?

Typical Response: 1

See Also

MEMory Subsystem Introduction

*SAV

MEMory:STATe:VALid?

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

Syntax

MEMory:STATe:VALid? <location>

Description

This command queries the specified storage location to determine whether a valid state is currently stored in this location. During the validation process, the instrument verifies that the location is *not* empty. You can use this command before sending the *RCL command to determine whether a state has been previously stored in this location.

Parameters

Name	Туре	Range of Values	Default Value
<location></location>	Numeric	An integer from 0 to 5	This is a required parameter.

Remarks

• This command does <u>not</u> guarantee that no errors will be generated when a stored state is recalled using the *RCL command. Even if this command determines that the specified storage location is valid, individual modules may still be in states that will generate an error. **Return Format**

The query returns 0 if no state has been stored in the specified location or if it has been deleted. It returns 1 if a valid state is stored in the specified location.

Example

The following query returns a 0, indicating that no valid state is currently stored in location 3.

MEM:STAT:VAL? 3

Typical Response: 0

See Also

MEMory Subsystem Introduction

MMEMory Subsystem Introduction This functionality is available on the 34972A only. **Command Summary**

MMEMory:EXPort?

MMEMory:FORMat:READing:CSEParator

MMEMory:FORMat:READing:CSEParator?

MMEMory:FORMat:READing:RLIMit

MMEMory:FORMat:READing:RLIMit?

MMEMory:IMPort:CATalog?

MMEMory:IMPort:CONFig?

MMEMory:LOG[:ENABle]

MMEMory:LOG[:ENABle]?

MMEMory:EXPort?

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

This functionality is available on the 34972A only.

Syntax

MMEMory:EXPort?

Description

This query exports the current contents of reading memory, along with the instrument configuration, to the default directory on the USB drive:

/34972A/data/<*SN*>/yyyymmdd_hhmmssmmm

Note than *<SN>* is the instrument's serial number, yyyymmdd indicates the current date, and hhmmssmmm indicates the current time in 24-hour clock format, down to the millisecond.

It waits until the export is complete and returns 0 (no errors) or 1 (export had errors).

Remarks

- A directory named /34972A/data/MY12345678/20100120_130542169 would indicate data taken from instrument MY12345678 at the time of 42.169 seconds after 1:05 pm on January 20, 2010.
- You can control the field delimiter in the exported files with MMEMory:FORMat:READing:CSEParator.
- Exporting the contents of reading memory can be a lengthy operation, depending on the number of readings in memory.
- For typical USB drives, there is a file system limit of 999 files and folders per directory. If you receive error message number 410, "Not enough disk space" while exporting data, check to ensure that you have not hit the limit of 999 timestamped folders for your instrument. You may receive error 410 even if additional space is available on the drive.

Return Format

The query returns 0 (no errors) or 1 (export had errors) when the file export is complete. If the query returns a 1, use the SYSTem:ERRor? command to read the errors.

Example

The following query exports the current contents of reading memory, along with the instrument configuration, to the USB drive.

MMEMory:EXPort?

Typical response: 0

See Also

MMEMory Subsystem Introduction MMEMory:FORMat:READing:RLIMit MMEMory:FORMat:READing:CSEParator

MMEMory:FORMat:READing:CSEParator

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

This functionality is available on the 34972A only.

Syntax

MMEMory:FORMat:READing:CSEParator < column_separator>

MMEMory:FORMat:READing:CSEParator?

Description

This command allows you to specify the character used to separate the columns in the output data on the USB drive. This enables you to make the file conform with the application software that you will use for viewing the file.

Parameters

Name	Туре	Range of Values	Default Value
<column_separator></column_separator>	Discrete	{TAB COMMa SEMicolon}	This is a required parameter.
			The factory default is COMMa.

Remarks

- When the instrument is shipped from the factory, the default state for <*column_separator*> is COMMa.
- The value of the <state> will be saved in non-volatile memory on the instrument and will not be affected by *RST or SYSTem:PRESet.

Return Format

The query returns TAB, COMM or SEM to indicate the value of the <*column_separator*>.

Examples

The following command specifies that tabs should be used to separate the columns in the output data on the USB drive.

MMEMory:FORMat:READing:CSEParator TAB

The following query indicates the character used to separate columns. In this case, it is tabs.

MMEMory:FORMat:READing:CSEParator?

Typical Response: TAB

See Also

MMEMory Subsystem Introduction

MMEMory:FORMat:READing:RLIMit

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

This functionality is available on the 34972A only.

Syntax

MMEMory:FORMat:READing:RLIMit <row_limit>

MMEMory:FORMat:READing:RLIMit?

Description

This command allows you to specify whether the maximum number of sweeps that can be logged to a single USB data file should be limited to one less than 64K ($2^{16} - 1 = 65,535$). If *<row_limit>* is ON, sweeps are stored in files named dat00001.csv, dat00002.csv, dat00003.csv, and so on, with 65,535 sweeps per file. If *<row_limit>* is OFF, data logged for the scan is stored in a single file named dat00001.csv, which is limited by both the space available on the USB drive and how the drive is formatted, up to a maximum of 2^{32} sweeps (roughly 4.3 billion).

Parameters

Name	Туре	Range of Values	Default Value
<row_limit></row_limit>	Boolean	{OFF 0 ON 1}	This is a required parameter.
			The factory default is ON.

Remarks

- This feature enables you to accommodate certain versions of common spreadsheet, database and data analysis programs that have limitations of 64K rows per file.
- When the instrument is shipped from the factory, the default state for <*row_limit*> is ON.
- The value of the <row_limit> will be saved in non-volatile memory on the instrument and will not be affected by *RST or SYSTem:PRESet.

Return Format

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

Examples

The following command turns the row limit feature on, causing USB data files to be split at the 64K - 1 boundary.

MMEMory:FORMat:READing:RLIMit ON

The following query indicates whether the row limit feature is on. In this case, it is OFF.

MMEMory:FORMat:READing:RLIMit?

Typical Response: 0

See Also

MMEMory Subsystem Introduction

MMEMory:LOG[:ENABle]

MMEMory:FORMat:READing:CSEParator

MMEMory:IMPort:CATalog?

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

This functionality is available on the 34972A only.

Syntax

MMEMory:IMPort:CATalog?

Description

This query returns a catalog listing all of the Keysight BenchLink DataLogger configuration (BLCFG) files in the root directory of the USB drive.

Remarks

- If the USB drive is not inserted or contains no files, the query returns an empty string: "".
- This command will only recognize files in the root directory of the USB drive with a .BLCFG extension.
- The command will recognize up to 50 BLCFG files in the root directory. If more than 50 files are found in the drive's root directory, the system will recognize only the 50 with the most recent time stamps.

Return Format

This query returns the catalog as a list of quoted file names, separated by commas:

"<file_name1>","<file_name2>","<file_name3>", etc.

Note that the file names will include the .BLCFG extension.

Example

The following query returns a list of all BLCFG files in the root directory of the USB drive. In this case, there are two files.

MMEM:IMP:CAT?

Typical Response: "MyConfig1.BLCFG", "PrevConfig.BLCFG"

See Also

MMEMory Subsystem Introduction

MMEMory:IMPort:CONFig?

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

This functionality is available on the 34972A only.

Syntax

MMEMory:IMPort:CONFig? "<configuration_file>"

Description

This query imports an Keysight BenchLink Data Logger configuration (BLCFG) file and attempts to configure the instrument according to the contents of the BLCFG file. It waits until the import is complete and returns 0 (no errors) or 1 (import had errors).

Parameters

Name	Туре	Range of Values	Default Value
<configuration_file></configuration_file>	Filename	Any file name, always with a .BLCFG extension.	This is a required parameter.

Remarks

- The configuration file must reside in the root directory of the USB drive; hence no path is included in the specification of the " <configuration_file>."
- Only the 50 most recent BLCFG files will be accessible. Files with names longer than 40 characters will not be accessible.
- Possible errors include a card set mismatch between the instrument and the BLCFG file, or a corrupt file. You should address errors by diagnosing your BLCFG files with the Keysight BenchLink Data Logger tool.
- Import operations can take several seconds, and the "Busy" status system bit (bit 14) is asserted during this time. Because this is a query, no more commands will be processed on the I/O port from which it was sent until the query completes and returns a 0 or 1.

Return Format

The query returns 0 (no errors) or 1 (import had errors) when the file import is complete. If the query returns a 1, use the SYSTem:ERRor? command to read the errors.

Examples

The following query performs the import and then returns a 0 or 1. In this case, it returns a 1, indicating that the file import had one or more errors.

MMEMory:IMPort:CONFig? "My34972ASetup.BLCFG"

Typical response: 0

See Also

MMEMory Subsystem Introduction

MMEMory:LOG[:ENABle]

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

This functionality is available on the 34972A only.

Syntax

MMEMory:LOG[:ENABle] <state>

MMEMory:LOG[:ENABle]?

Description

This command allows you to specify whether scanned readings are logged to the USB drive as they are taken.

Parameters

Name	Туре	Range of Values	Default Value
<state></state>	Boolean	{OFF 0 ON 1}	This is a required parameter. The factory default state is OFF.

Remarks

- The value of the <state> will be saved in non-volatile memory on the instrument and will not be affected by *RST or SYSTem:PRESet.
- For short scans, a READ? or MEASURE? query may take a bit of extra time to complete if you are also logging to USB.
- If you remove the USB drive during logging, logging will stop but the scan will continue. If you re-attach the USB drive, it will not cause logging to resume unless you follow the five-step procedure shown below. Otherwise, logging will resume at the next INITiate.
- To replace a USB stick on a system actively logging data to USB:
- 1. Press the SCAN button for several seconds until the scan stops.
- 2. Wait until the front panel indicates that the box is again idle. It can take some time after the scan has been interrupted, for logging to the USB drive to complete.
- 3. Once the instrument is idle, remove the USB drive.
- 4. After the old stick is removed, wait 5 seconds before inserting the new USB drive.
- 5. Press the SCAN button again to restart scanning and logging to the new USB drive.
 - For typical USB drives, there is a file system limit of 999 files and folders per directory. If you receive error message number 410, "Not enough disk space" while logging data, check to ensure that you have not hit the limit of 999 timestamped folders for your instrument. You may receive error 410 even if additional space is available on the drive.

1.

Return Format

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

Examples

The following command specifies that scanned readings are to be logged to the USB drive as they are taken. Data will also simultaneously be written to reading memory. To scan data into reading memory without logging it on the USB drive, you would use MMEM:LOG OFF.

MMEMory:LOG ON

The following query indicates whether scanned readings are to be logged to the USB drive. In this case, the returned value of 1 indicates that logging to the USB drive is ON (enabled).

MMEMory:LOG?

Typical Response: 1

See Also

MMEMory Subsystem Introduction

OUTPut Subsystem Introduction

Command Summary OUTPut:ALARm:CLEar:ALL OUTPut:ALARm:MODE OUTPut:ALARm:MODE? OUTPut:ALARm:SLOPe OUTPut:ALARm:SLOPe? OUTPut:ALARm{1|2|3|4}:CLEar OUTPut:ALARm{1|2|3|4}:SOURce

OUTPut:ALARm{1|2|3|4}:CLEar OUTPut:ALARm:CLEar:ALL

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

Syntax

OUTPut:ALARm{1|2|3|4}:CLEar

OUTPut:ALARm:CLEar:ALL

Description

The OUTPut:ALARm{1|2|3|4}:CLEar command clears the specified alarm output line. The OUTPut:ALARm:CLEar:ALL command clears all four alarm output lines.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34907A Multifunction Module (digital input only)
- 34908A 40 Channel Single-Ended Multiplexer Module

Remarks

- You can manually clear the output lines at any time (even during a scan) and the alarm data in memory is not cleared (however, data is cleared when you initiate a new scan). The alarm outputs are also cleared when you initiate a new scan.
- A Factory Reset (*RST command) clears all four alarm outputs but does not clear the alarm queue in either configuration.

Examples

The following command clears alarm output line 2.

OUTP:ALAR2:CLE

The following command clears all four alarm output lines.

OUTP:ALAR:CLE:ALL

See Also

OUTPut Subsystem Introduction OUTPut:ALARm:MODE OUTPut:ALARm:SLOPe OUTPut:ALARm{1|2|3|4}:SOURce

OUTPut:ALARm:MODE

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

Syntax

OUTPut:ALARm:MODE < mode>

OUTPut:ALARm:MODE?

Description

This command selects the configuration of the four TTL alarm output lines (the selected configuration applies to all four alarm output lines). The four alarm outputs are available from the rear-panel *Alarm Output* connector.

Latch Mode: In this mode (default), the corresponding output line is latched true when the first alarm occurs and remains asserted until you clear it by initiating a new scan or cycling power. You can manually clear the output lines at any time (even during a scan) and the alarm data in memory is not cleared (however, data is cleared when you initiate a new scan).

Track Mode: In this mode, the corresponding output line is asserted only while a channel's reading crosses a limit and subsequent readings remain outside the limit. When a reading returns to within limits, the output line is automatically cleared. You can manually clear the output lines at any time (even during a scan) and the alarm data in memory is not cleared (however, data is cleared when you initiate a new scan). The alarm outputs are also cleared when you initiate a new scan.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34907A Multifunction Module (digital input only)
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<mode></mode>	Discrete	{LATCh TRACk}	This is a required parameter.
			The factory default is LATCh

Remarks

• A Factory Reset (*RST command) clears all four alarm outputs but does not clear the alarm queue in either configuration.

Return Format

The query returns LATC or TRAC. The selected configuration applies to all four alarm output lines.

Examples

The following command enables the track mode on all four alarm output lines.

OUTP:ALAR:MODE TRAC

The following query returns the configuration of the four alarm output lines.

OUTP:ALAR:MODE?

Typical Response: TRAC

See Also

OUTPut Subsystem Introduction OUTPut:ALARm:SLOPe OUTPut:ALARm{1|2|3|4}:SOURce OUTPut:ALARm{1|2|3|4}:CLEar

OUTPut:ALARm:SLOPe

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

Syntax

OUTPut:ALARm:SLOPe <edge>

OUTPut:ALARm:SLOPe?

Description

This command selects the slope of the pulse from the four TTL alarm outputs (the selected configuration applies to all four alarm output lines). The four alarm outputs are available from the rear-panel *Alarm Output* connector.

If you select the negative/falling edge, 0 V (TTL low) indicates an alarm. If you select the positive/rising edge, +5V (TTL high) indicates an alarm.

NOTE

Changing the slope of the output lines may cause the lines to change state.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34907A Multifunction Module (digital input and totalizer)
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<edge></edge>	Discrete	{NEGative POSitive}	This is a required parameter.

The keyword NEGative refers to a falling edge, and the keyword POSitive refers to a rising edge, as shown below.



Falling Edge

Rising Edge

Remarks

• A Factory Reset (*RST command) resets the slope to the negative/falling edge.

Return Format

The query returns NEG or POS. The selected configuration applies to all four alarm output lines.

Examples

The following command selects the positive/rising edge on all four alarm output lines.

OUTP:ALAR:SLOP POS

The following query returns the slope of the four alarm output lines.

OUTP:ALAR:SLOPE?

Typical Response: POS

See Also

OUTPut Subsystem Introduction OUTPut:ALARm:MODE OUTPut:ALARm{1|2|3|4}:SOURce OUTPut:ALARm{1|2|3|4}:CLEar

OUTPut:ALARm{1|2|3|4}:SOURce

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

Syntax

OUTPut:ALARm{1|2|3|4}:SOURce (@<ch_list>)

OUTPut:ALARm{1|2|3|4}:SOURce?

Description

This command assigns one of four alarm numbers to report any alarm conditions on the specified multiplexer or digital channels.

On the digital modules, you can configure the instrument to generate an alarm when a specific bit pattern or bit pattern change is detected on a digital input channel or when a specific count is reached on a totalizer channel. These channels do *not* have to be part of the active scan list to generate an alarm.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34907A Multifunction Module (digital input only)
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	This is a required parameter.

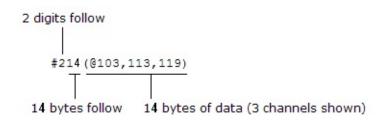
Remarks

- You can assign multiple channels to any of the four available alarms (numbered 1 through 4, see OUTPut:ALARm<n>:SOURce command). For example, you can configure the instrument to generate an alarm on the Alarm 1 output when a limit is exceeded on any of channels 103, 205, or 310. You cannot, however, assign alarms on a specific channel to more than one alarm number.
- A Factory Reset (*RST command) clears all alarm limits and turns off all alarms. An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does *not* clear the alarm limits and does *not* turn off alarms.

Return Format

The query returns a series of channel numbers in Definite-Length Block format. The syntax is a pound sign (#) followed by a non-zero digit representing the number of digits in the decimal integer to follow. This digit is followed by a decimal integer indicating the number of 8-bit data bytes to follow. This is followed by a block of data containing the specified number of bytes.

For example:



An empty scan list (one with no channels selected) will return "#13(@)".

Examples

The following command assigns Alarm 2 to report any alarm conditions on channels 03 and 13 in slot 100.

OUTP:ALAR2:SOUR (@103,113)

The following query returns the channels assigned to Alarm 2.

OUTP:ALAR2:SOUR?

Typical Response: #210(@103,113)

See Also

OUTPut Subsystem Introduction

CALCulate:LIMit:LOWer

CALCulate:LIMit:UPPer

OUTPut:ALARm:MODE

OUTPut:ALARm:SLOPe

OUTPut:ALARm{1|2|3|4}:CLEar

ROUTe Subsystem Introduction

Command Summary ROUTe:CHANnel:ADVance:SOURce ROUTe:CHANnel:ADVance:SOURce? ROUTe:CHANnel:DELay **ROUTe:CHANnel:DELay?** ROUTe:CHANnel:DELay:AUTO ROUTe:CHANnel:DELay:AUTO? ROUTe:CHANnel:FWIRe **ROUTe:CHANnel:FWIRe? ROUTe:CLOSe ROUTe:CLOSe?** ROUTe:CLOSe:EXCLusive **ROUTe:DONE? ROUTe: MONitor ROUTe: MONitor? ROUTe: MONitor: DATA?** ROUTe:MONitor:STATe **ROUTe: MONitor: STATe? ROUTe:OPEN ROUTe:OPEN? ROUTe:SCAN ROUTe:SCAN?** ROUTe:SCAN:SIZE?

ROUTe:CHANnel:ADVance:SOURce

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

Syntax

ROUTe:CHANnel:ADVance:SOURce < source >

ROUTe:CHANnel:ADVance:SOURce?

Description

This command selects the source to provide the channel advance signal to the next channel in the scan list for external scanning. When the channel advance signal is received, the instrument opens the currently selected channel and closes the next channel in the scan list. The instrument will accept an external TTL trigger pulse, a software (bus) command, or an immediate (continuous) scan trigger.

NOTE This command is valid only when the internal DMM is disabled (see INSTrument:DMM command) or removed from the Keysight 34970A/34972A.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<source/>	<i>rce</i> > Discrete {EXTernal BUS IMMediate}	This is a required parameter.	
			The factory default is EXTernal

Remarks

- For the *EXTernal* source, the 34970A/34972A will accept a hardware trigger applied to the rear-panel *Chan Adv Input* line (Pin 6). For an external device such as a DMM, the trigger received by the 34970A/34972A is normally sourced by the DMM's *Voltmeter Complete* output signal. The 34970A/34972A advances to the next channel in the scan list each time a low-true TTL pulse is received.
- For the BUS (software) source, the 34970A/34972A is triggered by the *TRG command received over the remote interface. The *TRG command will not be accepted unless the 34970A/34972A is in the "wait-for-trigger" state (see INITiate command). If the internal DMM receives an external trigger before the next "waiting for trigger" state, it will buffer one *TRG command and then ignore any additional triggers received (no error is generated).
- For the *IMMediate* (continuous) source, the channel advance signal is always present.
- The channel advance signal is ignored unless you have initiated the scan (INITiate command) and have received a scan trigger (TRIGger:SOURce command). Although the ROUTe:CHANnel:ADVance:SOURce command shares some of the same signals as the TRIGger:SOURce command, they cannot be set to the same source (except IMMediate). If you attempt to select the same source, an error is generated and the TRIGger:SOURce is reset to IMMediate.
- When the first trigger is received, the 34970A/34972A closes the first channel in the scan list *without* waiting for the specified channel advance source. If the channel advance source is EXTernal and the 34970A/34972A receives an event before it is ready, it will buffer one event and then ignore any additional events received (no error is generated).

- After the final channel in the scan list is closed, one more channel advance event must be received to complete the scan.
- A channel advance signal is not required for digital input or totalizer channels included in the scan list. Measurements on these channels are still performed by the 34970A/34972A and do not require synchronization with the external instrument.

Return Format

The query returns the present channel advance source: "EXT", "BUS", or "IMM".

Examples

The following program segment configures the 34970A/34972A for scanning using an external channel advance source. In this configuration, the 34970A/34972A advances to the next channel in the scan list each time a low-true TTL pulse is received.

```
INST:DMM OFF !Disable internal DMM
ROUT:SCAN (@101:120) !Configure scan list
TRIG:SOUR IMM !Set trigger source
TRIG:COUN 5 !Set trigger count
ROUT:CHAN:ADV:SOUR EXT !Set channel advance source
```

The following query returns the channel advance source currently selected on the 34970A/34972A.

ROUT : CHAN : ADV : SOUR?

Typical Response: EXT

See Also

ROUTe Subsystem Introduction

INITiate

INSTrument:DMM

ROUTe:CHANnel:FWIRe

TRIGger:SOURce

ROUTe:CHANnel:DELay

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

Syntax

ROUTe:CHANnel:DELay <seconds>,(@<ch_list>)

ROUTe:CHANnel:DELay? (@<ch_list>)

Description

This command adds a delay between multiplexer channels in the scan list (useful for high-impedance or high-capacitance circuits). The delay is inserted between the relay closure and the actual measurement on *each* channel, in addition to any delay that will implicitly occur due to relay settling time. The programmed channel delay overrides the default channel delay that the instrument automatically adds to each channel.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34907A Multifunction Module (digital input and totalizer channels only)
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<seconds></seconds>	Numeric	A number from 0 to 60, with 1 ms resolution.	This is a required parameter.
<ch_list></ch_list>	Channel List	One or more channels, as shown:	
		(@310) - channel 10 on the module in slot 300.	
		(@305:310) - channels 05 through 10 on the module in slot 300.	
		(@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	

Remarks

- You can select a unique delay for each channel on the module. The default channel delay is automatic; the instrument determines the delay based on function, range, integration time, and AC filter setting.
- The channel delay is valid only while scanning. If no channels have been assigned to the scan list (see ROUTe:SCAN command), the specified channel delay is ignored (no error is generated).
- To ensure you are getting the most accurate measurements possible, use care when setting the channel delay less than the default value (Automatic). The default channel delay is designed to optimize parameters, such as settling time, for the most accurate measurements.
- The CONFigure and MEASure? commands set the channel delay to Automatic.
- The instrument sets the channel delay to Automatic after a Factory Reset (*RST command).

Return Format

The query returns the delay in seconds in the form "+1.0000000E+00" for each channel specified. Multiple responses are separated by commas.

Examples

The following command adds a 2-second channel delay to channels 03 and 13 in slot 100.

ROUT:CHAN:DEL 2, (@103,113)

The following query returns the channel delay selected on channels 03 and 13 in slot 100.

ROUT:CHAN:DEL? (@103,113)

Typical Response: +2.0000000E+00,+2.0000000E+00

See Also ROUTe Subsystem Introduction ROUTe:CHANnel:DELay:AUTO ROUTe:SCAN

ROUTe:CHANnel:DELay:AUTO

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

Syntax

ROUTe:CHANnel:DELay:AUTO <state>[,(@<ch_list>)]

ROUTe:CHANnel:DELay:AUTO? [(@<ch_list>)]

Description

This command disables or enables an automatic channel delay on the specified channels. If enabled, the instrument determines the delay based on function, range, integration time, and AC filter setting.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34907A Multifunction Module (digital input and totalizer channels only)
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<state></state>	Boolean	{OFF 0 ON 1}	This is a required parameter.
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- Selecting a specific channel delay using the ROUTe:CHANnel:DELay command disables the automatic channel delay.
- The CONFigure and MEASure? commands set the channel delay to Automatic.
- The instrument sets the channel delay to Automatic after a Factory Reset (*RST command).

Return Format

The query returns 0 (OFF) or 1 (ON) for each channel specified. Multiple responses are separated by commas.

Examples

The following command enables an automatic channel delay on channels 03 and 13 in slot 100.

ROUT:CHAN:DEL:AUTO ON, (@103, 113)

The following query returns the automatic channel delay settings on channels 03 and 13 in slot 100.

ROUT:CHAN:DEL:AUTO? (@103,113)

Typical Response: 1,1

See Also ROUTe Subsystem Introduction ROUTe:CHANnel:DELay

ROUTe:CHANnel:FWIRe

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

Syntax

ROUTe:CHANnel:FWIRe <*state*>[,(@<*ch_list*>)]

ROUTe:CHANnel:FWIRe? [(@<ch_list>)]

Description

This command configures the specified channels for 4-wire external scanning without the internal DMM. When enabled, channel n is paired with channel n+10 (34901A) or n+8 (34902A) to provide source and sense connections.

NOTE This command is valid only when the internal DMM is disabled (see INSTrument:DMM command) or removed from the Keysight 34970A/34972A.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module

Parameters

Name	Туре	Range of Values	Default Value
<state></state>	Boolean	{OFF 0 ON 1}	
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If < <i>ch_list></i> is omitted, this command applies to the current scan list.

Remarks

- Specify the paired channel in Bank 1 (source) as the *<ch_list>* channel (channels in Bank 2 are not allowed in the *<ch_list>*).
- The ROUTe:CLOSe, ROUTe:CLOSe:EXCLusive, and ROUTe:OPEN commands ignore the current ROUTe:CHANnel:FWIRe setting (if no channels are in the scan list).

Return Format

The query returns 0 (OFF) or 1 (ON) for each channel specified. Multiple responses are separated by commas.

Examples

The following command configures channels 03 and 05 in slot 100 for 4wire external scanning.

INST:DMM OFF !Disable internal DMM
ROUT:CHAN:FWIR ON,(@103,105) !Enable 4-wire
configuration

The following query returns the 4-wire configuration selected on channels 03 and 05 in slot 100.

ROUT:CHAN:FWIR? (@103,105)

Typical Response: 1,1

See Also ROUTe Subsystem Introduction INSTrument:DMM

ROUTe:CHANnel:ADVance:SOURce

ROUTe:CLOSe

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

Syntax

ROUTe:CLOSe (@<ch_list>)

ROUTe:CLOSe? (@<ch_list>)

Description

This command closes the specified channels on a multiplexer or switch module. On the multiplexer modules, if any channel on the module is defined to be part of the scan list, attempting to send this command will result in an error.

Used With:

• All modules except 34907A

Parameters

Name	Туре	Range of Values	Default Value
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	This is a required parameter.

Remarks

- For the matrix module (34904A), the channel number represents the intersection of the desired row and column. For example, channel 234 represents the intersection of row 3 and column 4 on the module in slot 200 (assumes two-wire mode). For more information, see the simplified schematics.
- The RF Multiplexer modules (34905A, 34906A) will not respond to the ROUTE:OPEN command (an error is generated). To "open" a channel on these modules, send the ROUTE:CLOSe command to a different channel in the same bank.
- As part of the scan setup, the ROUTe:SCAN command examines the scan list and determines which channel relays and Analog Bus relays will be impacted by the scan. The following rules will apply once the scan is initiated and will impact what relays can be manually opened and closed.
- a. When the scan is initiated, the instrument will open all channels in modules that contain one or more channels in the scan list.
- b. While the scan is running, the instrument prohibits use of all channels in modules that contain one or more channels in the specified <*ch_list*> (these channels are dedicated to the scan).

Return Format

The query returns 1 if the specified channel is closed or 0 if the specified channel is open. Multiple responses are separated by commas.

Examples

The following command closes channels 03 and 13 in slot 100 (no Analog Bus connections are made).

ROUT:CLOS (@103,113)

The following command closes channel 03 on the matrix module in slot 300.

ROUT:CLOS (@303)

The following query reads the state of channels 03 and 13 in slot 100 (1 = closed; 0 = open).

ROUT:CLOS? (@103,113)

Typical Response:1,1

See Also

ROUTe Subsystem Introduction DIAGnostic:RELay:CYCLes? ROUTe:CLOSe:EXCLusive ROUTe:OPEN

ROUTe:CLOSe:EXCLusive

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

Syntax

ROUTe:CLOSe:EXCLusive (@<ch_list>)

Description

This command opens all channels on a multiplexer or switch module and then closes the specified channels. On the multiplexer modules, if any channel on the module is defined to be part of the scan list, attempting to send this command will result in an error.

Used With:

• All modules except 34907A

Parameters

Name	Туре	Range of Values	Default Value
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	This is a required parameter.

Remarks

- For the matrix modules (34904A), the channel number represents the intersection of the desired row and column. For example, channel 234 represents the intersection of row 3 and column 4 on the module in slot 200 (assumes two-wire mode). For more information, see the simplified schematics.
- This command opens all channels first, and then closes the channels in the *<ch_list>*, one at a time. Before it closes each channel, it opens all previous channels.
- The RF Multiplexer modules (34905A, 34906A) will not respond to the ROUTe:OPEN command (an error is generated). To "open" a channel on these modules, send the ROUTe:CLOSe:EXCLusive command to a different channel in the same bank.

Example

The following command opens all channels and then closes channel 03 on the matrix module in slot 300.

ROUT:CLOS:EXCL (@303)

See Also ROUTe Subsystem Introduction ROUTe:CLOSe ROUTe:OPEN

ROUTe:DONE?

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

Syntax

ROUTe:DONE?

Description

This queries the status of all relay operations on cards not involved in the scan and returns a 1 when all relay operations are finished (even during a scan).

Return Format

The query returns a 1.

Example

The following query returns a 1 when all relay operations are finished.

ROUT: DONE?

Typical Response: 1

See Also

ROUTe Subsystem Introduction

ROUTe:MONitor

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

Syntax

ROUTe:MONitor (@<channel>)

ROUTe:MONitor?

Description

This command/query selects the channel to be displayed on the front panel. Only one channel can be monitored at a time.

Parameters

Name	Туре	Range of Values	Default Value
<channel></channel>	Channel	A single channel, specified as in the following examples. (@310) - channel 10 on the module in slot 300. (@214) - channel14 on the module in slot 200.	This is a required parameter.

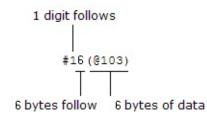
Remarks

- Channels must be configured for a measurement in order to be monitored (see CONFigure and SENSe commands). Configuring a channel for a measurement makes it monitorable and makes it part of the scan list.
- A scan always has priority over the Monitor function (see ROUTe:SCAN command).
- Any channel that can be "read" by the instrument can be monitored. This includes any combination of temperature, voltage, resistance, current, frequency, or period measurements on multiplexer channels. You can also monitor a digital input channel or the totalizer count on the digital modules.
- Mx+B scaling and alarm limits are applied to the selected channel during a Monitor and all alarm data is stored in the alarm queue (which will be cleared if power fails).
- For monitor operations using a multiplexer module, no measurements are taken if the internal DMM is disabled (see INSTrument:DMM command) or not installed in the mainframe. The internal DMM is not required for monitor operations on the digital modules.
- For 4-wire resistance measurements, the instrument automatically pairs channel n in Bank 1 with channel n+10 (34901A) or n+8 (34902A) to provide the source and sense connections.
- The count on a totalizer channel is not reset when it is being monitored (the Monitor ignores the totalizer reset mode).

Return Format

The query returns the Monitor channel in Definite-Length Block format. The syntax is a pound sign (#) followed by a non-zero digit representing the number of characters to follow. This digit is followed by a decimal integer indicating the number of data bytes to follow. This is followed by a block of data containing the specified number of bytes. The query always returns the channel currently displayed on the front panel.

For example:



Examples

The following program segment configures channel 3 in slot 100 for DC voltage measurements, enables monitoring on the channel, and turns on the Monitor mode.

CONF:VOLT:DC (@103) ROUT:MON:CHAN (@103) ROUT:MON:STAT ON

The following command queries the channel currently selected as the Monitor channel.

ROUT: MON: CHAN?

Typical Response: #16(@103)

See Also ROUTe Subsystem Introduction ROUTe:MONitor:STATe

ROUTe:MONitor:DATA?

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

Syntax

ROUTe:MONitor:DATA?

Description

This query reads the monitor data from the selected channel. It returns the reading only; the units, time, channel, and alarm information are not returned (the FORMat:READing commands do not apply to monitor readings).

Remarks

- If the Monitor mode is not currently enabled, this query returns an error indicating that it is unable to perform the requested operation.
- Readings acquired during a Monitor are not stored in memory but they are displayed on the front panel; however, all readings from a scan in progress at the same time are stored in memory.

Return Format

The query returns one reading for the Monitor channel, in the format +1.12345678E+01. If no data is available for the specified channel, instrument waits for data to become available.

Examples

The following query returns one reading from the Monitor channel.

ROUT: MON: DATA?

Typical Response: +1.84280000E-05

See Also ROUTe Subsystem Introduction ROUTe:MONitor ROUTe:MONitor:STATe

ROUTe:MONitor:STATe

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

Syntax

ROUTe:MONitor:STATe <mode>

ROUTe:MONitor:STATe?

Description

This command disables or enables the Monitor mode. The Monitor mode is equivalent to making continuous measurements on a single channel with an infinite scan count. Only one channel can be monitored at a time but you can change the channel being monitored at any time. This feature is useful for troubleshooting your system before a test or for watching an important signal.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34907A Multifunction Module (digital input and totalizer)
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

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

Remarks

- Channels must be configured for a measurement in order to be monitored (see CONFigure and SENSe commands). Configuring a channel for a measurement makes it monitorable and makes it part of the scan list.
- The Monitor mode is automatically enabled on all channels that are part of the active scan list (see ROUTe:SCAN command).
- A scan always has priority over the Monitor function (see ROUTe:SCAN command).
- The Monitor mode ignores all trigger settings (see TRIGger:SOURce command) and takes continuous readings on the selected channel using the IMMediate (continuous) source.
- Any channel that can be "read" by the instrument can be monitored. This includes any combination of temperature, voltage, resistance, current, frequency, or period measurements on multiplexer channels. You can also monitor a digital input channel or the totalizer count on the digital modules.
- Mx+B scaling and alarm limits are applied to the selected channel during a Monitor and all alarm data is stored in the alarm queue (which will be cleared if power fails).
- For monitor operations using a multiplexer module, no measurements are taken if the internal DMM is disabled (see INSTrument:DMM command) or not installed in the mainframe. The internal DMM is not required for monitor operations on the digital modules.
- The count on a totalizer channel is not reset when it is being monitored (the Monitor ignores the totalizer reset mode).
- Readings acquired during a Monitor are not stored in memory but

they are displayed on the front panel; however, all readings from a scan in progress at the same time are stored in memory.

Return Format

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

Examples

The following program segment configures channel 3 in slot 100 for DC voltage measurements, enables monitoring on the channel, and turns on the Monitor mode.

CONF:VOLT:DC (@103) ROUT:MON:CHAN (@103) ROUT:MON:STAT ON

The following query returns the state of the Monitor mode.

ROUT:MON:STAT?

Typical Response: 1

See Also

ROUTe Subsystem Introduction ROUTe:CLOSe ROUTe:MONitor:DATA? ROUTe:OPEN

ROUTe:OPEN

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

Syntax

ROUTe:OPEN (@<ch_list>)

ROUTe:OPEN? (@<ch_list>)

Description

This command opens the specified channels on a multiplexer or switch module.

Used With:

• All modules except 34907A

Parameters

Name	Туре	Range of Values	Default Value
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	This is a required parameter.

Remarks

- For the matrix modules, the channel number represents the intersection of the desired row and column. For example, channel 234 represents the intersection of row 3 and column 4 on the module in slot 200 (assumes two-wire mode). For more information, see the simplified schematics.
- The RF Multiplexer modules (34905A, 34906A) will not respond to the ROUTe:OPEN command (an error is generated). To "open" a channel on these modules, send the ROUTe:CLOSe command to a different channel in the same bank.
- As part of the scan setup, the ROUTe:SCAN command examines the scan list and determines which channel relays and Analog Bus relays will be impacted by the scan. The following rules will apply once the scan is initiated and will impact what relays can be manually opened and closed.
- a. When the scan is initiated, the instrument will open all channels in modules that contain one or more channels in the scan list.
- b. While the scan is running, the instrument prohibits use of all channels in modules that contain one or more channels in the specified <*ch_list*> (these channels are dedicated to the scan).

Return Format

The query returns 1 if the specified channel is open or 0 if the specified channel is closed. Multiple responses are separated by commas.

Examples

The following command opens channels 03 and 13 in slot 100.

```
ROUT: OPEN (@103, 113)
```

The following command opens channel 03 on the matrix module in slot 300.

```
ROUT: OPEN (@303)
```

The following command opens channels 01 through 08 on the matrix module in slot 300.

```
ROUT:OPEN (@301:308)
```

The following query reads the state of channels 03 and 06 in slot 100 (1 = open; 0 = closed).

ROUT: OPEN? (@103,106)

Typical Response: 1,1

See Also ROUTe Subsystem Introduction ROUTe:CLOSe

ROUTe:SCAN

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

Syntax

ROUTe:SCAN (@<scan_list>)

ROUTe:SCAN?

Description

This command selects the channels to be included in the scan list. This command is used in conjunction with the CONFigure commands to set up an automated scan. The specified channels supersede any channels previously defined to be part of the scan list. To start the scan, use the INITiate or READ? command.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34907A Multifunction Module (digital input and totalizer)
- 34908A 40 Channel Single-Ended Multiplexer Module
- NOTE To remove all channels from the present scan list, send "ROUT:SCAN (@)".

Parameters

Name	Туре	Range of Values	Default Value
<scan_list></scan_list>	Scan List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	This is a required parameter.

Remarks

- To remove all channels from the scan list, issue the command ROUT:SCAN (@).
- The instrument scans the list of channels in ascending order from slot 100 through slot 300 (channels are re-ordered as needed).When you specify a range of channels in the <scan_list>, the channels are always sorted in ascending order. Therefore, (@109:101) will always be interpreted as 101, 102, 103, etc.
- You can use either the internal DMM or an external instrument to make measurements of your configured channels. However, the 34970A/34972A allows only one scan list at a time; you cannot scan some channels using the internal DMM and others using an external instrument. Readings are stored in 34970A/34972A memory only when the internal DMM is used, except for digital input and totalizer channels.
- You can store at least 50,000 readings in memory and all readings are automatically time stamped. If memory overflows, the new readings will overwrite the first (oldest) readings stored; the most recent readings are always preserved. You can read the contents of memory at any time, even during a scan. Reading memory is not cleared when you read it.
- Each time you start a new scan, the instrument clears all readings (including alarm data) stored in reading memory from the previous measurement. Therefore, the contents of memory are always from the most recent measurement.
- If you abort a scan that is running (see ABORt command), the instrument will terminate any reading in progress (readings are not cleared from memory). If a scan is in progress when the command is received, the scan will not be completed and you cannot resume the scan from where it left off. Note that if you initiate a new scan,

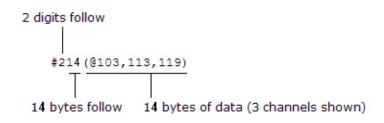
all readings are cleared from memory.

- The CONFigure and MEASure? commands overwrite the scan list.
- The present scan list is stored in non-volatile memory and will be retained when power is turned off.

Return Format

The query returns a list of channel numbers in Definite-Length Block format. The syntax is a pound sign (#) followed by a non-zero digit representing the number of characters to follow. This digit is followed by a decimal integer indicating the number of data bytes to follow. This is followed by a block of data containing the specified number of bytes. An empty scan list (one with no channels selected) will indicated by "#13(@)"

For example:



Examples

The following program segment shows how to use the CONFigure command to configure two channels for DC voltage measurements. The ROUTe:SCAN command puts the two channels into the scan list (and redefines the scan list). The INITiate command places the instrument in the "wait-for-trigger" state and then sends the readings to memory. The FETCh? command transfers the readings from memory to the instrument's output buffer.

CONF:VOLT:DC 10,0.003,(@103,108) **ROUT:SCAN (@103,108)** INIT FETC?

Typical Response: +4.27150000E-03,+1.32130000E-03

The following command clears the present scan list.

ROUT:SCAN (@)

The following query returns a list of channels in the present scan list.

ROUT:SCAN?

Typical Response: #210(@103,108)

See Also

ROUTe Subsystem Introduction

ABORt

INITiate

READ?

ROUTe:SCAN:SIZE?

ROUTe:SCAN:SIZE?

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

Syntax

ROUTe:SCAN:SIZE?

Description

This query returns the number of channels in the scan list.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34907A Multifunction Module (digital input and totalizer)
- 34908A 40 Channel Single-Ended Multiplexer Module

Remarks

• The present scan list is stored in non-volatile memory and will be retained when power is turned off.

Return Format

The query returns the number of channels as a signed integer from 0 to 120.

Example

The following query returns the number of channels in the scan list.

```
ROUT:SCAN (@101:120)
ROUT:SCAN:SIZE?
```

Typical Response: +20

See Also ROUTe Subsystem Introduction ROUTe:SCAN

SENSe Subsystem Introduction

If you specify a *<ch_list>* with one of these commands, that *<ch_list>* overwrites the current scan list.

Command Summary

AC Current

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

DC Current

[SENSe:]CURRent:DC:APERture [SENSe:]CURRent:DC:APERture? [SENSe:]CURRent:DC:NPLC [SENSe:]CURRent:DC:NPLC? [SENSe:]CURRent:DC:RANGe [SENSe:]CURRent:DC:RANGe:AUTO [SENSe:]CURRent:DC:RANGe:AUTO [SENSe:]CURRent:DC:RESolution [SENSe:]CURRent:DC:RESolution?

AC Voltage

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

DC Current

[SENSe:]VOLTage:DC:APERture [SENSe:]VOLTage:DC:APERture? [SENSe:]VOLTage:DC:NPLC [SENSe:]VOLTage:DC:NPLC? [SENSe:]VOLTage:DC:RANGe [SENSe:]VOLTage:DC:RANGe? [SENSe:]VOLTage:DC:RANGe:AUTO [SENSe:]VOLTage:DC:RANGe:AUTO? [SENSe:]VOLTage:DC:RESolution

2-Wire Resistance

[SENSe:]RESistance:APERture [SENSe:]RESistance:APERture? [SENSe:]RESistance:NPLC [SENSe:]RESistance:NPLC? [SENSe:]RESistance:OCOMpensated [SENSe:]RESistance:OCOMpensated? [SENSe:]RESistance:RANGe [SENSe:]RESistance:RANGe? [SENSe:]RESistance:RANGe:AUTO [SENSe:]RESistance:RANGe:AUTO? [SENSe:]RESistance:RESolution [SENSe:]RESistance:RESolution?

4-Wire Resistance

[SENSe:]FRESistance:APERture [SENSe:]FRESistance:NPLC [SENSe:]FRESistance:NPLC? [SENSe:]FRESistance:OCOMpensated [SENSe:]FRESistance:OCOMpensated? [SENSe:]FRESistance:RANGe [SENSe:]FRESistance:RANGe? [SENSe:]FRESistance:RANGe:AUTO [SENSe:]FRESistance:RANGe:AUTO? [SENSe:]FRESistance:RESolution

Frequency

[SENSe:]FREQuency:APERture [SENSe:]FREQuency:APERture? [SENSe:]FREQuency:RANGe:LOWer [SENSe:]FREQuency:RANGe:LOWer? [SENSe:]FREQuency:VOLTage:RANGe [SENSe:]FREQuency:VOLTage:RANGe? [SENSe:]FREQuency:VOLTage:RANGe:AUTO [SENSe:]FREQuency:VOLTage:RANGe:AUTO?

Period

[SENSe:]PERiod:APERture [SENSe:]PERiod:APERture? [SENSe:]PERiod:VOLTage:RANGe [SENSe:]PERiod:VOLTage:RANGe? [SENSe:]PERiod:VOLTage:RANGe:AUTO [SENSe:]PERiod:VOLTage:RANGe:AUTO?

Temperature

[SENSe:]TEMPerature:APERture [SENSe:]TEMPerature:APERture? [SENSe:]TEMPerature:NPLC [SENSe:]TEMPerature:NPLC? [SENSe:]TEMPerature:RJUNction? [SENSe:]TEMPerature:TRANsducer:FRTD:OCOMpensated [SENSe:]TEMPerature:TRANsducer:FRTD:OCOMpensated? [SENSe:]TEMPerature:TRANsducer:FRTD:RESistance[:REFerence] [SENSe:]TEMPerature:TRANsducer:FRTD:RESistance[:REFerence]? [SENSe:]TEMPerature:TRANsducer:FRTD:TYPE [SENSe:]TEMPerature:TRANsducer:FRTD:TYPE? [SENSe:]TEMPerature:TRANsducer:RTD:OCOMpensated [SENSe:]TEMPerature:TRANsducer:RTD:OCOMpensated? [SENSe:]TEMPerature:TRANsducer:RTD:RESistance[:REFerence] [SENSe:]TEMPerature:TRANsducer:RTD:RESistance[:REFerence]? [SENSe:]TEMPerature:TRANsducer:RTD:TYPE [SENSe:]TEMPerature:TRANsducer:RTD:TYPE? [SENSe:]TEMPerature:TRANsducer:TCouple:CHECk [SENSe:]TEMPerature:TRANsducer:TCouple:CHECk? [SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction [SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction? [SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction:TYPE [SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction:TYPE? [SENSe:]TEMPerature:TRANsducer:TCouple:TYPE [SENSe:]TEMPerature:TRANsducer:TCouple:TYPE? [SENSe:]TEMPerature:TRANsducer:THERmistor:TYPE [SENSe:]TEMPerature:TRANsducer:THERmistor:TYPE? [SENSe:]TEMPerature:TRANsducer:TYPE [SENSe:]TEMPerature:TRANsducer:TYPE?

Digital I/O and Totalizer

[SENSe:]DIGital:DATA:{BYTE|WORD}? [SENSe:]TOTalize:CLEar:IMMediate [SENSe:]TOTalize:DATA? [SENSe:]TOTalize:SLOPe [SENSe:]TOTalize:SLOPe? [SENSe:]TOTalize:STARt[:IMMediate] [SENSe:]TOTalize:STOP[:IMMediate] [SENSe:]TOTalize:TYPE [SENSe:]TOTalize:TYPE?

Miscellaneous

[SENSe:]FUNCtion

[SENSe:]FUNCtion?

[SENSe:]ZERO:AUTO

[SENSe:]ZERO:AUTO?

[SENSe:]CURRent:AC:BANDwidth

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

Syntax

[SENSe:]CURRent:AC:BANDwidth {<*filter*>|MIN|MAX}[,(@<*ch_list*>)]

[SENSe:]CURRent:AC:BANDwidth? [{(@<ch_list>)|MIN|MAX}]

Description

The instrument uses three different AC filters which enable you to either optimize low frequency accuracy or achieve faster AC settling times. The instrument selects the slow (3 Hz), medium (20 Hz), or fast (200 Hz) filter based on the input frequency that you specify with this command for the selected channels. If you omit the optional $<ch_list>$ parameter, this command applies to the currently defined scan list.

Used With:

• 34901A 20 Channel Multiplexer (2/4-wire) Module (channels 21 and 22 only)

Parameters

Name	Туре	Range of Values	Default Value
<filter></filter>	Discrete	{3 20 200}	20
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@321) - channel 21 on the module in slot 300. (@221:222) - channels 21 through 22 on the module in slot 200. (@121:122,222,321:322) - channels 21 and 22 on the module in slot 100, channel 22 on the module in slot 200, and channels 21-22 on the module in slot 300. Note that the channels must be of the form s 21 and s 22, where s is the first digit of the slot number.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- This command applies to AC current measurements only.
- For the *<filter>* parameter, specify the lowest frequency expected in the input signal on the specified channels. The instrument selects the appropriate filter based on the frequency you specify.

Input Frequency	Default Settling Delay	Minimum Settling Delay
3 Hz to 300 kHz (Slow)	7 seconds / reading	1.5 seconds
20 Hz to 300 kHz (Medium)	1 second / reading	200 ms
200 Hz to 300 kHz (Fast)	0.12 seconds / reading	20 ms

- The CONFigure and MEASure? commands automatically select the default 20 Hz (medium) filter.
- The instrument selects the default 20 Hz (medium) filter after a Factory Reset (*RST command). An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does not change the setting.
- The settling delay is controlled by the ROUTe:CHANnel:DELay command. You get the default delay with ROUTe:CHANnel:DELay:AUTO ON.

Return Format

The query returns 3 (slow), 20 (medium), or 200 (fast) for each channel specified. Multiple responses are separated by commas.

Examples

The following command selects the slow filter (3 Hz) on channels 21 and 22 in slot 100.

CURR:AC:BAND 3, (@121,122)

The following query returns the AC filter settings on channels 21 and 22 in slot 100.

CURR:AC:BAND? (@121,122)

Typical Response: 3,3

See Also

SENSe Subsystem Introduction [SENSe:]CURRent:AC:RANGe CONFigure:CURRent:AC

[SENSe:]CURRent:AC:RANGe [SENSe:]CURRent:DC:RANGe

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

Syntax

[SENSe:]CURRent:AC:RANGe {<*range*>|MIN|MAX}[,(@<*ch_list*>)] [SENSe:]CURRent:AC:RANGe? [{(@<*ch_list*>)|MIN|MAX}]

[SENSe:]CURRent:DC:RANGe {<*range*>|MIN|MAX}[,(@<*ch_list*>)] [SENSe:]CURRent:DC:RANGe? [{(@<*ch_list*>)|MIN|MAX}]

Description

These commands select the measurement range for AC and DC current measurements on the specified channels.

Used With:

• 34901A 20 Channel Multiplexer (2/4-wire) Module (channels 21 and 22 only)

Parameters

Name	Туре	Range of Values	Default Value
<range></range>	Discrete	Expected value in amps (ranges shown below). 10 mA (MIN) 100 mA 1 A (MAX)	This is a required parameter.
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@321) - channel 21 on the module in slot 300. (@221:222) - channels 21 through 22 on the module in slot 200. (@121:122,222,321:322) - channels 21 and 22 on the module in slot 100, channel 22 on the module in slot 200, and channels 21-22 on the module in slot 300. Note that the channels must be of the form s 21 and s 22, where s is the first digit of the slot	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

	number.	

Remarks

- Selecting a discrete range will disable autoranging on the specified channels (see [SENSe:]CURRent:AC:RANGe:AUTO and [SENSe:]CURRent:DC:RANGe:AUTO commands).
- The CONFigure and MEASure? commands automatically enable autoranging if the first parameter is AUTO, DEF or omitted.
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication: "±OVLD" from the front panel or "±9.9E+37" from the remote interface.
- The instrument selects autoranging after a Factory Reset (*RST command). An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does not change the setting.

Return Format

The query returns the range in the form "+1.0000000E-01" for each channel specified. Multiple responses are separated by commas.

Examples

The following command selects the 100 mA range on channels 21 and 22 in slot 100.

CURR:AC:RANG 0.1, (@121,122)

The following query returns the range selected on channels 21 and 22 in slot 100.

CURR:AC:RANG? (@121,122)

Typical Response: +1.00000000E-01,+1.0000000E-01

See Also

SENSe Subsystem Introduction CONFigure:CURRent:AC CONFigure:CURRent:DC [SENSe:]CURRent:AC:RANGe:AUTO [SENSe:]CURRent:DC:RANGe:AUTO

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

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

Syntax

[SENSe:]CURRent:AC:RANGe:AUTO <*state*>[,(@<*ch_list*>)] [SENSe:]CURRent:AC:RANGe:AUTO? [(@<*ch_list*>)]

[SENSe:]CURRent:DC:RANGe:AUTO <*state*>[,(@<*ch_list*>)] [SENSe:]CURRent:DC:RANGe:AUTO? [(@<*ch_list*>)]

Description

These commands disable or enable autoranging for AC and DC current measurements on the specified channels. Autoranging is convenient because the instrument automatically selects the range for each measurement based on the input signal detected. If you omit the optional *<ch_list>* parameter, this command applies to the currently defined scan list.

Used With:

• 34901A 20 Channel Multiplexer (2/4-wire) Module (channels 21 and 22 only)

Parameters

Name	Туре	Range of Values	Default Value
<mode></mode>	Boolean	{OFF 0 ON 1}	This is a required parameter.
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@321) - channel 21 on the module in slot 300. (@221:222) - channels 21 through 22 on the module in slot 200. (@121:122,222,321:322) - channels 21 and 22 on the module in slot 100, channel 22 on the module in slot 200, and channels 21-22 on the module in slot 300. Note that the channels must be of the form s 21 and s 22, where s is the first digit of the slot number.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- Autorange thresholds: Down range at: <10% of range Up range at: >120% of range
- With autoranging enabled, the instrument selects one of the following ranges based on the input signal detected:

10 mA 100 mA 1 A

- Selecting a discrete range (see [SENSe:]CURRent:AC:RANGe command) will disable autoranging on the specified channels.
- The CONFigure and MEASure? commands automatically enable autoranging if the first parameter is AUTO, DEF or omitted.
- The instrument enables autoranging after a Factory Reset (*RST command). An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does not change the setting.

Return Format

The query returns 0 (OFF) or 1 (ON) for each channel in the *<ch_list>*. Multiple values are separated by commas.

Examples

In these examples, you could substitute the node name DC for AC.

The following command turns on AC current measurement autoranging for two channels.

CURR:AC:RANG:AUTO 1, (@221:222)

The following query returns the value of autoranging for three channels.

CURR:AC:RANG:AUTO? (@221,321,322)

Typical Response: 1,0,1

See Also

SENSe Subsystem Introduction

[SENSe:]CURRent:AC:RESolution [SENSe:]CURRent:DC:RESolution

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

Syntax

[SENSe:]CURRent:AC:RESolution {<*resolution*>|MIN|MAX}[, (@<*ch_list*>)] [SENSe:]CURRent:AC:RESolution? [{(@<*ch_list*>)|MIN|MAX}]

[SENSe:]CURRent:DC:RESolution {<*resolution*>|MIN|MAX}[, (@<*ch_list*>)] [SENSe:]CURRent:DC:RESolution? [{(@<*ch_list*>)|MIN|MAX}]

Description

This command selects the measurement resolution for current measurements on the specified channels. The instrument clears all readings from memory when a new scan is initiated, when any measurement parameters are changed (CONFigure and SENSe commands), and when the triggering configuration is changed (TRIGger commands). If you omit the optional *<ch_list>* parameter, this command applies to the currently defined scan list.

Used With:

• 34901A 20 Channel Multiplexer (2/4-wire) Module (channels 21 and 22 only)

Parameters

Name	Туре	Range of Values	Default Value
<resolution></resolution>	Numeric	Desired resolution in amps.	0.000003 x Range (1 PLC)
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@321) - channel 21 on the module in slot 300. (@221:222) - channels 21 through 22 on the module in slot 200. (@121:122,222,321:322) - channels 21 and 22 on the module in slot 100, channel 22 on the module in slot 200, and channels 21-22 on the module in slot 300. Note that the channels must be of the form s 21 and s 22, where s is the first digit of the slot number.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- For the *<resolution>* parameter, you can substitute MIN or MAX for a numeric value. MIN selects the smallest value accepted, which gives the highest resolution; MAX selects the largest value accepted, which gives the least resolution.
- The instrument will dispatch a settings conflict error if you issue this command when[SENSe:]CURRent:AC:RANGe:AUTO (AC resolution) or [SENSe:]CURRent:DC:RANGe:AUTO (DC resolution) is ON for one or more of the specified channels.
- Setting the resolution also sets the integration time for the measurement. The following table shows the relationship between integration time, measurement resolution, number of digits, and number of bits.

Integration Time	Resolution	Digits	Bits
0.02 PLC	<0.0001 x Range	4½ Digits	15
0.2 PLC	<0.00001 x Range	5½ Digits	18
1 PLC	<0.000003 x Range	5½ Digits	20
2 PLC	<0.0000022 x Range	6½ Digits	21
10 PLC	<0.000001 x Range	6½ Digits	24
20 PLC	<0.0000008 x Range	6½ Digits	25
100 PLC	<0.0000003 x Range	6½ Digits	26

200 PLC	< 0.0000022	6½	26
	x Range	Digits	

- You can also set the integration time by specifying an aperture time (see [SENSe:]CURRent[:DC]:APERture command). However, note that specifying integration time using NPLCs executes faster and offers better noise rejection characteristics for values of NPLC greater than 1.
- The CONFigure, MEASure?, [SENSe:]CURRent[:DC]:NPLC, and [SENSe:]CURRent[:DC]:RESolution commands automatically disable the aperture mode (these commands select an integration time in NPLCs).
- The instrument sets the resolution to 1 PLC after a Factory Reset (*RST command). An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does not change the setting.

Return Format

The query returns the resolution in the form "+1.0000000E-04" for each channel specified. Multiple responses are separated by commas.

Examples

The following command sets the measurement resolution to 0.01 mA on channels 21 and 22 in slot 100.

CURR:DC:RES 0.00001, (@121, 122)

The following query returns the resolution selected on channels 21 and 22 in slot 100.

CURR:DC:RES? (@121,122) CURR:DC:APER:ENAB? !Verify that aperture mode is disabled ("0")

Typical Response: +1.0000000E-04,+1.0000000E-04

See Also

SENSe Subsystem Introduction

CONFigure:CURRent:AC

CONFigure:CURRent:DC

[SENSe:]CURRent:AC:RANGe:AUTO

[SENSe:]CURRent:DC:RANGe:AUTO

[SENSe:]CURRent:DC:APERture

[SENSe:]CURRent:DC:NPLC

[SENSe:]CURRent:DC:APERture

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

Syntax

[SENSe:]CURRent:DC:APERture {<time>|MIN|MAX}[,(@<ch_list>)]

[SENSe:]CURRent:DC:APERture? [{(@<ch_list>)|MIN|MAX}]

Description

This command enables the aperture mode and sets the integration time in seconds (called *aperture time*) for DC current measurements on the specified channels. If you omit the optional *<ch_list>* parameter, this command applies to the currently defined scan list.

NOTE You should use this command only when you want precise control of the integration time of the internal DMM. Otherwise, specifying integration time using NPLC (see [SENSe:]CURRent[:DC]:NPLC command) executes faster and offers better power line noise rejection characteristics for values of NPLC greater than 1.

Used With:

• 34901A 20 Channel Multiplexer (2/4-wire) Module (channels 21 and 22 only)

Parameters

Name	Туре	Range of Values	Default Value
<time></time>	Numeric	Desired aperture time in seconds between 400 μ s and 1 second, with 4 μ s resolution. MIN = 400 μ s, MAX = 1 second	Aperture disabled.
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@321) - channel 21 on the module in slot 300. (@221:222) - channels 21 through 22 on the module in slot 200. (@121:122,222,321:322) - channels 21 and 22 on the module in slot 100, channel 22 on the module in slot 200, and channels 21-22 on the module in slot 300. Note that the channels must be of the form s 21 and s 22, where s is the first digit of the slot number.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- For the <seconds> parameter, you can substitute MIN or MAX for a numeric value. MIN selects the smallest value accepted, which gives the lowest resolution; MAX selects the largest value accepted, which gives the highest resolution.
- Only the integral number of power line cycles (1, 2, 10, 20, 100, or 200 PLCs) provide normal mode (line frequency noise) rejection.
- The CONFigure, MEASure?, [SENSe:]CURRent[:DC]:NPLC, [SENSe:]CURRent[:DC]:RESolution commands automatically disable the aperture mode (these commands select an integration time in NPLCs).
- The aperture mode is disabled after a Factory Reset (*RST command). An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does not change the setting.

Return Format

The query returns the aperture time in the form "+1.0000000E-01" for each channel specified. Multiple responses are separated by commas.

Examples

The following command enables the aperture mode and sets the aperture time to 300 ms on channels 21 and 22 in slot 100.

CURR:DC:APER 300E-03, (@121,122)

The following query returns the aperture time selected on channels 21 and 22 in slot 100.

CURR:DC:APER? (@121,12) CURR:DC:APER:ENAB? !Verify that aperture mode is enabled ("1")

Typical Response: +3.0000000E-01,+3.0000000E-01

See Also

SENSe Subsystem Introduction CONFigure:CURRent:DC [SENSe:]CURRent:DC:NPLC

[SENSe:]CURRent:DC:NPLC

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

Syntax

[SENSe:]CURRent:DC:NPLC {<*PLCs*>|MIN|MAX}[,(@<*ch_list*>)]

[SENSe:]CURRent:DC:NPLC? [{(@<ch_list>)|MIN|MAX}]

Description

This command sets the integration time in number of power line cycles (PLCs) on the specified channels.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).If you omit the optional *<ch_list>* parameter, this command applies to the currently defined scan list.

Parameters

Name	Туре	Range of Values	Default Value
<plcs></plcs>	Discrete	0.02 0.2 1 2 10 20 100 200} MIN = 0.02 PLC, MAX = 200 PLC	1 PLC
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@321) - channel 21 on the module in slot 300. (@221:222) - channels 21 through 22 on the module in slot 200. (@121:122,222,321:322) - channels 21 and 22 on the module in slot 100, channel 22 on the module in slot 200, and channels 21-22 on the module in slot 300. Note that the channels must be of the form s 21 and s 22, where s is the first digit of the slot number.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- Only the integral number of power line cycles (1, 2, 10, 20, 100, or 200 PLCs) provide normal mode (line frequency noise) rejection.
- Setting the resolution also sets the integration time for the measurement. The following table shows the relationship between integration time, measurement resolution, number of digits, and number of bits.

Integration Time	Resolution	Digits	Bits
0.02 PLC	<0.0001 x Range	4½ Digits	15
0.2 PLC	<0.00001 x Range	5½ Digits	18
1 PLC	<0.000003 x Range	5½ Digits	20
2 PLC	<0.0000022 x Range	6½ Digits	21
10 PLC	<0.000001 x Range	6½ Digits	24
20 PLC	<0.0000008 x Range	6½ Digits	25
100 PLC	<0.0000003 x Range	6½ Digits	26
200 PLC	<0.00000022 x Range	6½ Digits	26

 The NPLC command automatically specifies [SENSe:]ZERO:AUTO as OFF for 0.02 to 0.2 PLCs and as ON for 1 PLC or more.

- The specified integration time is used for all measurements on the selected channels. If you have applied Mx+B scaling or have assigned alarms to the selected channel, those measurements are also made using the specified integration time. Measurements taken during the Monitor function also use the specified integration time.
- You can also set the integration time by specifying an *aperture time* (see [SENSe:]CURRent[:DC]:APERture command). However, note that specifying integration time using NPLCs executes faster and offers better noise rejection characteristics for values of NPLC greater than 1.
- The CONFigure, MEASure?, [SENSe:]CURRent[:DC]:NPLC, [SENSe:]CURRent[:DC]:RESolution commands automatically disable the aperture mode (these commands select an integration time in NPLCs).
- The instrument sets the integration time to 1 PLC after a Factory Reset (*RST command). An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does *not* change the setting.

Return Format

The query returns the integration time in the form "+1.0000000E+00" for each channel specified. Multiple responses are separated by commas.

Examples

The following command set the integration time to 0.2 PLCs on channels 21 and 22 in slot 100.

CURR:DC:NPLC 0.2, (@121, 122)

The following query returns the integration time settings on channels 21 and 22 in slot 100.

CURR:DC:NPLC? (@121,122)

Typical Response: +2.0000000E-01,+2.0000000E-01

See Also

SENSe Subsystem Introduction CONFigure:CURRent:DC [SENSe:]CURRent:DC:APERture

[SENSe:]CURRent:DC:RESolution

[SENSe:]DIGital:DATA:{BYTE|WORD}?

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

Syntax

[SENSe:]DIGital:DATA:{BYTE|WORD}? (@<ch_list>)

Description

This query configures the specified channels as inputs and reads an 8bit byte or a 16-bit word digital pattern from the specified digital input channels.

Parameters

Name	Туре	Range of Values	Default Value
<ch_list></ch_list>	Channel List	One or more digital I/O channels, as shown: (@301) - channel 01 on the module in slot 300. (@101:102,201,302) - channels 01 and 02 on the modules on slot 100, channel 01 on the module in slot 200, and channel 02 on the module in slot 300.	This is a required parameter.

Remarks

- To read both ports simultaneously (WORD), you must send the command to port 01 (LSB) and neither port can be included in the scan list.
- The digital input channels are numbered "**s**01" (LSB) and "**s**02" (MSB), where **s** is the first digit of the slot number.

Return Format

The output from this command is affected by the FORMat:READing commands.

Examples

The following command reads the value on channel 02 of the module in slot 100.

[SENSe:]DIGital:DATA:BYTE? (@102)

Typical Response: +100

The following command reads the value on channels 01 and 02 of the module in slot 200.

[SENSe:]DIGital:DATA:WORD? (@201)

Typical Response: +32103

See Also

SENSe Subsystem Introduction

[SENSe:]FREQuency:APERture [SENSe:]PERiod:APERture

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

Syntax

[SENSe:]FREQuency:APERture {<seconds>|MIN|MAX}[,(@<ch_list>)] [SENSe:]FREQuency:APERture? [{(@<ch_list>)|MIN|MAX}]

[SENSe:]PERiod:APERture {<seconds>|MIN|MAX}[,(@<ch_list>)] [SENSe:]PERiod:APERture? [{(@<ch_list>)|MIN|MAX}]

Description

These commands select the aperture time (also called *gate time*) for frequency and period measurements on the specified channels.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<seconds></seconds>	Discrete	Desired gate time in seconds: 10 ms (4½ digits, MIN) 100 ms (5½ digits) 1 second (6½ digits, MAX)	100 ms
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- For the <seconds> parameter, you can substitute MIN or MAX for a numeric value. MIN selects the smallest value accepted, which gives the lowest resolution; MAX selects the largest value accepted, which gives the highest resolution.
- Because frequency and period are related functions, changing a measurement parameter for one function will also change the corresponding parameter for the other function.
- The instrument sets the aperture time to 100 ms after a Factory Reset (*RST command). An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does not change the setting.

Return Format

The query returns the aperture time in the form "+1.0000000E-01" for each channel specified. Multiple responses are separated by commas.

Examples

The following command sets the gate time to 10 ms on channels 03 and 13 in slot 100.

You can substitute the node name PERiod where the node name FREQ appears below.

```
FREQ:APER 10E-03, (@103,113)
```

The following query returns the gate time selected on channels 03 and 13 in slot 100.

```
FREQ:APER? (@103,113)
```

Typical Response: +1.0000000E-02,+1.0000000E-02

See Also

SENSe Subsystem Introduction

CONFigure:FREQuency

CONFigure:PERiod

[SENSe:]FREQuency:RANGe:LOWer

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

Syntax

[SENSe:]FREQuency:RANGe:LOWer {<*frequency*>|MIN|MAX}[, (@<*ch_list*>)]

[SENSe:]FREQuency:RANGe:LOWer? [{(@<ch_list>)|MIN|MAX}]

Description

The instrument uses three different timeout ranges for frequency measurements. The instrument selects the slow (3 Hz), medium (20 Hz), or fast (200 Hz) measurement timeout based on the input frequency that you specify with this command for the selected channels.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<frequency></frequency>	Numeric	An integer from 3 to 300,000.	This is a required parameter.
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- Applies to frequency measurements only.
- For the *<frequency>* parameter, specify the lowest frequency expected in the input signal on the specified channels. The instrument selects the appropriate measurement timeout based on the frequency you specify. Attempts to measure frequencies below the specified limit may falsely return a value of 0.

Input Frequency	Timeout
3 Hz to 300 kHz (Slow)	1 second
20 Hz to 300 kHz (Medium)	100 ms
200 Hz to 300 kHz (Fast)	10 ms

- The CONFigure and MEASure? commands automatically select the 20 Hz (medium) timeout.
- The instrument selects the medium timeout (20 Hz) after a Factory Reset (*RST command). An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does not change the setting.

Return Format

The query returns 3.0000000 (slow), 2.0000000E+1 (medium), or 2.0000000E+2 (fast).

Examples

For each of the commands shown below, you could use the node name PERiod in place of the FREQ node name.

The following command selects the slow filter (3 Hz).

FREQ:RANG:LOW 3

The following query returns the timeout setting.

FREQ:RANG:LOW?

Typical Response: 3.000000

See Also

SENSe Subsystem Introduction

CONFigure:FREQuency

CONFigure:PERiod

[SENSe:]FREQuency:VOLTage:RANGe [SENSe:]PERiod:VOLTage:RANGe

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

Syntax

[SENSe:]FREQuency:VOLTage:RANGe {<*range*>|MIN|MAX}[, (@<*ch_list*>)] [SENSe:]FREQuency:VOLTage:RANGe? [{(@<*ch_list*>)|MIN|MAX}]

[SENSe:]PERiod:VOLTage:RANGe {<*range*>|MIN|MAX}[,(@<*ch_list*>)] [SENSe:]PERiod:VOLTage:RANGe? [{(@<*ch_list*>)|MIN|MAX}]

Description

These commands select the voltage range for frequency and period measurements on the specified channels.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<range></range>	Discrete	Desired range in volts: 100 mV (MIN) 1 V 10 V 100 V 1000 V (MAX)	This is a required parameter.
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- Selecting a discrete range will disable autoranging on the specified channels.
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication: "±OVLD" from the front panel or "±9.9E+37" from the remote interface.
- The CONFigure and MEASure? commands automatically enable autoranging if the first parameter is AUTO, DEF or omitted.
- Because frequency and period are related functions, changing a measurement parameter for one function will also change the corresponding parameter for the other function.
- The instrument enables autoranging after a Factory Reset (*RST command). An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does not change the setting.

Return Format

The query returns the voltage range in the form "+1.0000000E+01".

Examples

The following command selects the 10 volt range for frequency measurements.

FREQ:VOLT:RANG 10

The following query returns the voltage range selected.

FREQ:VOLT:RANG?

Typical Response: +1.0000000E+01

See Also

SENSe Subsystem Introduction

CONFigure:FREQuency

CONFigure:PERiod

[SENSe:]FREQuency:VOLTage:RANGe:AUTO

[SENSe:]PERiod:VOLTage:RANGe:AUTO

[SENSe:]FREQuency:VOLTage:RANGe:AUTO [SENSe:]PERiod:VOLTage:RANGe:AUTO

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

Syntax

[SENSe:]FREQuency:VOLTage:RANGe:AUTO <*state*>[,(@<*ch_list*>)] [SENSe:]FREQuency:VOLTage:RANGe:AUTO? [(@<*ch_list*>)]

[SENSe:]PERiod:VOLTage:RANGe:AUTO <*state*>[,(@<*ch_list*>)] [SENSe:]PERiod:VOLTage:RANGe:AUTO? [(@<*ch_list*>)]

Description

These commands disable or enable voltage autoranging for frequency and period measurements on the specified channels. Autoranging is convenient because the instrument automatically selects the range for each measurement based on the input signal detected.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<mode></mode>	Boolean	{OFF 0 ON 1}	This is a required parameter.
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- Autorange thresholds: Down range at: <10% of range Up range at: >120% of range
- With autoranging enabled, the instrument selects one of the following ranges based on the input signal detected:

100mV 1 V 10 V 100 V 300 V

- Selecting a discrete range (see [SENSe:]FREQuency:VOLTage:RANGe command) will disable autoranging on the specified channels.
- The CONFigure and MEASure? commands automatically enable autoranging if the first parameter is AUTO, DEF or omitted.
- Because frequency and period are related functions, changing a measurement parameter for one function will also change the corresponding parameter for the other function
- The instrument enables autoranging after a Factory Reset (*RST command). An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does not change the setting.

Return Format

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

Examples

The following command disables autoranging.

FREQ:VOLT:RANG:AUTO OFF

The following query returns the autoranging setting.

FREQ:VOLT:RANG:AUTO?

Typical Response: 0

See Also

SENSe Subsystem Introduction

CONFigure:FREQuency

CONFigure:PERiod

[SENSe:]FREQuency:VOLTage:RANGe

[SENSe:]PERiod:VOLTage:RANGe

[SENSe:]RESistance:APERture [SENSe:]FRESistance:APERture

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

Syntax

[SENSe:]RESistance:APERture {<*time*>|MIN|MAX}[,(@<*ch_list*>)] [SENSe:]RESistance:APERture? [{(@<*ch_list*>)|MIN|MAX}]

[SENSe:]FRESistance:APERture {<*time*>|MIN|MAX}[,(@<*ch_list*>)] [SENSe:]FRESistance:APERture? [{(@<*ch_list*>)|MIN|MAX}]

Description

These commands enable the aperture mode and set the integration time (<*aperture_time*>) in seconds for 2-wire (RESistance) and 4-wire (FRESistance) resistance measurements on the specified channels.

NOTE You should use this command only when you want precise control of the integration time of the internal DMM. Otherwise, specifying integration time using NPLC (see [SENSe:]RESistance:NPLC command) executes faster and offers better power line noise rejection characteristics for values of NPLC greater than 1.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34908A 40 Channel Single-Ended Multiplexer Module (RESistance only; not FRESistance)

Parameters

Name	Туре	Range of Values	Default Value
<aperture_time></aperture_time>	Numeric	A number of seconds, from 0.0004 to 4.	This is a required parameter.You must specify the time, or MIN or MAX.
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- For the <*seconds*> parameter, you can substitute MIN or MAX for a numeric value. MIN selects the smallest value accepted, which gives the lowest resolution; MAX selects the largest value accepted, which gives the highest resolution.
- Because 2-wire and 4-wire resistance are related functions, changing a measurement parameter for one function will also change the corresponding parameter for the other function (see [SENSe:]FRESistance:APERture command).
- For 4-wire resistance measurements, the instrument automatically pairs channel *n* in Bank 1 with channel *n+10* in Bank 2 (34901A) or *n+8* (34902A) to provide the source and sense connections. For example, make the source connections to the HI and LO terminals on channel 02 in Bank 1 and the sense connections to the HI and LO terminals on channel 12 (34901A) or 10 (34902A) in Bank 2.Specify the paired channel in Bank 1 (source) as the <*ch_list*> channel (channels in Bank 2 are not allowed in the <*ch_list*>).
- Only the integral number of power line cycles (1, 2, 10, 20, 100, or 200 PLCs) provide normal mode (line frequency noise) rejection.
- The CONFigure, MEASure?, [SENSe:]RESistance:NPLC, [SENSe:]RESistance:RESolution, [SENSe:]FRESistance:NPLC, and [SENSe:]FRESistance:RESolution commands disable the aperture mode (these commands select an integration time in number of power line cycles).
- The aperture mode is disabled after a Factory Reset (*RST command). An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does not change the setting.

Return Format

The query returns the aperture time in the form "+1.0000000E-01" for each channel specified. Multiple responses are separated by commas.

Examples

In each of the following examples, you could replace the node name FRES with RESistance.

The following command enables the aperture mode and sets the aperture time to 300 ms on channels 03 and 13 in slot 100. For this 4-wire measurement, the instrument automatically pairs these channels in Bank 1 with the corresponding channels in Bank 2.

FRES: APER 300E-03, (@103, 113)

The following query returns the aperture time selected on channels 03 and 13 in slot 100.

FRES:APER? (@103,113)
FRES:APER:ENAB? !Verify that aperture mode is
enabled ("1")

Typical Response: +3.0000000E-01,+3.0000000E-01

See Also

SENSe Subsystem Introduction

CONFigure:FRESistance

CONFigure:RESistance

[SENSe:]FRESistance:NPLC

[SENSe:]RESistance:NPLC

[SENSe:]RESistance:NPLC [SENSe:]FRESistance:NPLC

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

Syntax

[SENSe:]RESistance:NPLC {<*PLCs*>|MIN|MAX}[,(@<*ch_list*>)] [SENSe:]RESistance:NPLC? [{(@<*ch_list*>)|MIN|MAX}]

[SENSe:]FRESistance:NPLC {<*PLCs*>|MIN|MAX}[,(@<*ch_list*>)] [SENSe:]FRESistance:NPLC? [{(@<*ch_list*>)|MIN|MAX}]

Description

These commands set the integration time in number of power line cycles (PLCs) on the specified channels. 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).

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34908A 40 Channel Single-Ended Multiplexer Module (RESistance only; not FRESistance)

Parameters

Name	Туре	Range of Values	Default Value
<plcs></plcs>	Discrete	{0.02 0.2 1 2 10 20 100 200 MIN MAX}	This is a required parameter.
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- Only the integral number of power line cycles (1, 2, 10, 20, 100, or 200 PLCs) provide normal mode (line frequency noise) rejection.
- Because 2-wire and 4-wire resistance are related functions, changing a measurement parameter for one function will also change the corresponding parameter for the other function .
- For 4-wire resistance measurements, the instrument automatically pairs channel *n* in Bank 1 with channel *n+10* in Bank 2 (34901A) or *n+8* (34902A) to provide the source and sense connections. For example, make the source connections to the HI and LO terminals on channel 02 in Bank 1 and the sense connections to the HI and LO terminals on channel 12 (34901A) or 10 (34902A) in Bank 2.Specify the paired channel in Bank 1 (source) as the <*ch_list*> channel (channels in Bank 2 are not allowed in the <*ch_list*>).
- Setting the resolution also sets the integration time for the measurement. The following table shows the relationship between integration time, measurement resolution, number of digits, and number of bits.

Integration Time	Resolution	Digits	Bits
0.02 PLC	<0.0001 x Range	4½ Digits	15
0.2 PLC	<0.00001 x Range	5½ Digits	18
1 PLC	<0.000003 x Range	5½ Digits	20
2 PLC	<0.0000022 x Range	6½ Digits	21
10 PLC	<0.000001 x	6½	24

	Range	Digits	
20 PLC	<0.0000008 x Range	6½ Digits	25
100 PLC	<0.0000003 x Range	6½ Digits	26
200 PLC	<0.00000022 x Range	6½ Digits	26

- The specified integration time is used for all measurements on the selected channels. If you have applied Mx+B scaling or have assigned alarms to the selected channel, those measurements are also made using the specified integration time. Measurements taken during the Monitor function also use the specified integration time.
- You can also set the integration time by specifying an aperture time (see [SENSe:]RESistance:APERture command). However, note that specifying integration time using NPLCs executes faster and offers better noise rejection characteristics for values of NPLC greater than 1.
- The CONFigure, MEASure?, [SENSe:]RESistance:NPLC, [SENSe:]FRESistance:NPLC, [SENSe:]RESistance:RESolution, and [SENSe:]FRESistance:RESolution commands disable the aperture mode (these commands select an integration time in number of power line cycles).
- The instrument sets the integration time to 1 PLC after a Factory Reset (*RST command). An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does not change the setting.

Return Format

The query returns the integration time in the form "+1.0000000E+00" for each channel specified. Multiple responses are separated by commas.

Examples

In each of the following examples, you could replace the node name FRES with RESistance.

The following command set the integration time to 0.2 PLCs on channels 03 and 13 in slot 100. For this 4-wire measurement, the instrument automatically pairs these channels in Bank 1 with the corresponding channels in Bank 2.

FRES:NPLC 0.2, (@103, 113)

The following query returns the integration time settings on channels 03 and 13 in slot 100.

FRES:NPLC? (@103,113)
FRES:APER:ENAB? !Verify that aperture mode is
disabled ("0")

Typical Response: +2.0000000E-01,+2.0000000E-01

See Also

SENSe Subsystem Introduction [SENSe:]RESistance:APERture [SENSe:]FRESistance:APERture [SENSe:]RESistance:RESolution [SENSe:]FRESistance:RESolution

[SENSe:]RESistance:OCOMpensated [SENSe:]FRESistance:OCOMpensated

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

This functionality is available on the 34972A only.

Syntax

[SENSe:]RESistance:OCOMpensated <*state*>[,(@<*ch_list*>)] [SENSe:]RESistance:OCOMpensated? [(@<*ch_list*>)]

[SENSe:]FRESistance:OCOMpensated <*state*>[,(@<*ch_list*>)] [SENSe:]FRESistance:OCOMpensated? [(@<*ch_list*>)]

Description

Offset compensation removes the effects of any DC voltages in the circuit being measured. The technique involves taking the difference between two resistance measurements on the specified channels, one with the current source turned on and one with the current source turned off.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34908A 40 Channel Single-Ended Multiplexer Module (RESistance only; not FRESistance)

Parameters

Name	Туре	Range of Values	Default Value
<state></state>	Boolean	{OFF 0 ON 1}	This is a required parameter. The factory default value is OFF.
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- Turning offset compensation on will double measurement time.
- Once enabled, offset compensation is applied to both 2-wire and 4-wire resistance measurements on the specified channels.
- Because 2-wire and 4-wire resistance are related functions, changing a measurement parameter for one function will also change the corresponding parameter for the other function .
- For 4-wire resistance measurements, the instrument automatically pairs channel *n* in Bank 1 with channel *n+10* in Bank 2 (34901A) or *n+8* (34902A) to provide the source and sense connections. For example, make the source connections to the HI and LO terminals on channel 02 in Bank 1 and the sense connections to the HI and LO terminals on channel 12 (34901A) or 10 (34902A) in Bank 2.Specify the paired channel in Bank 1 (source) as the <*ch_list*> channel (channels in Bank 2 are not allowed in the <*ch_list*>).
- The CONFigure and MEASure? commands automatically disable offset compensation.
- The instrument disables offset compensation after a Factory Reset (*RST command). An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does not change the setting.

Return Format

The query returns 0 (OFF) or 1 (ON) for each channel specified. Multiple responses are separated by commas.

Examples

In each of the following examples, you can replace the node name RES with FRES.

The following command enables offset compensation on channels 3 and 13 in slot 100.

```
RES: OCOM ON, (@103, 113)
```

The following query returns the offset compensation settings on channels 03 and 13 in slot 100.

RES:0COM? (@103,113)

Typical Response: 1,1

See Also

SENSe Subsystem Introduction

CONFigure:RESistance

CONFigure:RESistance

[SENSe:]RESistance:RANGe [SENSe:]FRESistance:RANGe

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

Syntax

[SENSe:]RESistance:RANGe {<*range*>|MIN|MAX}[,(@<*ch_list*>)] [SENSe:]RESistance:RANGe? [{(@<*ch_list*>)|MIN|MAX}]

[SENSe:]FRESistance:RANGe {<*range*>|MIN|MAX}[,(@<*ch_list*>)] [SENSe:]FRESistance:RANGe? [{(@<*ch_list*>)|MIN|MAX}]

Description

This command selects the measurement range for 2-wire (RESistance) and 4-wire (FRESistance) resistance measurements on the specified channels.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34908A 40 Channel Single-Ended Multiplexer Module (RESistance only; not FRESistance)

Parameters

Name	Туре	Range of Values	Default Value
<range></range>	Discrete	Desired range in ohms: 100Ω (MIN) 1 kΩ 10 kΩ 100 kΩ 1 MΩ 10 MΩ 100 MΩ (MAX)	This is a required parameter.
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- Selecting a discrete range will disable autoranging on the specified channels (see [SENSe:]RESistance:RANGe:AUTO command).
- Because 2-wire and 4-wire resistance are related functions, changing a measurement parameter for one function will also change the corresponding parameter for the other function (see [SENSe:]RESistance:RANGe command).
- The CONFigure and MEASure? commands automatically enable autoranging if the first parameter is AUTO, DEF or omitted.
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication: "±OVLD" from the front panel or "±9.9E+37" from the remote interface.
- For 4-wire resistance measurements, the instrument automatically pairs channel *n* in Bank 1 with channel *n+10* in Bank 2 (34901A) or *n+8* (34902A) to provide the source and sense connections. For example, make the source connections to the HI and LO terminals on channel 02 in Bank 1 and the sense connections to the HI and LO terminals on channel 12 (34901A) or 10 (34902A) in Bank 2.Specify the paired channel in Bank 1 (source) as the <*ch_list*> channel (channels in Bank 2 are not allowed in the <*ch_list*>).
- The instrument enables autoranging after a Factory Reset (*RST command). An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does not change the setting.

Return Format

The query returns the range in the form "+1.0000000E+03" for each channel specified. Multiple responses are separated by commas.

Examples

In the following examples, you can susbstitute the node name RES for FRES.

The following command selects the 10 k Ω range on channels 03 and 13 in slot 100. For this 4-wire measurement, the instrument automatically pairs these channels in Bank 1 with the corresponding channels in Bank 2.

FRES:RANG 10E+3, (@103,113)

The following query returns the range selected on channels 03 and 13 in slot 100.

```
FRES:RANG? (@103,113)
```

Typical Response: +1.00000000E+04,+1.0000000E+04

See Also

SENSe Subsystem Introduction

CONFigure:FRESistance

CONFigure:RESistance

[SENSe:]FRESistance:RANGe:AUTO

[SENSe:]RESistance:RANGe:AUTO

[SENSe:]RESistance:RANGe:AUTO [SENSe:]FRESistance:RANGe:AUTO

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

Syntax

[SENSe:]RESistance:RANGe:AUTO <*state*>[,(@<*ch_list*>)] [SENSe:]RESistance:RANGe:AUTO? [(@<*ch_list*>)]

[SENSe:]FRESistance:RANGe:AUTO <*state*>[,(@<*ch_list*>)] [SENSe:]FRESistance:RANGe:AUTO? [(@<*ch_list*>)]

Description

This command disables or enables autoranging for 2-wire (RESistance) or 4-wire (FRESistance) resistance measurements on the specified channels. Autoranging is convenient because the instrument automatically selects the range for each measurement based on the input signal detected.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34908A 40 Channel Single-Ended Multiplexer Module (RESistance only; not FRESistance)

Parameters

Name	Туре	Range of Values	Default Value
<state></state>	Boolean	{OFF 0 ON 1}	This is a required parameter. The factory default value is ON.
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- For 4-wire resistance measurements, the instrument automatically pairs channel *n* in Bank 1 with channel *n+10* in Bank 2 (34901A) or *n+8* (34902A) to provide the source and sense connections. For example, make the source connections to the HI and LO terminals on channel 02 in Bank 1 and the sense connections to the HI and LO terminals on channel 12 (34901A) or 10 (34902A) in Bank 2.Specify the paired channel in Bank 1 (source) as the <*ch_list*> channel (channels in Bank 2 are not allowed in the <*ch_list*>).
- Because 2-wire and 4-wire resistance are related functions, changing a measurement parameter for one function will also change the corresponding parameter for the other function .
- Autorange thresholds: Down range at: <10% of range Up range at: >120% of range
- With autoranging enabled, the instrument selects one of the following ranges based on the input signal detected:

100Ω 1 kΩ 10 kΩ 100 kΩ 1 MΩ 10 MΩ 100 MΩ

- Selecting a discrete range (see [SENSe:]RESistance:RANGe command) will disable autoranging on the specified channels.
- The CONFigure and MEASure? commands automatically enable autoranging if the first parameter is AUTO, DEF or omitted.
- The instrument enables autoranging after a Factory Reset (*RST

command). An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does not change the setting. **Return Format**

The query returns 0 (OFF) or 1 (ON) for each channel specified. Multiple responses are separated by commas.

Examples

In the following examples, you can substitute the node name RES for FRES.

The following command disables autoranging on channels 03 and 13 in slot 100. For this 4-wire measurement, the instrument automatically pairs these channels in Bank 1 with the corresponding channels in Bank 2.

FRES:RANG:AUTO 0FF, (@103,113)

The following query returns the autoranging settings on channels 03 and 13 in slot 100.

FRES:RANG:AUTO? (@103,113)

Typical Response: 0,0

See Also

SENSe Subsystem Introduction

CONFigure:FRESistance

CONFigure:RESistance

[SENSe:]FRESistance:RANGe

[SENSe:]RESistance:RANGe

[SENSe:]RESistance:RESolution [SENSe:]FRESistance:RESolution

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

Syntax

[SENSe:]RESistance:RESolution {<*resolution*>|MIN|MAX}[,(@<*ch_list*>)] [SENSe:]RESistance:RESolution? [{(@<*ch_list*>)|MIN|MAX}]

[SENSe:]FRESistance:RESolution {<*resolution*>|MIN|MAX}[, (@<*ch_list*>)] [SENSe:]FRESistance:RESolution? [{(@<*ch_list*>)|MIN|MAX}]

Description

These commands select the measurement resolution for 2-wire (RESistance) and 4-wire (FRESistance) resistance measurements on the specified channels. Specify the resolution in the same units as the selected measurement function, *not in number of digits*.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34908A 40 Channel Single-Ended Multiplexer Module (RESistance only; not FRESistance)

Parameters

Name	Туре	Range of Values	Default Value
<resolution></resolution>	Numeric	Desired resolution in ohms	0.000003 x Range (1 PLC)
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- For 4-wire resistance measurements, the instrument automatically pairs channel *n* in Bank 1 with channel *n+10* in Bank 2 (34901A) or *n+8* (34902A) to provide the source and sense connections. For example, make the source connections to the HI and LO terminals on channel 02 in Bank 1 and the sense connections to the HI and LO terminals on channel 12 (34901A) or 10 (34902A) in Bank 2.Specify the paired channel in Bank 1 (source) as the <*ch_list*> channel (channels in Bank 2 are not allowed in the <*ch_list*>).
- For the *<resolution>* parameter, you can substitute MIN or MAX for a numeric value. MIN selects the smallest value accepted, which gives the highest resolution; MAX selects the largest value accepted, which gives the least resolution.
- The instrument will dispatch a settings conflict error if you issue this command when[SENSe:]CURRent:DC:RANGe:AUTO is ON for one or more of the specified channels.
- Because 2-wire and 4-wire resistance are related functions, changing a measurement parameter for one function will also change the corresponding parameter for the other function.
- Setting the resolution also sets the integration time for the measurement. The following table shows the relationship between integration time, measurement resolution, number of digits, and number of bits.

Integration Time	Resolution	Digits	Bits
0.02 PLC	<0.0001 x Range	4½ Digits	15
0.2 PLC	<0.00001 x Range	5½ Digits	18

1 PLC	<0.000003 x Range	5½ Digits	20
2 PLC	<0.0000022 x Range	6½ Digits	21
10 PLC	<0.000001 x Range	6½ Digits	24
20 PLC	<0.0000008 x Range	6½ Digits	25
100 PLC	<0.0000003 x Range	6½ Digits	26
200 PLC	<0.00000022 x Range	6½ Digits	26

- You can also set the integration time by specifying an aperture time (see [SENSe:]RESistance:APERture command). However, note that specifying integration time using NPLCs executes faster and offers better noise rejection characteristics for values of NPLC greater than 1.
- The CONFigure, MEASure?, [SENSe:]RESistance:NPLC, [SENSe:]RESistance:NPLC, [SENSe:]RESistance:RESolution, and [SENSe:]FRESistance:RESolution commands disable the aperture mode (these commands select an integration time in number of power line cycles).
- The instrument sets the resolution to 1 PLC after a Factory Reset (*RST command). An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does not change the setting.

Return Format

The query returns the resolution in the form "+1.0000000E+02" for each channel specified. Multiple responses are separated by commas.

Examples

In the following commands, you can substitute the node name RES:FRES for RES:RES.

The following command sets the measurement resolution to 100Ω on channels 03 and 13 in slot 100.

```
RES:RES 100, (@103, 113)
```

The following query returns the resolution selected on channels 03 and 13 in slot 100.

```
RES:RES? (@103,113)
RES:APER:ENAB? !Verify that aperture mode is
disabled ("0")
```

Typical Response: +1.00000000E+02,+1.0000000E+02

See Also

SENSe Subsystem Introduction

CONFigure:FRESistance

CONFigure:RESistance

[SENSe:]FRESistance:APERture

[SENSe:]RESistance:APERture

[SENSe:]FRESistance:NPLC

[SENSe:]RESistance:NPLC

[SENSe:]FUNCtion

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

Syntax

[SENSe:]FUNCtion "<function>"[,(@<ch_list>)]

[SENSe:]FUNCtion? [(@<ch_list>)]

Description

Select the measurement function on the specified channels. The function name must be enclosed in quotes in the command string (for example, FUNC "VOLT:DC").

Parameters

Name	Туре	Range of Values	Default Value
<function></function>	Discrete	{TEMPerature VOLTage[:DC] VOLTage:AC RESistance FRESistance CURRent[:DC] CURRent:AC FREQuency PERiod}	This is a required parameter.
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- This command is not available on digital cards.
- Note that when you change the measurement function on a channel, all of the other measurement attributes (range, resolution, etc.) are set to their default values.
- You cannot set any function-specific measurement attributes unless the channel is already configured for that function. For example, you cannot set the AC filter unless that channel is already configured for AC voltage or AC current measurements.

Return Format

The query returns a quoted string indicating the short form of the function name (example: "VOLT") on each channel. Multiple channels are separated by commas.

Examples

The following commands specify functions for the channels shown.

```
FUNC "TEMPerature",(@301)
FUNC "FREQuency",(@204)
```

The following query returns the functions specified for the channels shown.

```
FUNC? (@204,301)
```

Typical response: "FREQ", "TEMP"

See Also

SENSe Subsystem Introduction

[SENSe:]TEMPerature:APERture

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

Syntax

[SENSe:]TEMPerature:APERture {<*seconds*>|MIN|MAX|DEF} [, (@<*ch_list*>)]

[SENSe:]TEMPerature:APERture? [{(@<ch_list>)|MIN|MAX}]

Description

This command enables the aperture mode and sets the integration time in seconds (called *aperture time*) for temperature measurements on the specified channels.

NOTE

You should use this command only when you want precise control of the integration time of the internal DMM. Otherwise, specifying integration time using NPLC (see [SENSe:]TEMPerature:NPLC command) executes faster and offers better noise rejection characteristics for values of NPLC greater than 1.

The following table shows which temperature transducers are supported by each of the multiplexer modules.

Module	Thermocouple	RTD 2- Wire	RTD 4- Wire	Thermistor
34901A Armature Multiplexer	Yes	Yes	Yes	Yes
34902A Reed Multiplexer	Yes	Yes	Yes	Yes
34908A Armature	Not Recommended ¹	Yes	No	Yes

Multiplexer (1-Wire)			
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¹With a one-wire multiplexer, even very small ground currents can introduce substantial measurement error.

Parameters

Name	Туре	Range of Values	Default Value
<seconds></seconds>	Numeric	Desired aperture time in seconds between $400 \ \mu s$ and $1 \ second,$ with $4 \ \mu s$ resolution. MIN = $400 \ \mu s,$ MAX = 1 second	Aperture disabled.
<ch_list></ch_list>	Numeric	One or more channels in the form (@scc).	If < <i>ch_list</i> > is omitted, this command applies to the current scan list.

Remarks

- For the <seconds> parameter, you can substitute MIN or MAX for a numeric value. MIN selects the smallest value accepted, which gives the lowest resolution; MAX selects the largest value accepted, which gives the highest resolution.
- Only the integral number of power line cycles (1, 2, 10, 20, 100, or 200 PLCs) provide normal mode (line frequency noise) rejection.
- The CONFigure, MEASure?, and [SENSe:]TEMPerature:NPLC commands disable the aperture mode (these commands select an integration time in number of power line cycles).
- The aperture mode is disabled after a Factory Reset (*RST command). An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does not change the setting.

Return Format

The query command returns the aperture time in the form "+1.00000000E-01" for each channel specified. Multiple responses are separated by commas.

Examples

The following command enables the aperture mode and sets the aperture time to 400 ms on channels 03 and 13 in slot 100.

TEMP:APER 400E-03, (@103,113)

The following query returns the aperture time selected on channels 03 and 13 in slot 100.

```
TEMP:APER? (@103,113)
```

Typical response: +4.0000000E-01,+4.0000000E-01

See Also

SENSe Subsystem Introduction

CONFigure:TEMPerature

[SENSe:]TEMPerature:NPLC

[SENSe:]TEMPerature:NPLC

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

Syntax

[SENSe:]TEMPerature:NPLC {<*PLCs*>|MIN|MAX}[,(@<*ch_list*>)]

[SENSe:]TEMPerature:NPLC? [{(@<ch_list>)|MIN|MAX}]

Description

This command sets the integration time in number of power line cycles (PLCs) on the specified channels.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).

The following table shows which temperature transducers are supported by each of the multiplexer modules.

Module	Thermocouple	RTD 2- Wire	RTD 4- Wire	Thermistor
34901A Armature Multiplexer	Yes	Yes	Yes	Yes
34902A Reed Multiplexer	Yes	Yes	Yes	Yes
34908A Armature Multiplexer (1-Wire)	Not Recommended ¹	Yes	No	Yes

¹With a one-wire multiplexer, even very small ground currents can introduce substantial measurement error.

Parameters

Name	Туре	Range of Values	Default Value
<plcs></plcs>	Discrete	{0.02 0.2 1 2 10 20 100 200} MIN = 0.02 PLC, MAX = 200 PLC	1 PLC
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- Only the integral number of power line cycles (1, 2, 10, 20, 100, or 200 PLCs) provide normal mode (line frequency noise) rejection.
- Setting the resolution also sets the integration time for the measurement. The following table shows the relationship between integration time, measurement resolution, number of digits, and number of bits.

Integration Time	Resolution	Digits	Bits
0.02 PLC	<0.0001 x Range	4½ Digits	15
0.2 PLC	<0.00001 x Range	5½ Digits	18
1 PLC	<0.000003 x Range	5½ Digits	20
2 PLC	<0.0000022 x Range	6½ Digits	21
10 PLC	<0.000001 x Range	6½ Digits	24
20 PLC	<0.0000008 x Range	6½ Digits	25
100 PLC	<0.0000003 x Range	6½ Digits	26
200 PLC	<0.00000022 x Range	6½ Digits	26

• The specified integration time is used for all measurements on the selected channels. If you have applied Mx+B scaling or have assigned alarms to the selected channel, those measurements are

also made using the specified integration time. Measurements taken during the Monitor function also use the specified integration time.

- You can also set the integration time by specifying an aperture time (see [SENSe:]TEMPerature:APERture command). However, note that specifying integration time using NPLCs executes faster and offers better noise rejection characteristics for values of NPLC greater than 1.
- The CONFigure, MEASure?, and [SENSe:]TEMPerature:NPLC commands disable the aperture mode (these commands select an integration time in number of power line cycles).
- The instrument sets the integration time to 1 PLC after a Factory Reset (*RST command). An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does not change the setting.

Return Format

The query returns the integration time in the form "+1.0000000E+00" for each channel specified. Multiple responses are separated by commas.

Examples

The following command set the integration time to 0.2 PLCs on channels 03 and 13 in slot 100.

TEMP:NPLC 0.2, (@103, 113)

The following query returns the integration time settings on channels 03 and 13 in slot 100.

TEMP:NPLC? (@103,113)
TEMP:APER:ENAB? !Verify that aperture mode is
disabled ("0")

Typical Response: +2.0000000E-01,+2.0000000E-01

See Also SENSe Subsystem Introduction CONFigure:TEMPerature

[SENSe:]TEMPerature:RJUNction?

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

Syntax

[SENSe:]TEMPerature:RJUNction? [(@<ch_list>)]

Description

This query returns he internal reference junction temperature on the specified channels. This is useful only for an internal reference source).

Parameters

Name	Туре	Range of Values	Default Value
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

• This query returns the reference temperature in degrees Celsius, regardless of the temperature units currently selected (see UNIT:TEMPerature command).

Return Format

The query returns a number in the form +2.89753100E+01.

Example

The following query returns the temperature of the internal reference junction on channels 03, 04, and 05 in slot 200.

TEMP:RJUN? (@203:205) !Always returns result in degrees Celsius

Typical Response: +2.35212231E+01,+2.37701293E+01,+2.38291321E+01 See Also

SENSe Subsystem Introduction

[SENSe:]TEMPerature:TRANsducer:RTD:OCOMp [SENSe:]TEMPerature:TRANsducer:FRTD:OCOM

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

Syntax

Syntax

[SENSe:]TEMPerature:TRANsducer:RTD:OCOMpensated <mode> [, (@<ch_list>)] [SENSe:]TEMPerature:TRANsducer:RTD:OCOMpensated? [(@<ch_list>)]

[SENSe:]TEMPerature:TRANsducer:FRTD:OCOMpensated <mode> [, (@<ch_list>)] [SENSe:]TEMPerature:TRANsducer:FRTD:OCOMpensated? [(@<ch_list>)]

Description

Offset compensation removes the effects of any DC voltages in the circuit being measured. The technique involves taking the difference between two resistance measurements on the specified channels, one with the current source turned on and one with the current source turned off.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34908A 40 Channel Single-Ended Multiplexer Module (RTD only; not FRTD)

Parameters

Name	Туре	Range of Values	Default Value
<mode></mode>	Boolean	{OFF 0 0N 1}	OFF 0
<ch_list></ch_list>	Numeric	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If < <i>ch_list></i> is omitted, this command applies to the current scan list.

Remarks

- This command applies only to 2-wire and 4-wire RTD measurements on the 100 Ω , 1 k Ω , and 10 k Ω ranges. Once enabled, offset compensation is applied to both 2-wire and 4-wire RTD measurements on the specified channels.
- Because 2-wire and 4-wire resistance are related functions, changing a measurement parameter for one function will also change the corresponding parameter for the other function.
- For 4-wire resistance measurements, the instrument automatically pairs channel *n* in Bank 1 with channel *n+10* in Bank 2 (34901A) or *n+8* (34902A) to provide the source and sense connections. For example, make the source connections to the HI and LO terminals on channel 02 in Bank 1 and the sense connections to the HI and LO terminals on channel 12 (34901A) or 10 (34902A) in Bank 2.Specify the paired channel in Bank 1 (source) as the <*ch_list*> channel (channels in Bank 2 are not allowed in the <*ch_list*>).
- The instrument disables offset compensation after a Factory Reset (*RST command). An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does *not* change the setting.

Return Format

The query command returns "0" (OFF) or "1" (ON) for each channel specified. Multiple responses are separated by commas.

Examples

The following command enables offset compensation on channels 3 and 13 in slot 1. For this 4-wire measurement, the instrument automatically pairs these channels in Bank 1 with the corresponding channels in Bank 2.

TEMP:TRAN:FRTD:OCOM ON,(@103,113)

The following query returns the offset compensation settings on channels 03 and 13 in slot 100.

TEMP:TRAN:FRTD:OCOM? (@103,113)

Typical Response: 1,1

See Also SENSe Subsystem Introduction CONFigure:TEMPerature

[SENSe:]TEMPerature:TRANsducer:RTD:RESista [SENSe:]TEMPerature:TRANsducer:FRTD:RESist

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

Syntax

[SENSe:]TEMPerature:TRANsducer:RTD:RESistance[:REFerence] <reference>[,(@<ch_list>)] [SENSe:]TEMPerature:TRANsducer:RTD:RESistance[:REFerence]? [(@<ch_list>)]

[SENSe:]TEMPerature:TRANsducer:FRTD:RESistance[:REFerence] <reference>[,(@<ch_list>)] [SENSe:]TEMPerature:TRANsducer:FRTD:RESistance[:REFerence]? [(@<ch_list>)]

Description

The resistance of an RTD is nominal at 0 °C and is referred to as *Ro*. These commands select the nominal resistance (*Ro*) for 2-wire (RTD) or 4-wire (FRTD) measurements on the specified channels.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34908A 40 Channel Single-Ended Multiplexer Module (RTD only; not FRTD)

Parameters

Name	Туре	Range of Values	Default Value
<reference></reference>	Numeric	A number (of ohms) between 49 and 2100.	100
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- Because 2-wire and 4-wire resistance are related functions, changing a measurement parameter for one function will also change the corresponding parameter for the other function.
- For 4-wire resistance measurements, the instrument automatically pairs channel *n* in Bank 1 with channel *n+10* in Bank 2 (34901A) or *n+8* (34902A) to provide the source and sense connections. For example, make the source connections to the HI and LO terminals on channel 02 in Bank 1 and the sense connections to the HI and LO terminals on channel 12 (34901A) or 10 (34902A) in Bank 2.Specify the paired channel in Bank 1 (source) as the <*ch_list*> channel (channels in Bank 2 are not allowed in the <*ch_list*>).
- The instrument sets the nominal resistance to 100Ω after a Factory Reset (*RST command). An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does not change the setting.

Return Format

The query returns the nominal resistance a value of the form +1.0000000E+02. Multiple values are separated by commas.

Examples

In each of the following examples, you could substitute the node name FRTD for RTD.

The following command sets the nominal resistance to 75Ω on channels 01 through 04 in slot 200.

```
TEMP:TRAN:RTD:RES:REF 75,(@201:204)
```

The following query returns the reference resistance for the four channels shown.

TEMP:TRAN:RTD:RES:REF? (@201:204)

Typical Response: 7.5000000E+01,7.5000000E+01,7.5000000E+01,7.5000000E+01 See Also

SENSe Subsystem Introduction

[SENSe:]TEMPerature:TRANsducer:RTD:TYPE [SENSe:]TEMPerature:TRANsducer:FRTD:TYPE

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

Syntax

[SENSe:]TEMPerature:TRANsducer:RTD:TYPE <*type*>[,(@<*ch_list*>)] [SENSe:]TEMPerature:TRANsducer:RTD:TYPE? [(@<*ch_list*>)]

[SENSe:]TEMPerature:TRANsducer:FRTD:TYPE <*type*>[,(@<*ch_list*>)] [SENSe:]TEMPerature:TRANsducer:FRTD:TYPE? [(@<*ch_list*>)]

Description

This command selects the RTD type for 2-wire (RTD) or 4-wire (FRTD) temperature measurements on the specified channels.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34908A 40 Channel Single-Ended Multiplexer Module (RTD only; not FRTD)

Parameters

Name	Туре	Range of Values	Default Value
<type></type>	Discrete	{85 91}	This is a required parameter.
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- For 4-wire resistance measurements, the instrument automatically pairs channel *n* in Bank 1 with channel *n+10* in Bank 2 (34901A) or *n+8* (34902A) to provide the source and sense connections. For example, make the source connections to the HI and LO terminals on channel 02 in Bank 1 and the sense connections to the HI and LO terminals on channel 12 (34901A) or 10 (34902A) in Bank 2.Specify the paired channel in Bank 1 (source) as the <*ch_list*> channel (channels in Bank 2 are not allowed in the <*ch_list*>).
- The instrument supports RTDs with Alpha = 0.00385 (DIN/IEC 751) using ITS-90 software conversions or Alpha = 0.00391 using IPTS-68 software conversions.
- "PT100" is a special label that is sometimes used to refer to an RTD with Alpha = 0.00385 and Ro = 100Ω .
- The instrument sets the RTD type to "85" after a Factory Reset (*RST command). An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does not change the setting.

Return Format

The query returns +85 or +91. Multiple results are separated by commas.

Examples

In the following examples, you could substitute the node name FRTD for the node name RTD.

The following command sets the transducer type to 85 on the channels shown.

```
[SENSe:]TEMPerature:TRANsducer:RTD:TYPE 85,
(@301:305)
```

The following query returns the transducer type on the channels shown.

[SENSe:]TEMPerature:TRANsducer:RTD:TYPE? (@202,204,301:305,308)

Typical Response: +85,+91,+85,+85,+85,+85,+91

See Also

SENSe Subsystem Introduction

[SENSe:]TEMPerature:TRANsducer:TCouple:CHI

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

Syntax

[SENSe:]TEMPerature:TRANsducer:TCouple:CHECk <*state*>[, (@<*ch_list*>)]

[SENSe:]TEMPerature:TRANsducer:TCouple:CHECk? [(@<ch_list>)]

Description

This command disables or enables the *thermocouple check* feature to verify that your thermocouples are properly connected for measurements. If you enable this feature, the instrument measures the channel resistance after each thermocouple measurement to ensure a proper connection. If an open connection is detected (greater than 5 k Ω on the 10 k Ω range), the instrument reports an overload condition for that channel's temperature reading.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<state></state>	Boolean	{OFF 0 ON 1}	This is a required parameter. The factory default is OFF.
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

• The instrument disables the thermocouple check feature after a Factory Reset (*RST command). An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does not change the setting.

Return Format

The query returns 0 (disabled) or 1 (enabled) to indicate the status of each thermocouple check for the channel list.

Examples

The following command enables the thermocouple check feature for six channels.

TEMP:TRAN:TCouple:CHEC ON, (@103, 104, 205-208)

The following query returns the status of the thermocouple check feature for each of the following channels.

TEMP:TRAN:TCouple:CHEC? (@103,105,203-205,301)

Typical Response: 1,0,0,0,1,0

See Also

SENSe Subsystem Introduction

[SENSe:]TEMPerature:TRANsducer:TCouple:RJL

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

Syntax

[SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction {<*temperature*>|MIN|MAX}[,(@<*ch_list*>)]

[SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction? [(@<ch_list>)]

Description

This command sets the *fixed* reference junction temperature in degrees Celsius for thermocouple measurements on the specified channels.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<temperature></temperature>	Numeric	A number representing the temperature in degrees Celsius, from -20 to +80.	This is a required parameter. The factory default value is 0.
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- For this command, you must always specify the temperature in degrees Celsius regardless of the temperature units currently selected (see UNIT:TEMPerature command).
- The instrument sets the thermocouple junction to 0 °C after a Factory Reset (*RST command). An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does not change the setting.

Return Format

The query returns the fixed reference junction temperature in degrees Celsius in the form +1.12345678E+01.

Examples

The following command sets the fixed junction temperature in degrees Celsius for thermocouple measurements on channels 01 through 03 in slot 100.

TEMPerature:TRANsducer:TCouple:RJUNction 27.3
(@301:303)

The following query returns the fixed junction temperature in degrees Celsius on the specified channels.

TEMP:TRAN:TC:RJUN? (@301:303)

Typical Response: 2.73000000E+01,2.73000000E+01,2.73000000E+01

See Also

SENSe Subsystem Introduction

[SENSe:]TEMPerature:TRANsducer:TCouple:RJL

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

Syntax

[SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction:TYPE <*type*>[, (@<*ch_list*>)]

[SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction:TYPE? [(@<ch_list>)]

Description

Thermocouple measurements require a reference junction temperature. For the reference junction temperature, you can use an *internal* measurement on the module's terminal block, an *external* thermistor or RTD measurement, or a known *fixed* junction temperature. This command selects the reference junction source for thermocouple measurements on the specified channels.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34908A 40 Channel Single-Ended Multiplexer Module (RTD only; not FRTD)

Parameters

Name	Туре	Range of Values	Default Value
<type></type>	Discrete	{INTernal EXTernal FIXed}	This is a required parameter.
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- The accuracy of the measurement is highly dependent upon the thermocouple connections and the type of reference junction used. Use a fixed temperature reference for the highest accuracy measurements (you must maintain the known junction temperature). The internal isothermal block reference requires no external wiring but provides lower accuracy measurements than a fixed reference.
- To store a reference temperature, first configure channel 1 on a multiplexer card for an RTD or thermistor measurement (see CONFigure:TEMPerature command). Then assign the measurement from that channel as the external reference using one of the following commands:

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

- When you initiate a measurement on an external reference channel (see INITiate or READ? command), subsequent thermocouple measurements use the stored temperature as their reference. The temperature is used for all subsequent thermocouple measurements on that card.
- If you select a fixed reference junction source, you can specify a value between -20 °C and +80 °C using the
 [SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction
 command. You must always specify the temperature in degrees
 Celsius regardless of the temperature units currently selected (see UNIT:TEMPerature command).
- The instrument selects the fixed source after a Factory Reset (*RST command). An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does not change the setting.

Return Format

The query returns INT, EXT or FIX for each channel in the *<chan_list>*. Multiple channels are separated by commas.

Examples

The following command sets the reference junction type to an external thermistor on channels 01 through 04 in slot 200.

TEMP:TRAN:TC:RJUN:TYPE EXT,(@201:204)

The following query returns the reference junction type for the four channels shown.

```
TEMP:TRAN:TC:RJUN:TYPE? (@201:204)
```

Typical Response: EXT, EXT, EXT, EXT

See Also

SENSe Subsystem Introduction

[SENSe:]TEMPerature:TRANsducer:TCouple:TYF

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

Syntax

[SENSe:]TEMPerature:TRANsducer:TCouple:TYPE <*type*>[, (@<*ch_list*>)]

[SENSe:]TEMPerature:TRANsducer:TCouple:TYPE? [(@<ch_list>)]

Description

This command selects the thermocouple type to use for measurements on the specified channels.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<type></type>	Discrete	{B E J K N R S T}	This is a required parameter.
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- Thermocouple measurements require a reference junction temperature (see [SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction:TYPE command). For the reference junction temperature, you can use an internal measurement on the module's terminal block (34901A only), an external thermistor or RTD measurement, or a known fixed junction temperature. By default, a fixed reference junction temperature of 0.0 °C is used.
- The instrument sets the thermocouple type to "J" after a Factory Reset (*RST command). An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does not change the setting.

Return Format

The query returns the thermocouple type as a quoted letter for each channel in the list. Multiple channels are separated by commas.

Examples

The following command sets the thermocouple to J for the channels shown.

```
TEMP:TRAN:TCouple:TYPE J,(@201:204)
```

The following query returns the thermocouple type for the channels shown.

```
TEMP:TRAN:TC:TYPE? (@101,103,202:204,301)
```

Typical Response: B,R,J,J,J,K

See Also

SENSe Subsystem Introduction

[SENSe:]TEMPerature:TRANsducer:THERmistor:

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

Syntax

[SENSe:]TEMPerature:TRANsducer:THERmistor:TYPE <*type*>[, (@<*ch_list*>)]

[SENSe:]TEMPerature:TRANsducer:THERmistor:TYPE? [(@<ch_list>)]

Description

This command selects the thermistor type for temperature measurements on the specified channels.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<type></type>	Discrete	{2252 5000 10000}	This is a required parameter.
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- The instrument supports 2.2 k Ω (YSI 44004 Series), 5 k Ω (YSI 44007 Series), and 10 k Ω (YSI 44006 Series) thermistors.
- The instrument sets the thermistor type to "5000" after a Factory Reset (*RST command). An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does not change the setting.

Return Format

The query returns 2252,5000 or 10000 for each channel in the list. Multiple values are separated by commas.

Examples

The following command sets the thermocouple type to 5000 for the channels shown.

TEMP:TRAN:THER:TYPE 5000,(@201,202,301)

The following query returns the thermocouple type for each of the following channels.

```
TEMP:TRAN:THER:TYPE? (@201:203,301:303)
```

Typical Response: 5000,5000,2252,5000,10000,2252

See Also

SENSe Subsystem Introduction

[SENSe:]TEMPerature:TRANsducer:TYPE

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

Syntax

[SENSe:]TEMPerature:TRANsducer:TYPE {TCouple|RTD|FRTD|THERmistor|DEF}[,(@<ch_list>)]

[SENSe:]TEMPerature:TRANsducer:TYPE? [(@<ch_list>)]

Description

This command selects the temperature transducer probe type to use for measurements on the specified channels.

The following table shows which temperature transducers are supported by each of the multiplexer modules.

Module	Thermocouple	RTD 2- Wire	RTD 4- Wire	Thermistor
34901A Armature Multiplexer	Yes	Yes	Yes	Yes
34902A Reed Multiplexer	Yes	Yes	Yes	Yes
34908A Armature Multiplexer (1-Wire)	Not Recommended ¹	Yes	No ¹	Yes

¹With a one-wire multiplexer, even very small ground currents can introduce substantial measurement error.

Parameters

Name	Туре	Range of Values	Default Value
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- Choosing the type DEF is equivalent to choosing TC.
- For 4-wire resistance measurements, the instrument automatically pairs channel *n* in Bank 1 with channel *n+10* in Bank 2 (34901A) or *n+8* (34902A) to provide the source and sense connections. For example, make the source connections to the HI and LO terminals on channel 02 in Bank 1 and the sense connections to the HI and LO terminals on channel 12 (34901A) or 10 (34902A) in Bank 2.Specify the paired channel in Bank 1 (source) as the <*ch_list*> channel (channels in Bank 2 are not allowed in the <*ch_list*>).
- The instrument selects thermocouple as the probe type after a Factory Reset (*RST command). An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does not change the setting.

Return Format

The query returns TC, RTD, FRTD, or THER. Multiple channels are separated by commas.

Examples

The following command sets the temperature transducer type to FRTD for the channels shown.

TEMP:TRAN:TYPE FRTD,(@201:205)

The following query returns the temperature transducer type for the channels shown.

```
TEMP:TRAN:TYPE? (@201:208)
```

Typical Response: FRTD, FRTD, FRTD, FRTD, FRTD, RTD, TC, THER

See Also

SENSe Subsystem Introduction

[SENSe:]TOTalize:CLEar:IMMediate

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

Syntax

[SENSe:]TOTalize:CLEar:IMMediate [(@<ch_list>)]

Description

This command immediately clears the count on the specified counter/totalizer channels.

Used With:

• 34907A Multifunction Module (totalizer channel only)

Parameters

Name	Туре	Range of Values	Default Value
<ch_list></ch_list>	Channel List	One or more totalizer channels, as shown: (@303) - channel 03 on the module in slot 300. (@103,203,303) - channel 03 on the modules on slot 100, 200, and 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Example

The following command clears the count on totalizer channel 03 on the module in slot 200.

TOT:CLEAR:IMM (@203)

See Also SENSe Subsystem Introduction [SENSe:]TOTalize:DATA?

[SENSe:]TOTalize:DATA?

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

Syntax

[SENSe:]TOTalize:DATA? [(@<ch_list>)]

Description

This query reads the count on the specified totalizer channels. If you have configured the count to be reset when it is read (see CONFigure:TOTalize and [SENSe:]TOTalize:TYPE commands), then this command will reset the count to 0 after it is read. The count is reset regardless of whether the specified channels are in a scan list or even whether a scan is in progress.

Used With:

• 34907A Multifunction Module (totalizer channel only)

Parameters

Name	Туре	Range of Values	Default Value
<ch_list></ch_list>	Channel List	One or more totalizer channels, as shown: (@303) - channel 03 on the module in slot 300. (@103,203,303) - channel 03 on the modules on slot 100, 200, and 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- The maximum count is 67,108,863 (2²⁶ 1). The count rolls over to 0 after reaching the maximum allowed value.
- The output from this command is affected by the settings of the FORMat:READing commands. Depending on the formats selected, each reading may or may not be stored with measurement units, time stamp, channel number, and alarm status information.

Return Format

The query returns an unsigned decimal value representing the count on each totalizer channel specified (a full 32-bit count is returned). Multiple responses are separated by commas.

Example

The following query reads the count on totalizer channel 03 on the module in slot 3.

TOT:DATA? (@303)

Typical Response: 1.32130000E+03

See Also

SENSe Subsystem Introduction

CONFigure:TOTalize

[SENSe:]TOTalize:TYPE

[SENSe:]TOTalize:SLOPe

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

Syntax

[SENSe:]TOTalize:SLOPe <edge>[,(@<ch_list>)]

[SENSe:]TOTalize:SLOPe? [(@<ch_list>)]

Description

This command configures the specified totalizer channels to count on the rising edge (positive) or falling edge (negative) of the input signal.

Used With:

• 34907A Multifunction Module (totalizer channel only)

Parameters

Name	Туре	Range of Values	Default Value
<edge></edge>	Discrete	{NEGative POSitive}	This is a required parameter.
<ch_list></ch_list>	Channel List	One or more totalizer channels, as shown: (@303) - channel 03 on the module in slot 300. (@103,203,303) - channel 03 on the modules on slot 100, 200, and 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

• The selected slope is stored in volatile memory and will be set to "POS" when power is turned off or after a Factory Reset (*RST command).

Return Format

The query returns NEG or POS for the specified channels. Multiple responses are separated by commas .

Examples

The following command configures totalizer channel 03 on the module in slot 300 to count on the negative edge (falling) of the input signal.

TOT:SLOP NEG, (@303)

The following query returns the edge setting on totalizer channel 3 on the modules in slots 1 and 3.

TOT:SLOP? (@103,303)

Typical Response: NEG,NEG

See Also

SENSe Subsystem Introduction

[SENSe:]TOTalize:STARt[:IMMediate]

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

Syntax

[SENSe:]TOTalize:STARt:IMMediate [(@<ch_list>)]

Description

This command immediately starts totalizing on the specified counter/totalizer channels.

Used With:

• 34907A Multifunction Module (totalizer channel only)

Parameters

Name	Туре	Range of Values	Default Value
<ch_list></ch_list>	Channel List	One or more totalizer channels, as shown: (@303) - channel 03 on the module in slot 300. (@103,203,303) - channel 03 on the modules on slot 100, 200, and 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Example

The following command starts totalizing on totalizer channel 03 on the module in slot 200.

TOT:STARt:IMM (@203)

See Also

SENSe Subsystem Introduction

[SENSe:]TOTalize:DATA?

[SENSe:]TOTalize:STOP[:IMMediate]

[SENSe:]TOTalize:STOP[:IMMediate]

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

Syntax

[SENSe:]TOTalize:STOP[:IMMediate] [(@<ch_list>)]

Description

This command immediately stops totalizing on the specified counter/totalizer channels.

Used With:

• 34907A Multifunction Module (totalizer channel only)

Parameters

Name	Туре	Range of Values	Default Value
<ch_list></ch_list>	Channel List	One or more totalizer channels, as shown: (@303) - channel 03 on the module in slot 300. (@103,203,303) - channel 03 on the modules on slot 100, 200, and 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Example

The following command stops totalizing on totalizer channel 03 on the module in slot 200.

TOT:STOP:IMM (@203)

See Also

SENSe Subsystem Introduction

[SENSe:]TOTalize:DATA?

[SENSe:]TOTalize:STARt[:IMMediate]

[SENSe:]TOTalize:TYPE

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

Syntax

[SENSe:]TOTalize:TYPE <mode>[,(@<ch_list>)]

[SENSe:]TOTalize:TYPE? [(@<ch_list>)]

Description

This command enables or disables an automatic reset of the count on the specified totalizer channels. To read the totalizer during a scan without resetting the count, select the READ parameter. To read the totalizer during a scan and reset the count to 0 after it is read, select the RRESet parameter (this means "read and reset").

Used With:

• 34907A Multifunction Module (totalizer channel only)

Parameters

Name	Туре	Range of Values	Default Value
<mode></mode>	Discrete	{READ RRESet}	This is a required parameter.
<ch_list></ch_list>	Channel List	One or more totalizer channels, as shown: (@303) - channel 03 on the module in slot 300. (@103,203,303) - channel 03 on the modules on slot 100, 200, and 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

• The maximum count is 67,108,863 (2²⁶ - 1). The count rolls over to 0 after reaching the maximum allowed value.

Return Format

The query returns READ or RRES for the specified channels. Multiple responses are separated by commas.

Examples

The following command configures totalizer channel 03 on the module in slot 300 to be read without resetting its count.

TOT:TYPE READ, (@303)

The following query returns the totalizer setting on totalizer channel 03 on the modules in slots 200 and 300.

TOT:TYPE? (@203,303)

Typical Response: READ, READ

See Also SENSe Subsystem Introduction [SENSe:]TOTalize:DATA?

[SENSe:]VOLTage:AC:BANDwidth

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

Syntax

[SENSe:]VOLTage:AC:BANDwidth {<*filter*>|MIN|MAX}[,(@<*ch_list*>)]

[SENSe:]VOLTage:AC:BANDwidth? [{(@<ch_list>)|MIN|MAX}]

Description

The instrument uses three different AC filters which enable you to either optimize low-frequency accuracy or achieve faster AC settling times. The instrument selects the slow (3 Hz), medium (20 Hz), or fast (300 Hz) filter based on the input frequency that you specify with this command for the selected channels.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<filter></filter>	Discrete	{3 20 200}	20
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

• This command applies to AC voltage measurements only.

For the *<filter>* parameter, specify the lowest frequency expected in the input signal on the specified channels. The instrument selects the appropriate filter based on the frequency you specify.

Input Frequency	Default Settling Delay	Minimum Settling Delay
3 Hz to 300 kHz (Slow)	7 seconds / reading	1.5 seconds
20 Hz to 300 kHz (Medium)	1 second / reading	200 ms
200 Hz to 300 kHz (Fast)	0.12 seconds / reading	20 ms

- The CONFigure and MEASure? commands automatically select the default 20 Hz (medium) filter.
- The instrument selects the default 20 Hz (medium) filter after a Factory Reset (*RST command). An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does not change the setting.
- The settling delay is controlled by the ROUTe:CHANnel:DELay command. You get the default delay with ROUTe:CHANnel:DELay:AUTO ON.

Return Format

The query returns 3 (slow), 20 (medium), or 200 (fast) for each channel specified. Multiple responses are separated by commas.

Examples

The following command selects the slow filter (3 Hz) on channels 03 and 13 in slot 100.

VOLT:AC:BAND 3,(@103,113)

The following query returns the ac filter settings on channels 03 and 13 in slot 100.

VOLT:AC:BAND? (@103,113)

Typical Response: 3,3

See Also SENSe Subsystem Introduction CONFigure:VOLTage:AC

[SENSe:]VOLTage:AC:RANGe [SENSe:]VOLTage:DC:RANGe

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

Syntax

[SENSe:]VOLTage:AC:RANGe {<*range*>|MIN|MAX}[,(@<*ch_list*>)] [SENSe:]VOLTage:AC:RANGe? [{(@<*ch_list*>)|MIN|MAX}]

[SENSe:]VOLTage:DC:RANGe {<*range*>|MIN|MAX}[,(@<*ch_list*>)] [SENSe:]VOLTage:DC:RANGe? [{(@<*ch_list*>)|MIN|MAX}]

Description

These commands selects the measurement range for AC and DC voltage measurements on the specified channels.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<range></range>	Discrete	Desired range in volts: 100 mV (MIN) 1 V 10 V 100 V 300 V (MAX)	This is a required parameter.
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- Selecting a discrete range will disable autoranging on the specified channels (see [SENSe:]VOLTage:AC:RANGe:AUTO command).
- The CONFigure and MEASure? commands automatically enable autoranging if the first parameter is AUTO, DEF or omitted.
- If the input signal is greater than can be measured on the selected range (manual ranging), the instrument gives an overload indication: "±OVLD" from the front panel or "±9.9E+37" from the remote interface.
- The instrument enables autoranging after a Factory Reset (*RST command). An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does not change the setting.

Return Format

The query returns the range in the form "+1.0000000E+01" for each channel specified. Multiple responses are separated by commas.

Examples

In the following examples, you can substitute the node name AC for DC.

The following command selects the 10 volt range on channels 03 and 13 in slot 100.

VOLT:DC:RANG 10, (@103,113)

The following query returns the range selected on channels 03 and 13 in slot 100.

VOLT:DC:RANG? (@103,113)

Typical Response: +1.00000000E+01,+1.0000000E+01

See Also

SENSe Subsystem Introduction

CONFigure:VOLTage:AC

CONFigure:VOLTage:DC

[SENSe:]VOLTage:AC:RANGe:AUTO

[SENSe:]VOLTage:DC:RANGe:AUTO

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

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

Syntax

[SENSe:]VOLTage:AC:RANGe:AUTO <*state*>[,(@<*ch_list*>)] [SENSe:]VOLTage:AC:RANGe:AUTO? [(@<*ch_list*>)]

[SENSe:]VOLTage:DC:RANGe:AUTO <*state*>[,(@<*ch_list*>)] [SENSe:]VOLTage:DC:RANGe:AUTO? [(@<*ch_list*>)]

Description

These commands disable or enable autoranging for AC and DC voltage measurements on the specified channels. Autoranging is convenient because the instrument automatically selects the range for each measurement based on the input signal detected.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<state></state>	Boolean	{OFF 0 ON 1}	This is a required parameter. The factory default is ON.
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- Autorange thresholds: Down range at: <10% of range Up range at: >120% of range
- With autoranging enabled, the instrument selects one of the following ranges based on the input signal detected:

100mV 1 V 10 V 100 V 300 V

- Selecting a discrete range (see [SENSe:]VOLTage:AC:RANGe command) will disable autoranging on the specified channels.
- The CONFigure and MEASure? commands automatically enable autoranging if the first parameter is AUTO, DEF or omitted.
- The instrument enables autoranging after a Factory Reset (*RST command). An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does not change the setting.

Return Format

The query returns 0 (OFF) or 1 (ON) for each channel specified. Multiple responses are separated by commas.

Examples

In each of the following examples, you can replace the node name AC with DC.

The following command disables autoranging on channels 03 and 13 in slot 100.

```
VOLT:AC:RANG:AUTO OFF,(@103,113)
```

The following query returns the autoranging settings on channels 03 and 13 in slot 100.

VOLT:AC:RANG:AUTO? (@103,113)

Typical Response: 0,0

See Also

SENSe Subsystem Introduction

CONFigure:VOLTage:AC

CONFigure:VOLTage:DC

[SENSe:]VOLTage:AC:RANGe

[SENSe:]VOLTage:DC:RANGe

[SENSe:]VOLTage:DC:APERture

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

Syntax

[SENSe:]VOLTage:DC:APERture {<time>|MIN|MAX}[,(@<ch_list>)]

[SENSe:]VOLTage:DC:APERture? [{(@<ch_list>)|MIN|MAX}]

Description

This command enables the aperture mode and sets the integration time in seconds (called *aperture time*) for DC voltage measurements on the specified channels.

NOTE You should use this command only when you want precise control of the integration time of the internal DMM. Otherwise, specifying integration time using NPLC (see [SENSe:]VOLTage[:DC]:NPLC command) executes faster and offers better power line noise rejection characteristics for values of NPLC greater than 1.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<time></time>	Numeric	Desired aperture time in seconds between 300 μ s and 1 second, with 4 μ s resolution. MIN = 300 μ s, MAX = 1 second	Aperture disabled.
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- For the <seconds> parameter, you can substitute MIN or MAX for a numeric value. MIN selects the smallest value accepted, which gives the lowest resolution; MAX selects the largest value accepted, which gives the highest resolution.
- Only the integral number of power line cycles (1, 2, 10, 20, 100, or 200 PLCs) provide normal mode (line frequency noise) rejection.
- The CONFigure, MEASure?, [SENSe:]VOLTage[:DC]:NPLC, and [SENSe:]VOLTage[:DC]:RESolution commands disable the aperture time mode (these commands select an integration time in number of power line cycles).
- The aperture mode is disabled after a Factory Reset (*RST command). An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does not change the setting.

Return Format

The query returns the aperture time in the form "+1.0000000E-01" for each channel specified. Multiple responses are separated by commas.

Examples

The following command enables the aperture mode and sets the aperture time to 300 ms on channels 03 and 13 in slot 100.

VOLT:DC:APER 300E-03, (@103, 113)

The following query returns the aperture time selected on channels 03 and 13 in slot 100.

VOLT:DC:APER? (@103,113) VOLT:DC:APER:ENAB? !Verify that aperture mode is enabled ("1")

Typical Response: +3.0000000E-01,+3.0000000E-01

See Also

SENSe Subsystem Introduction CONFigure:VOLTage:DC [SENSe:]VOLTage:DC:NPLC

[SENSe:]VOLTage:DC:NPLC

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

[SENSe:]VOLTage:DC:NPLC {<*PLCs*>|MIN|MAX}[,(@<*ch_list*>)] [SENSe:]VOLTage:DC:NPLC? [{(@<*ch_list*>)|MIN|MAX}]

Syntax

Description

This command sets the integration time in number of power line cycles (PLCs) on the specified channels.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).

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<plcs></plcs>	Discrete	{0.02 0.2 1 2 10 20 100 200 MIN MAX}	This is a required parameter.
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- Only the integral number of power line cycles (1, 2, 10, 20, 100, or 200 PLCs) provide normal mode (line frequency noise) rejection.
- Setting the resolution also sets the integration time for the measurement. The following table shows the relationship between integration time, measurement resolution, number of digits, and number of bits.

Integration Time	Resolution	Digits	Bits
0.02 PLC	<0.0001 x Range	4½ Digits	15
0.2 PLC	<0.00001 x Range	5½ Digits	18
1 PLC	<0.000003 x Range	5½ Digits	20
2 PLC	<0.0000022 x Range	6½ Digits	21
10 PLC	<0.000001 x Range	6½ Digits	24
20 PLC	<0.0000008 x Range	6½ Digits	25
100 PLC	<0.0000003 x Range	6½ Digits	26
200 PLC	<0.00000022 x Range	6½ Digits	26

• The specified integration time is used for all measurements on the selected channels. If you have applied Mx+B scaling or have assigned alarms to the selected channel, those measurements are

also made using the specified integration time. Measurements taken during the Monitor function also use the specified integration time.

- You can also set the integration time by specifying an aperture time (see [SENSe:]VOLTage[:DC]:APERture command). However, note that specifying integration time using NPLCs executes faster and offers better noise rejection characteristics for values of NPLC greater than 1.
- The CONFigure, MEASure?, [SENSe:]VOLTage[:DC]:NPLC, and [SENSe:]VOLTage[:DC]:RESolution commands disable the aperture time mode (these commands select an integration time in number of power line cycles).
- The instrument sets the integration time to 1 PLC after a Factory Reset (*RST command). An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does not change the setting.

Return Format

The query returns the integration time in power line cycles for each channel in the form +1.12345678E+01.

Examples

The following command sets the integration time to 20 PLCs on channels 03 through 06 in slot 200.

VOLT:DC:NPLC 20, (@203:206)

The following query returns the integration time on the same channels.

VOLT:DC:NPLC? (@203:206)

Typical Response: +2.0000000E+01,+2.0000000E+01,+2.0000000E+01,+2.0000000E+ See Also

SENSe Subsystem Introduction

[SENSe:]VOLTage:DC:RESolution

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

Syntax

[SENSe:]VOLTage:DC:RESolution {<*resolution*>|MIN|MAX}[, (@<*ch_list*>)]

[SENSe:]VOLTage:DC:RESolution? [{(@<ch_list>)|MIN|MAX}]

Description

This command selects the measurement resolution for DC voltage measurements on the specified channels. The instrument clears all readings from memory when a new scan is initiated, when any measurement parameters are changed (CONFigure and SENSe commands), and when the triggering configuration is changed (TRIGger commands).

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<resolution></resolution>	Numeric	Desired resolution in volts.	This is a required field. You must specify a numeric < <i>resolution></i> or specify MIN or MAX to select the smallest or largest < <i>resolution></i> .
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- For the *<resolution>* parameter, you can substitute MIN or MAX for a numeric value. MIN selects the smallest value accepted, which gives the highest resolution; MAX selects the largest value accepted, which gives the least resolution.
- The instrument will dispatch a settings conflict error if you issue this command when [SENSe:]VOLTage:DC:RANGe:AUTO is ON for one or more of the specified channels.
- Setting the resolution also sets the integration time for the measurement. The following table shows the relationship between integration time, measurement resolution, number of digits, and number of bits.

Integration Time	Resolution	Digits	Bits
0.02 PLC	<0.0001 x Range	4½ Digits	15
0.2 PLC	<0.00001 x Range	5½ Digits	18
1 PLC	<0.000003 x Range	5½ Digits	20
2 PLC	<0.0000022 x Range	6½ Digits	21
10 PLC	<0.000001 x Range	6½ Digits	24
20 PLC	<0.0000008 x Range	6½ Digits	25
100 PLC	<0.0000003 x Range	6½ Digits	26

200 PLC	< 0.0000022	6½	26
	x Range	Digits	

- You can also set the integration time by specifying an aperture time (see [SENSe:]VOLTage[:DC]:APERture command). However, note that specifying integration time using NPLCs executes faster and offers better noise rejection characteristics for values of NPLC greater than 1.
- The CONFigure, MEASure?, [SENSe:]VOLTage[:DC]:NPLC, and [SENSe:]VOLTage[:DC]:RESolution commands disable the aperture time mode (these commands select an integration time in number of power line cycles).
- The instrument sets the resolution to 1 PLC after a Factory Reset (*RST command). An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does not change the setting.

Return Format

The query returns the resolution in the form +1.12345678E+01 for each channel in the *<ch_list>*. Multiple channels are separated by commas.

Examples

The following command sets the <resolution> to 50 microvolts for the channels shown.

VOLT:DC:RES 0.00005, (@201:204)

The following query returns the <resolution> for channels 01 through 04 on slot 200.

```
VOLT:DC:RES? (@201:204)
```

Typical Response: +1.0000000E+01,+1.0000000E+01,+1.0000000E+01,+1.0000000E+ See Also

SENSe Subsystem Introduction

[SENSe:]ZERO:AUTO

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

Syntax

[SENSe:]ZERO:AUTO <mode>[,(@<ch_list>)]

[SENSe:]ZERO:AUTO? [(@<ch_list>)]

Description

This command enables (default) or disables the autozero mode on the specified channels.

Parameters

Name	Туре	Range of Values	Default Value
<mode></mode>	Discrete	{OFF ONCE ON}	This is a required parameter.
<ch_list></ch_list>	Channel List	One or more channels, as shown: (@310) - channel 10 on the module in slot 300. (@305:310) - channels 05 through 10 on the module in slot 300. (@202:207,209,302:308) - channels 02 through 07 and 09 on the module in slot 200 and channels 02 through 08 on the module in slot 300.	If you omit the optional < <i>ch_list></i> parameter, this command applies to the currently defined scan list.

Remarks

- The OFF and ONCE parameters have the same effect.
- The CONFigure, MEASure and NPLC commands automatically specify ZERO:AUTO as OFF for 0.02 to 0.2 PLCs and as ON for 1 PLC or more.

Return Format

The query form returns 0 (OFF or ONCE) or 1.

Examples

The following command turns the autozero mode OFF (@301:305).

```
ZER0:AUT0 OFF (@301:305)
```

The following query returns the state of the autozero mode, which in this case is OFF. Multiple responses are separated by commas.

```
ZER0:AUT0? (@301:305)
```

Typical response: 0,0,0,0,0

See Also

SENSe Subsystem Introduction

SOURce Subsystem Introduction

Command Summary SOURce:DIGital:DATA[:{BYTE|WORD}] SOURce:DIGital:DATA[:{BYTE|WORD}]? SOURce:DIGital:STATe? SOURce:VOLTage SOURce:VOLTage?

SOURce:DIGital:DATA[:{BYTE|WORD}]

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

Syntax

SOURce:DIGital:DATA[:{BYTE|WORD}] <data>,(@<ch_list>)

SOURce:DIGital:DATA[:{BYTE|WORD}]? (@<ch_list>)

Description

This command outputs a digital pattern as an 8-bit byte or 16-bit word to the specified digital output channels.

Parameters

Name	Туре	Range of Values	Default Value
<data></data>	Numeric	An integer from 0 to 255 (:BYTE) or 65,535 (:WORD).	This is a required parameter.
<ch_list></ch_list>	Channel List	One or more digital I/O channels, as shown: (@301) - channel 01 on the module in slot 300. (@101:102,201,302) - channels 01 and 02 on the modules on slot 100, channel 01 on the module in slot 200, and channel 02 on the module in slot 300.	This is a required parameter.

Remarks

- Note that you cannot configure a port for output operations if that port is already configured to be part of the scan list (digital input).
- You must specify an integer value, either as a decimal number (213), a binary number (#b11010101) or a hexadecimal number (#hD5).
- The digital output channels are numbered "**s**01" (lower byte) and "**s**02" (upper byte), where **s** represents the slot number.
- If you are going to write to both ports simultaneously (WORD), you must send the command to channel 01.

Return Format

The :BYTE? (or :WORD?) query returns the last byte or word sent to the specified digital output channel as a decimal number in the form +255.

Examples

The following commands all output the number 12345 to channel 01 on the module in slot 200.

```
SOUR:DIGital:DATA:WORD 12345,(@201) !
decimal integer 12345
SOUR:DIGital:DATA:WORD #b0011000000111001,(@201) !
binary equivalent of decimal integer 12345
SOUR:DIGital:DATA:WORD #h3039,(@201) !
hexadecimal equivalent of decimal integer 12345
```

The following command reads the number on channel 01 on the module in slot 200.

SOUR:DIG:DATA:WORD? (@201)

Typical Response: +12345

See Also

SOURce Subsystem Introduction

SOURce:DIGital:STATe?

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

Syntax

SOURce:DIGital:STATe? (@<ch_list>)

Description

This command returns the status (input or output) of the specified digital channels.

Used With:

• 34907A Multifunction Module (digital I/O channels only)

Parameters

Name	Туре	Range of Values	Default Value
<ch_list></ch_list>	Channel List	One or more digital I/O channels, as shown: (@301) - channel 01 on the module in slot 300. (@101:102,201,302) - channels 01 and 02 on the modules on slot 100, channel 01 on the module in slot 200, and channel 02 on the module in slot 300.	This is a required parameter.

Remarks

- A channel is set as an output channel when you send a SOURce:DIGital:DATA[:{BYTE|WORD}] command.
- A channel is set as an input channel when you place it in a scan list or send a [SENSe:]DIGital:DATA:{BYTE|WORD}? command.

Return Format

The query returns 0 if the specified channel is an input channel or 1 if the channel is an output channel. Multiple responses are separated by commas.

Example

The following query returns the input/output state of channels 01 and 02 on the module in slot 300. In this case, both channels are configured for output.

SOUR:DIG:STAT? (@301,302)

Typical Response: 1,1

See Also SOURce Subsystem Introduction SOURce:VOLTage

SOURce:VOLTage

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

Syntax

SOURce:VOLTage <voltage>,(@<ch_list>)

SOURce:VOLTage? (@<ch_list>)

Description

NOTE

This command sets the output voltage level for the specified DAC channels on the 34907A Multifunction Module.

This command outputs a DC voltage level.

Parameters

Name	Туре	Range of Values	Default Value
<voltage></voltage>	Numeric	A number of volts from -12 to +12, in resolution of 0.001 V.	0 Vdc
<ch_list></ch_list>	Channel List	One or more DAC channels, as shown: (@304) - channel 04 on the module in slot 300. (@104:105,204,305) - channels 04 and 05 on the modules on slot 100, channel 04 on the module in slot 200, and channel 05 on the module in slot 300.	This is a required parameter.

Remarks

- The DAC channels are numbered "*s*04" and "*s*05", where *s* represents the slot number.
- Each DAC channel is capable of 10 mA maximum output current.
- A Factory Reset (*RST command), Instrument Preset (SYSTem:PRESet command), and Card Reset (SYSTem:CPON command) will reset the DAC outputs to 0 Vdc.

Return Format

The query returns the output voltage in the form +1.00000000E+00 for each DAC channel specified. Multiple responses are separated by commas.

Examples

The following command outputs +2.5 Vdc on DAC channels 04 and 05 in slot 200.

SOUR: VOLT 2.5, (@204,205) OUTP: STAT ON, (@204,205)

The following query returns the voltage outputs on DAC channels 04 and 05 in slot 200.

SOUR: VOLT? (@204,205)

Typical Response: +2.5000000E+00,+2.5000000E+00

See Also

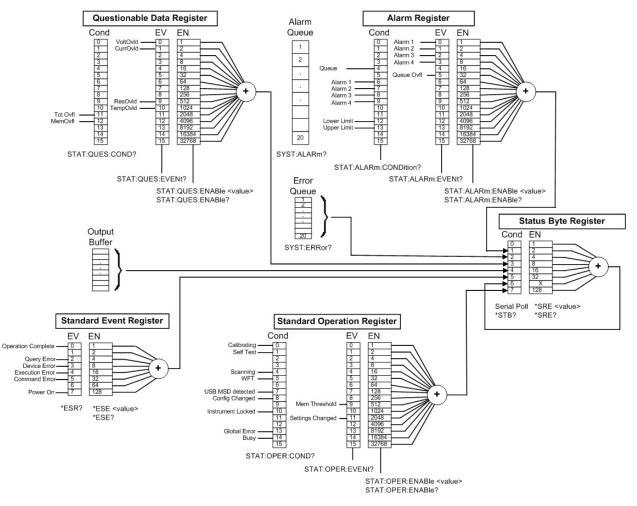
SOURce Subsystem Introduction

STATus Subsystem Introduction

Keysight 34970A/34972A Status System Diagram

Printable PDF Version

STATus:PRESet



Command Summary

*ESE

*ESE?

*ESR?

*SRE

*STB?

STATus:ALARm:CONDition?

STATus:ALARm:ENABle

STATus:ALARm:ENABle?

STATus:ALARm[:EVENt]?

STATus:OPERation:CONDition?

STATus:OPERation:ENABle

STATus:OPERation:ENABle?

STATus:OPERation[:EVENt]?

STATus:PRESet

STATus:QUEStionable:CONDition?

STATus:QUEStionable:ENABle

STATus:QUEStionable:ENABle?

STATus:QUEStionable[:EVENt]?

STATus:ALARm:CONDition?

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

Syntax

STATus:ALARm:CONDition?

Description

This command queries the condition register for the *Alarm Register* group (note that this condition register uses only bit 4). This is a read-only register and the bits are not cleared when you read the register.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34907A Multifunction Module (digital input and totalizer channels only)
- 34908A 40 Channel Single-Ended Multiplexer Module

Remarks

• The following table lists the bit definitions for the alarm enable register.

Bit #	Bit Name	Decimal Value	Definition
0-3	Not Used	1-8	0 is returned.
4	Queue Not Empty	16	The alarm queue is not empty.
5	Not Used	32	0 is returned.
6	Alarm 1	64	Alarm 1 is triggered.
7	Alarm 2	128	Alarm 2 is triggered.
8	Alarm 3	256	Alarm 3 is triggered.
9	Alarm 4	512	Alarm 4 is triggered.
10- 11	Not Used	1024-2048	0 is returned.
12	Lower Limit	4096	A lower limit alarm has occurred.
13	Upper Limit	8192	An upper limit alarm has occurred.
14- 15	Not Used	16384- 32768	0 is returned.

• A Factory Reset (*RST command) will clear the "Queue Empty" bit (bit 4) in the condition register.

Return Format

The query reads the condition register and returns a decimal value which corresponds to the binary-weighted sum of all bits set in the register (see table above). For example, if bits 6 - 8 are set, this command will return +448.

Examples

The following query reads the condition register (bits 6 and 9 are set).

STAT: ALAR: COND?

Typical Response: +576

See Also

STATus Subsystem Introduction STATus:ALARm:ENABle STATus:ALARm[:EVENt]? SYSTem:ALARm?

STATus:ALARm:ENABle

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

Syntax

STATus:ALARm:ENABle <*enable_val*>

STATus:ALARm:ENABle?

Description

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

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34907A Multifunction Module (digital input and totalizer channels only)
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<enable_val></enable_val>	Numeric	An integer from 0 to 65535, specifying the alarms to enable as a bit sum.	This is a required parameter.

Remarks

• The following table lists the bit definitions for the alarm enable register.

Bit #	Bit Name	Decimal Value	Definition
0	Alarm 1	1	An event has occurred on Alarm 1.
1	Alarm 2	2	An event has occurred on Alarm 2.
2	Alarm 3	4	An event has occurred on Alarm 3.
3	Alarm 4	8	An event has occurred on Alarm 4.
4	Queue Not Empty	16	The alarm queue is not empty.
5	Queue Overflow	32	An alarm queue overflow event has occurred.
6	Alarm 1	64	Alarm 1 is triggered.
7	Alarm 2	128	Alarm 2 is triggered.
8	Alarm 3	256	Alarm 3 is triggered.
9	Alarm 4	512	Alarm 4 is triggered.
10- 11	Not Used	1024-2048	0 is returned.
12	Lower Limit	4096	A lower limit alarm has occurred.

13	Upper Limit	8192	An upper limit alarm has occurred.
14- 15	Not Used	16384- 32768	0 is returned.

Return Format

The query reads the enable register and returns a decimal value that corresponds to the binary-weighted sum of all bits set in the register. For example, if bit 1 (decimal value = 2) and bit 2 (decimal value = 4) are enabled, the query will return +6.

Examples

The following command enables alarm registers 0 through 3.

STAT:ALAR:ENAB 15

The following query returns a the binary sum equivalent to the enabled registers.

STAT:ALAR:ENAB?

Typical Response: +15

See Also

STATus Subsystem Introduction

STATus:ALARm[:EVENt]?

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

Syntax

STATus:ALARm[:EVENt]?

Description

This command queries the event register for the Alarm Register group.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34907A Multifunction Module (digital input and totalizer channels only)
- 34908A 40 Channel Single-Ended Multiplexer Module

Remarks

• The following table lists the bit definitions for the alarm event register.

Bit #	Bit Name	Decimal Value	Definition
0	Alarm 1	1	An event has occurred on Alarm 1.
1	Alarm 2	2	An event has occurred on Alarm 2.
2	Alarm 3	4	An event has occurred on Alarm 3.
3	Alarm 4	8	An event has occurred on Alarm 4.
4	Queue Not Empty	16	The alarm queue is not empty.
5	Queue Overflow	32	An alarm queue overflow event has occurred.
6	Alarm 1	64	Alarm 1 is triggered.
7	Alarm 2	128	Alarm 2 is triggered.
8	Alarm 3	256	Alarm 3 is triggered.
9	Alarm 4	512	Alarm 4 is triggered.
10-11	Not Used	1024-2048	0 is returned.
12	Lower Limit	4096	A lower limit alarm has occurred.

13	Upper Limit	8192	An upper limit alarm has occurred.
14-15	Not Used	16384- 32768	0 is returned.

- Note that if any of bits 0 through 3 are set, bit 4 will also be set to indicate that the Alarm Queue is not empty.
- Once a bit is set, it remains set until cleared by reading the event register or the *CLS (clear status) command.

Return Format

The query reads the event register and returns a decimal value which corresponds to the binary-weighted sum of all bits set in the register (see table above). For example, if bit 1 (decimal value = 2) and bit 2 (decimal value = 4) are set, this command will return +6.

Examples

The following query indicates that alarm events have occurred on alarms 1 and 3.

STAT:ALAR:EVENt?

Typical Response: +5

See Also

STATus Subsystem Introduction STATus:ALARm:CONDition? STATus:ALARm:ENABle

STATus:OPERation:CONDition?

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

Syntax

STATus:OPERation:CONDition?

Description

This command queries the condition register for the *Standard Operation Register* group. This is a read-only register and the bits are not cleared when you read the register.

NOTE

For more information on the Status System for the instrument, see Status System Introduction.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34907A Multifunction Module (digital input and totalizer channels only)
- 34908A 40 Channel Single-Ended Multiplexer Module

Remarks

- The condition register bits reflect the current condition. If a condition is no longer true, the corresponding bit is cleared in the condition register.
- The following table lists the bit definitions for the Standard Operation Register.

Bit #	Bit Name	Decimal Value	Definition
0	Calibrating	1	The instrument is calibrating.
1	Self Test	2	The instrument is doing a self- test.
2	Not Used	4	(Always returns 0)
3	Not Used	8	(Always returns 0)
4	Scanning	16	The instrument is scanning.
5	WFT	32	The instrument is waiting for a trigger.
6	Not Used	64	(Always returns 0)
7	USB MSD detected	128	A USB mass storage device (USB drive) has been detected.
8	Config Changed	256	The instrument configuration has changed.
9	Not Used	512	(Always returns 0)
10	Instrument Locked	1024	The instrument is locked.
11	Not Used	2048	(Always returns 0)
12	Not Used	4096	(Always returns 0)

13	Global Error	8192	An error is in the global error queue.
14	Busy	16384	The instrument is busy.
15	Not Used	32768	(Always returns 0)

- Bit 14, the Busy bit, will be set while the instrument is performing long commands, such as MMEMory:IMPort:CONFig?.
- A Factory Reset (*RST command) will set the "Configuration Change" bit (bit 8) in the condition register.

Return Format

The query reads the condition register and returns a decimal value that corresponds to the binary-weighted sum of all bits set in the register (see table above). For example, if bit 4 (decimal value = 16) and bit 8 (decimal value = 256) are set, this command will return "+272".

Examples

The following command reads the condition register (bit 8 is set).

STAT: OPER: COND?

Typical Response: +256

See Also

STATus Subsystem Introduction STATus:OPERation:ENABle STATus:OPERation[:EVENt]?

STATus:OPERation:ENABle

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

Syntax

STATus:OPERation:ENABle <enable_val>

STATus:OPERation:ENABle?

Description

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

NOTE

For more information on the Status System for the instrument, see Status System Introduction.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34907A Multifunction Module (digital input and totalizer channels only)
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<enable_val></enable_val>	Numeric	An integer from 0 to 65535, specifying the bits to enable as a bit sum.	This is a required parameter.

Remarks

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

Bit #	Bit Name	Decimal Value	Definition
0	Calibrating	1	The instrument is calibrating.
1	Self Test	2	The instrument is doing a self-test.
2	Not Used	4	(Always returns 0)
3	Not Used	8	(Always returns 0)
4	Scanning	16	The instrument is scanning.
5	WFT	32	The instrument is waiting for a trigger.
6	Not Used	64	(Always returns 0)
7	USB MSD detected	128	A USB mass storage device (USB drive) has been detected.
8	Config Changed	256	The instrument configuration has changed.
9	Mem Threshold	512	The number of readings in memory has exceeded the memory threshold setting (see DATA:POINts:EVENt:THReshold).
10	Instrument Locked	1024	The instrument is locked.
11	Settings Changed	2048	The instrument's settings have changed.
12	Not Used	4096	(Always returns 0)
13	Global Error	8192	An error is in the global error queue.

14	Busy	16384	The instrument is busy.
15	Not Used	32768	(Always returns 0)

- Use the <enable_value> parameter to specify which bits will be reported to the Status Byte. The decimal value specified corresponds to the binary-weighted sum of the bits you wish to enable in the register. For example, to enable bit 0 (decimal value = 1) and bit 10 (decimal value = 1024), the corresponding decimal value would be 1024 (1 + 1024).
- Bit 14, the Busy bit, will be set while the instrument is performing long commands, such as MMEMory:IMPort:CONFig?.

Return Format

The query command reads the enable register and returns a decimal value corresponding to the binary-weighted sum of all bits set in the register. For example, if bit 0 (decimal value = 1) and bit 10 (decimal value = 1024) are enabled, the query command will return +1025.

Examples

The following command enables bit 9 (decimal value = 512) in the enable register.

STAT: OPER: ENAB 512

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

STAT: OPER: ENAB?

Typical Response: +512

See Also

STATus Subsystem Introduction STATus:OPERation:CONDition? STATus:OPERation[:EVENt]?

STATus:OPERation[:EVENt]?

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

Syntax

STATus:OPERation[:EVENt]?

Description

This command queries the condition register for the *Standard Operation Register* group. This is a read-destructive register and the bits are cleared when you read the register.

NOTE

For more information on the Status System for the instrument, see Status System Introduction.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34907A Multifunction Module (digital input and totalizer channels only)
- 34908A 40 Channel Single-Ended Multiplexer Module

Remarks

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

Bit #	Bit Name	Decimal Value	Definition
0	Calibrating	1	The instrument is calibrating.
1	Self Test	2	The instrument is doing a self-test.
2	Not Used	4	(Always returns 0)
3	Not Used	8	(Always returns 0)
4	Scanning	16	The instrument is scanning.
5	WFT	32	The instrument is waiting for a trigger.
6	Not Used	64	(Always returns 0)
7	USB MSD detected	128	A USB mass storage device (USB drive) has been detected.
8	Config Changed	256	The instrument configuration has changed.
9	Mem Threshold	512	The number of readings in memory has exceeded the memory threshold setting (see DATA:POINts:EVENt:THReshold).
10	Instrument Locked	1024	The instrument is locked.
11	Settings Changed	2048	The instrument's settings have changed.
12	Not Used	4096	(Always returns 0)
13	Global Error	8192	An error is in the global error queue.

14	Busy	16384	The instrument is busy.
15	Not Used	32768	(Always returns 0)

- Bit 14, the Busy bit, will be set while the instrument is performing long commands, such as MMEMory:IMPort:CONFig?.
- This register is cleared when it is read, or when you issue a *CLS command.

Return Format

The query reads the operation event register and returns a decimal value which corresponds to the binary-weighted sum of all bits set in the register (see table above). For example, if bit 1 (decimal value = 2) and bit 9 (decimal value = 512) are set, this command will return "+514".

Examples

The following command reads the questionable event register (bits 1 and 9 are set).

STAT: OPER?

Typical Response: +514

See Also

STATus Subsystem Introduction STATus:OPERation:CONDition? STATus:OPERation:ENABle

STATus:PRESet

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

Syntax

STATus:PRESet

Description

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

Example

The following command clears all bits in the registers listed above.

STATus:PRESet

See Also

STATus Subsystem Introduction

STATus:QUEStionable:CONDition?

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

Syntax

STATus:QUEStionable:CONDition?

Description

This command queries the condition register for the *Questionable Data Register* group. This is a read-only register and the bits are not cleared when you read the register.

NOTE For more information on the Status System for the instrument, see Status System Introduction.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34907A Multifunction Module (digital input and totalizer channels only)
- 34908A 40 Channel Single-Ended Multiplexer Module

Remarks

- The condition register bits reflect the current condition. If a condition is no longer true, the corresponding bit is cleared in the condition register.
- The following table lists the bit definitions for the Questionable Data Register.

Bit #	Bit Name	Decimal Value	Definition
0-10	Not Used	1-1024	(Always returns 0)
11	Totalizer Overflow	2048	A totalizer has counted past its limit.
12	Memory Overflow	4096	The reading memory has overflowed.
13-15	Not Used	8192-32768	(Always returns 0)

• A Factory Reset (*RST command) clears all bits in the condition register.

Return Format

The query reads the questionable condition register and returns a decimal value which corresponds to the binary-weighted sum of all bits set in the register (see table above). For example, if bit 11 (decimal value = 2048) and bit 12 (decimal value = 4096) are set, this command will return "6144".

Examples

The following command reads the condition register (bit 11 is set).

STAT: QUES: COND?

Typical Response: +2048

See Also

STATus Subsystem Introduction STATus:QUEStionable:ENABle

STATus:QUEStionable[:EVENt]?

STATus:QUEStionable:ENABle

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

Syntax

STATus:QUEStionable:ENABle <enable_val>

STATus:QUEStionable:ENABle?

Description

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

NOTE

For more information on the Status System for the instrument, see Status System Introduction.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34907A Multifunction Module (digital input and totalizer channels only)
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<enable_val></enable_val>	Numeric	An integer from 0 to 65535, specifying the bits to enable as a bit sum.	This is a required parameter.

Remarks

• The following table lists the bit definitions for the Questionable Data Register.

Bit #	Bit Name	Decimal Value	Definition
0	Voltage Overload	1	The instrument has experienced a voltage overload.
1	Current Overload	2	The instrument has experienced a current overload.
2	Not Used	4	(Always returns 0)
3	Not Used	8	(Always returns 0)
4	Not Used	16	(Always returns 0)
5	Not Used	32	(Always returns 0)
6	Not Used	64	(Always returns 0)
7	Not Used	128	(Always returns 0)
8	Not Used	256	(Always returns 0)
9	Res Overload	512	The instrument has experienced a resistance overload.
10	Temperature Overload	1024	The instrument has experienced a temperature overload.
11	Totalizer Overflow	2048	A totalizer has counted past its limit.
12	Memory Overflow	4096	The reading memory has overflowed.

13	Not Used	8192	(Always returns 0)
14	Not Used	16384	(Always returns 0)
15	Not Used	32768	(Always returns 0)

- Use the <enable_value> parameter to specify which bits will be reported to the Status Byte. The decimal value specified corresponds to the binary-weighted sum of the bits you wish to enable in the register. For example, to enable bit 0 (decimal value = 1) and bit 10 (decimal value = 1024), the corresponding decimal value would be 1025 (1 + 1024).
- The *CLS (clear status) command will not clear the enable register but it does clear all bits in the *event register*.
- The ***RST** command has no effect on this register.

Return Format

The query command reads the enable register and returns a decimal value corresponding to the binary-weighted sum of all bits set in the register. For example, if bit 0 (decimal value = 1) and bit 10 (decimal value = 1024) are enabled, the query command will return +1025.

Examples

The following command enables bit 9 (decimal value = 512) in the enable register.

STAT:QUES:ENAB 512

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

STAT:QUES:ENAB?

Typical Response: +512

See Also

STATus Subsystem Introduction

STATus:QUEStionable:CONDition?

STATus:QUEStionable[:EVENt]?

STATus:QUEStionable[:EVENt]?

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

Syntax

STATus:QUEStionable[:EVENt]?

Description

This command queries the condition register for the *Questionable Data Register* group. This is a read-destructive register and the bits are cleared when you read the register.



For more information on the Status System for the instrument, see Status System Introduction.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34907A Multifunction Module (digital input and totalizer channels only)
- 34908A 40 Channel Single-Ended Multiplexer Module

Remarks

• The following table lists the bit definitions for the Questionable Data Register.

Bit #	Bit Name	Decimal Value	Definition
0	Voltage Overload	1	The instrument has experienced a voltage overload.
1	Current Overload	2	The instrument has experienced a current overload.
2	Not Used	4	(Always returns 0)
3	Not Used	8	(Always returns 0)
4	Not Used	16	(Always returns 0)
5	Not Used	32	(Always returns 0)
6	Not Used	64	(Always returns 0)
7	Not Used	128	(Always returns 0)
8	Not Used	256	(Always returns 0)
9	Res Overload	512	The instrument has experienced a resistance overload.
10	Temperature Overload	1024	The instrument has experienced a temperature overload.
11	Totalizer Overflow	2048	A totalizer has counted past its limit.
12	Memory Overflow	4096	The reading memory has overflowed.

13	Not Used	8192	(Always returns 0)
14	Not Used	16384	(Always returns 0)
15	Not Used	32768	(Always returns 0)

- Once a bit is set, it remains set until cleared by reading the event register or the *CLS (clear status) command.
- The ***RST** command has no effect on this register.

Return Format

The query reads the questionable event register and returns a decimal value which corresponds to the binary-weighted sum of all bits set in the register (see table above). For example, if bit 1 (decimal value = 2) and bit 9 (decimal value = 512) are set, this command will return "+514".

Example

The following command reads the questionable event register (bits 1 and 9 are set).

STAT:QUES?

Typical Response: +514

See Also

STATus Subsystem Introduction

STATus:QUEStionable:ENABle

STATus:QUEStionable:CONDition?

SYSTem Subsystem Introduction

Command Summary

SYSTem:ALARm?

SYSTem:CPON

SYSTem:CTYPe?

SYSTem:DATE

SYSTem:DATE?

SYSTem:ERRor?

SYSTem:INTerface

SYSTem:INTerface?

SYSTem:LANGuage

SYSTem:LANGuage?

SYSTem:LFRequency?

SYSTem:LOCal

SYSTem:LOCK:NAME?

SYSTem:LOCK:OWNer?

SYSTem:LOCK:RELease

SYSTem:LOCK:REQuest?

SYSTem:PRESet

SYSTem:REMote

SYSTem:RWLock

SYSTem:SECurity[:IMMediate]

SYSTem:TIME

SYSTem:TIME?

SYSTem:TIME:SCAN?

SYSTem:VERSion?

LAN Configuration Commands

NOTE

The instrument uses the following LAN ports (34972A only):

- Port 5024 is used for SCPI Telnet sessions.
- Port 5025 is used for Socket sessions.

LAN Configuration Introduction

Remote Interface Configuration Commands SYSTem:COMMunicate:LAN:CONTrol? SYSTem:COMMunicate:LAN:DHCP SYSTem:COMMunicate:LAN:DHCP? SYSTem:COMMunicate:LAN:DNS SYSTem:COMMunicate:LAN:DNS? SYSTem:COMMunicate:LAN:DOMain? SYSTem:COMMunicate:LAN:GATEway SYSTem:COMMunicate:LAN:GATEway? SYSTem:COMMunicate:LAN:HOSTname SYSTem:COMMunicate:LAN:HOSTname? SYSTem:COMMunicate:LAN:IPADdress SYSTem:COMMunicate:LAN:IPADdress? SYSTem:COMMunicate:LAN:MAC? SYSTem:COMMunicate:LAN:SMASk SYSTem:COMMunicate:LAN:SMASk? SYSTem:COMMunicate:LAN:TELNet:PROMpt SYSTem:COMMunicate:LAN:TELNet:PROMpt? SYSTem:COMMunicate:LAN:TELNet:WMESsage SYSTem:COMMunicate:LAN:TELNet:WMESsage? SYSTem:COMMunicate:LAN:UPDate

NOTE The instrument uses the following LAN ports (34972A only):

- Port 5024 is used for SCPI Telnet sessions.
- Port 5025 is used for Socket sessions.

SYSTem:COMMunicate:LAN:CONTrol?

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

This functionality is available on the 34972A only.

Syntax

SYSTem:COMMunicate:LAN:CONTrol?

Description

This query returns the control connection port number for socket communications.

Remarks

- This query is only used when programming over sockets.
- You can use the control socket connection to send a Device Clear to the instrument or to detect pending Service Request (SRQ) events.
- This query always returns 0 if not sent from a socket connection.

Return Format

The query returns the control connection port number. If 0 is returned, the interface does not support a Socket Control connection.

Examples

The following query returns the control connection port number.

SYST: COMM: LAN: CONT?

Typical Response: +5005

See Also

LAN Configuration Introduction

SYSTem:COMMunicate:LAN:DHCP

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

This functionality is available on the 34972A only.

Syntax

SYSTem:COMMunicate:LAN:DHCP < mode>

SYSTem:COMMunicate:LAN:DHCP?

Description

This command disables or enables use of the Dynamic Host Configuration Protocol (DHCP) for the instrument.

When DHCP is <u>enabled</u> (factory setting), the instrument will try to obtain an IP address from a DHCP server. If a DHCP server is found, it will assign a dynamic IP address, Subnet Mask, and Default Gateway to the instrument. If a DHCP server is not found, the instrument uses AutoIP to automatically configure its IP setting in the Automatic Private IP Addressing range (169.254.xxx.xxx).

When DHCP is <u>disabled</u>, the instrument will use the static IP address, Subnet Mask, and Default Gateway during power-on.

NOTE If you change the DHCP mode, you must execute a SYSTem:COMMunicate:LAN:UPDate command to activate the setting.

Parameters

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

Remarks

- Most site LANs have a DHCP server.
- If a DHCP LAN address is not assigned by a DHCP server, then an AutoIP address static IP will be assumed after approximately two minutes.
- The DHCP setting is stored in non-volatile memory, and does not change when power has been off, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).
- The query returns the current setting only. This may differ from what was just set if you have not yet executed a SYSTem:COMMunicate:LAN:UPDate command.

Return Format

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

Examples

The following command disables DHCP.

SYST:COMM:LAN:DHCP OFF SYST:COMM:LAN:UPDate

The following query returns the current DHCP setting.

SYST:COMM:LAN:DHCP?

Typical Response: 0

See Also

LAN Configuration Introduction

SYSTem:COMMunicate:LAN:GATEway

SYSTem:COMMunicate:LAN:IPADdress

SYSTem:COMMunicate:LAN:SMASk

SYSTem:COMMunicate:LAN:UPDate

SYSTem:COMMunicate:LAN:DNS

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

This functionality is available on the 34972A only.

Syntax

SYSTem:COMMunicate:LAN:DNS "<address>"

SYSTem:COMMunicate:LAN:DNS? [{CURRent|STATic}]

Description

This command assign the IP address of the Domain Name System server (DNS).

Contact your network administrator to determine whether DNS is being used and for the correct address. If DHCP is available and enabled, DHCP will auto-assign the DNS address. This auto-assigned DNS address takes precedence over the static DNS address assigned with this command.

NOTE

If you change the DNS address, you must execute a SYSTem:COMMunicate:LAN:UPDate command to activate the setting.

Parameters

Name	Туре	Range of Values	Default Value
<address></address>	Quoted String	Specified in four-byte dot notation ("nnn.nnn.nnn"), where "nnn" in each case is a byte value in the range 0 through 255.	This is a required parameter.

Remarks

- The assigned DNS address is used for the DNS server if DHCP is disabled. Otherwise, the DNS server address is auto-assigned by DHCP.
- The DNS address is stored in non-volatile memory, and does not change when power has been off, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

The query form returns the address of the DNS server in the form "nnn.nnn.nnn".

Note that the query version of the command has two optional parameters. Specify "CURRent" (default) to read the DNS address currently in use. Specify "STATic" to read the DNS address, static gateway, or IP address currently stored in non-volatile memory within the instrument. The DNS address stored in memory is used if DHCP is disabled. If DHCP is enabled, it will auto-assign the DNS address, and that DHCP assigned address can be read by specifying "CURRent".

Examples

The following command sets the static DNS address.

```
SYST:COMM:LAN:DNS "198.105.232.4"
SYST:COMM:LAN:UPDate
```

The following query returns the DNS address currently being used by the instrument (the quotes are also returned).

SYST:COMM:LAN:DNS? CURR

Typical Response: "198.105.232.4"

See Also

LAN Configuration Introduction

SYSTem:COMMunicate:LAN:HOSTname

SYSTem:COMMunicate:LAN:UPDate

SYSTem:COMMunicate:LAN:DOMain?

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

This functionality is available on the 34972A only.

Syntax

SYSTem:COMMunicate:LAN:DOMain?

Description

This query returns the current network domain.

Remarks

• If the instrument has a DNS server, it looks up its domain name.

Return Format

The query reads the domain name and returns an ASCII string enclosed in double quotes. If a domain name has not been assigned, a null string ("") is returned.

Examples

The following query returns the domain name currently being used by the instrument (the quotes are also returned).

SYST:COMM:LAN:DOM?

Typical Response: "example.com"

See Also

LAN Configuration Introduction

SYSTem:COMMunicate:LAN:DNS

SYSTem:COMMunicate:LAN:HOSTname

SYSTem:COMMunicate:LAN:GATEway

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

This functionality is available on the 34972A only.

Syntax

SYSTem:COMMunicate:LAN:GATEway "<address>"

SYSTem:COMMunicate:LAN:GATEway? [{CURRent|STATic}]

Description

This command assigns the static gateway for the instrument.

Contact your network administrator to determine whether subnetting is being used and for the correct address. If DHCP is enabled, DHCP will auto-assign the gateway. This auto-assigned gateway takes precedence over the static gateway assigned with this command.

NOTE

If you change the gateway, you must execute a SYSTem:COMMunicate:LAN:UPDate command to activate the setting.

Parameters

Name	Туре	Range of Values	Default Value
<address></address>	Quoted String	Specified in four-byte dot notation ("nnn.nnn.nnn"), where "nnn" in each case is a byte value in the range 0 through 255.	This is a required parameter.

Remarks

- The assigned gateway is used if DHCP is disabled. Otherwise, the gateway is auto-assigned by DHCP.
- The static gateway is stored in non-volatile memory, and does not change when power has been off, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).
- If DHCP is enabled (see SYSTem:COMMunicate:LAN:DHCP command), the static gateway is assigned by the DHCP server, so the specified static gateway is not used. However, if DHCP is turned off, the currently configured static gateway will be used.
- A gateway value of "0.0.0.0" indicates that subnetting is not being used.

Return Format

The query form returns the address of the gateway in the form "nnn.nnn.nnn".

Note that the query version of the command has two optional parameters. Specify "CURRent" (default) to read the static gateway currently in use. Specify "STATic" to read the static gateway currently stored in non-volatile memory within the instrument. The gateway stored in memory is used if DHCP is disabled. If DHCP is enabled, it will auto-assign the gateway can be read by specifying "CURRent".

Examples

The following command sets the static gateway.

```
SYST:COMM:LAN:GATEway "192.168.1.1"
SYST:COMM:LAN:UPDate
```

The following query returns the gateway currently being used by the instrument (the quotes are also returned).

SYST:COMM:LAN:GATEway? CURR

Typical Response: "192.168.1.1"

See Also

LAN Configuration Introduction

SYSTem:COMMunicate:LAN:IPADdress

SYSTem:COMMunicate:LAN:SMASk

SYSTem:COMMunicate:LAN:DHCP

SYSTem:COMMunicate:LAN:UPDate

SYSTem:COMMunicate:LAN:HOSTname

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

This functionality is available on the 34972A only.

Syntax

SYSTem:COMMunicate:LAN:HOSTname "<name>"

SYSTem:COMMunicate:LAN:HOSTname? [{CURRent|STATic}]

Description

This command assigns a host name to the instrument. The host name is the host portion of the domain name, which is translated into an IP address.

NOTE

If you change the host name, you must execute a SYSTem:COMMunicate:LAN:UPDate command to activate the setting.

Parameters

Name	Туре	Range of Values	Default Value
<name></name>	Quoted ASCII String	A string of up to 45 characters. The first character must be a letter (A-Z), but the remaining 44 characters can be letters, numbers (0-9), or dashes ("-"). Blank spaces are not allowed.	This is a required parameter. The LXI reset value is A- 34970A- nnnn or A-34972A- nnnn , where nnnnn is the last 5 digits in the instrument's serial number.

Remarks

- If Dynamic Domain Name System (DDNS) is available on your network and your instrument uses DHCP, the host name is registered with the Dynamic DNS service at power-on.
- If DHCP is enabled (see SYSTem:COMMunicate:LAN:DHCP command), the DHCP server can assign a different name if the requested name is already in use on the network.
- The host name is stored in non-volatile memory, and does not change when power has been off, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

The query reads the host name and returns an ASCII string enclosed in double quotes. If a host name has not been assigned, the query returns a null string ("").

Note that the query version of the command has two optional parameters. Specify "CURRent" (default) to read the host name that the instrument is currently using. Specify "STATic" to read the desired host name currently stored in non-volatile memory within the instrument (which may not be the actual name currently in use on the network).

Examples

The following command defines a host name.

SYST:COMM:LAN:HOST "LAB1-34970A" SYST:COMM:LAN:UPDate

The following query returns the host name currently being used by the instrument (the quotes are also returned).

SYST:COMM:LAN:HOST? CURR or SYST:COMM:LAN:HOST?

Typical Response: "LAB1-34970A"

See Also

LAN Configuration Introduction

SYSTem:COMMunicate:LAN:DHCP

SYSTem:COMMunicate:LAN:DOMain?

SYSTem:COMMunicate:LAN:UPDate

SYSTem:COMMunicate:LAN:IPADdress

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

This functionality is available on the 34972A only.

Syntax

SYSTem:COMMunicate:LAN:IPADdress "<address>"

SYSTem:COMMunicate:LAN:IPADdress? [{CURRent|STATic}]

Description

This command assigns the static IP address for the instrument.

If DHCP is enabled, DHCP will auto-assign the IP address. This autoassigned IP address takes precedence over the static IP address assigned with this command.

NOTE If you change the IP address, you must execute a SYSTem:COMMunicate:LAN:UPDate command to activate the setting.

Parameters

Name	Туре	Range of Values	Default Value
<address></address>	Quoted String	Specified in four-byte dot notation ("nnn.nnn.nnn"), where "nnn" in each case is a byte value in the range 0 through 255.	This is a required parameter.

Remarks

- The assigned IP address is used if DHCP is disabled. Otherwise, the IP address is auto-assigned by DHCP.
- The IP address is stored in non-volatile memory, and does not change when power has been off, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).
- If DHCP is enabled (see SYSTem:COMMunicate:LAN:DHCP command), the IP address is assigned by the DHCP server, so the specified IP address is not used. However, if DHCP is turned off, the currently configured IP address will be used.
- IF DHCP is enabled, but a DHCP server is not available, the IP address is determined by AutoIP.
- If you are planning to use a static IP address on a site LAN, contact your network administrator to obtain a fixed IP address to be used exclusively for your instrument, along with the corresponding subnet mask and gateway.

Return Format

The query form returns the address of the IP address of the instrument in the form "nnn.nnn.nnn".

Note that the query version of the command has two optional parameters. Specify "CURRent" (default) to read the IP address currently in use. Specify "STATic" to read the IP address currently stored in nonvolatile memory within the instrument. The IP address stored in memory is used if DHCP is disabled. If DHCP is enabled, it will auto-assign the IP address, and that DHCP assigned address can be read by specifying "CURRent".

Examples

The following command sets the static IP address.

```
SYST:COMM:LAN:IPAD "198.168.1.2"
SYST:COMM:LAN:UPDate
```

The following query returns the IP address currently being used by the instrument (the quotes are also returned).

SYST:COMM:LAN:IPAD? CURR

Typical Response: "198.168.1.2"

See Also

- LAN Configuration Introduction
- SYSTem:COMMunicate:LAN:DHCP
- SYSTem:COMMunicate:LAN:SMASk
- SYSTem:COMMunicate:LAN:GATEway
- SYSTem:COMMunicate:LAN:UPDate

SYSTem:COMMunicate:LAN:MAC?

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

This functionality is available on the 34972A only.

Syntax

SYSTem:COMMunicate:LAN:MAC?

Description

This query reads the instrument's Media Access Control (MAC) address, also known as the link-layer address, the Ethernet (station) address, LANIC ID, or Hardware Address. This is an unchangeable 48-bit address assigned by the manufacturer to each unique Internet device.

NOTE Your network administrator may need the instrument's MAC address in order to assign a static IP address for this device.

Remarks

- The instrument's MAC address is unique to the instrument. It is set at the factory and cannot be changed.
- The MAC address is stored in non-volatile memory, and does not change when power has been off, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

The query reads the MAC address and returns an ASCII string enclosed in double quotes. The MAC address is represented as 12 hexadecimal characters. Examples

The following query returns the MAC address (the quotes are also returned).

SYST:COMM:LAN:MAC?

Typical Response: "0030D3001041"

See Also

LAN Configuration Introduction

SYSTem:COMMunicate:LAN:IPADdress

SYSTem:COMMunicate:LAN:SMASk

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

This functionality is available on the 34972A only.

Syntax

SYSTem:COMMunicate:LAN:SMASk "<mask>"

SYSTem:COMMunicate:LAN:SMASk? [{CURRent|STATic}]

Description

This command assigns a Subnet Mask for the instrument. The instrument uses the Subnet Mask to determine whether a client IP address is on the same local subnet. When a client IP address is on a different subnet, all packets must be sent to the Default Gateway. Contact your network administrator to determine whether subnetting is being used and for the correct Subnet Mask.

NOTE If you change the subnet mask, you must execute a SYSTem:COMMunicate:LAN:UPDate command to activate the setting.

Parameters

Name	Туре	Range of Values	Default Value
<mask></mask>	Quoted String	Specified in four-byte dot notation ("nnn.nnn.nnn"), where "nnn" in each case is a byte value in the range 0 through 255.	This is a required parameter. The factory default value is "255.255.0.0".

Remarks

- The assigned subnet mask is used if DHCP is disabled. Otherwise, the subnet mask is auto-assigned by DHCP.
- If DHCP is enabled (factory default), the subnet mask does not need to be set.
- If DHCP is enabled (see SYSTem:COMMunicate:LAN:DHCP command), the subnet mask is assigned by the DHCP server, so the specified subnet mask is not used. However, if DHCP is turned off, the currently configured Subnet Mask will be used.
- A value of "0.0.0.0" or "255.255.255.255" indicates that subnetting is not being used.
- The Subnet Mask is stored in non-volatile memory, and does not change when power has been off, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

The query returns the Subnet Mask in the form "nnn.nnn.nnn".

Note that the query version of the command has two optional parameters. Specify "CURRent" (default) to read the dynamic Subnet Mask currently being used by the instrument. Specify "STATic" to read the Subnet Mask currently stored in non-volatile memory within the instrument (may not be the actual mask used by the instrument if DHCP is enabled).

Examples

The following command sets the Subnet Mask.

```
SYST:COMM:LAN:SMAS "255.255.254.0"
SYST:COMM:LAN:UPDate
```

The following query returns the subnet mask currently being used by the instrument (the quotes are also returned).

SYST:COMM:LAN:SMAS? CURR or SYST:COMM:LAN:SMAS?

Typical Response: "255.255.254.0"

See Also

LAN Configuration Introduction

SYSTem:COMMunicate:LAN:DHCP

SYSTem:COMMunicate:LAN:GATEway

SYSTem:COMMunicate:LAN:IPADdress

SYSTem:COMMunicate:LAN:UPDate

SYSTem:COMMunicate:LAN:TELNet:PROMpt SYSTem:COMMunicate:LAN:TELNet:WMESsage

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

This functionality is available on the 34972A only.

Syntax

SYSTem:COMMunicate:LAN:TELNet:PROMpt "*<string>*" SYSTem:COMMunicate:LAN:TELNet:PROMpt?

SYSTem:COMMunicate:LAN:TELNet:WMESsage "<*string*>" SYSTem:COMMunicate:LAN:TELNet:WMESsage?

Description

These commands set the command prompt and welcome message that are displayed when you use a Telnet session to communicate with the instrument.

Parameters

Name	Туре	Range of Values	Default Value
<string></string>	Quoted ASCII String	A string of up to 15 characters (prompt) or 63 characters (welcome message).	"34972A>" (prompt) "Welcome to Keysight's 34972A Switch/Measure Unit" (welcome message)

Remarks

- The Telnet port is an alternate way to send SCPI commands to the instrument.
- Port 5024 is used for SCPI Telnet sessions.
- Telnet session can typically be started as follows from a host computer shell:

telnet <*IP_address*> <*port*>

For example:

telnet 169.254.4.10 5024

To exit a Telnet session, press <**Ctrl-D**>.

- The command prompt and welcome message are stored in nonvolatile memory, and they do not change when power has been off or after a Factory Reset (*RST command).
- The following image shows both the prompt and the welcome message.

Return Format

The queries return the command prompt or welcome message as ASCII strings enclosed in double quotes.

Examples

The following command defines the command prompt.

```
SYST:COMM:LAN:TELN:PROM "Command>"
```

The following query returns the command prompt currently being used (the quotes are also returned).

SYST:COMM:LAN:TELN:PROM?

Typical Response: "Command>"

See Also

LAN Configuration Introduction

SYSTem:COMMunicate:LAN:UPDate

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

This functionality is available on the 34972A only.

Syntax

SYSTem:COMMunicate:LAN:UPDate

Description

This command updates all of the LAN changes. It disconnects all active LAN and Web connections and restarts the LAN interface, possibly with a new IP address, depending on how your instrument's IP address is assigned.

Remarks

• Executing this command is necessary to make the following commands take effect:

SYSTem:COMMunicate:LAN:DHCP

SYSTem:COMMunicate:LAN:DNS

SYSTem:COMMunicate:LAN:GATEway

SYSTem:COMMunicate:LAN:HOSTname

SYSTem:COMMunicate:LAN:IPADdress

SYSTem:COMMunicate:LAN:SMASk

- Be very careful when you execute this command, because your instrument may not work on the LAN if you update the instrument with invalid LAN settings.
- If your instrument does not work after you execute this command, push the LAN Reset front panel softkey to restore the settings to reset values and reset the LAN, or use another I/O interface, such as USB, to correct the settings.

Example

The commands below demonstrate a typical use model for setting and applying LAN parameters.

SYST:COMM:LAN:DHCP OFF SYST:COMM:LAN:IPADdress "192.168.1.2" SYST:COMM:LAN:SMASk "255.255.0.0" SYST:COMM:LAN:GATEway "192.168.1.1" SYST:COMM:LAN:UPDate See Also

- LAN Configuration Introduction
- SYSTem:COMMunicate:LAN:DHCP
- SYSTem:COMMunicate:LAN:DNS
- SYSTem:COMMunicate:LAN:GATEway
- SYSTem:COMMunicate:LAN:HOSTname
- SYSTem:COMMunicate:LAN:IPADdress
- SYSTem:COMMunicate:LAN:SMASk

SYSTem:ALARm?

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

Syntax

SYSTem:ALARm?

Description

This query reads the alarm data from the alarm queue (one alarm event is read and deleted from the queue each time this command is executed). A record of up to 20 alarms can be stored in the instrument's alarm queue.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34907A Multifunction Module (digital input and totalizer channels only)
- 34908A 40 Channel Single-Ended Multiplexer Module

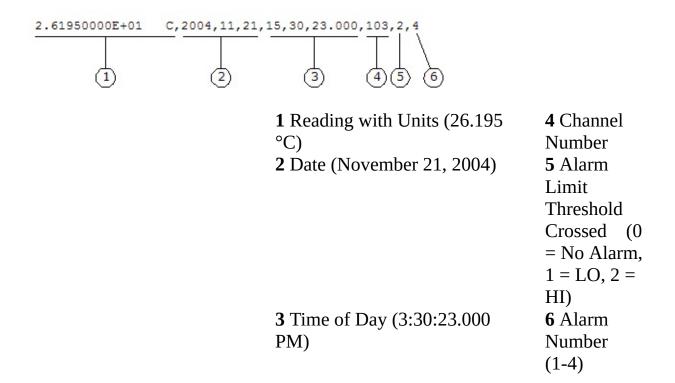
Remarks

- Each time you start a new scan, the instrument clears all readings (including alarm data) stored in reading memory from the previous measurement. Therefore, the contents of memory are always from the most recent measurement.
- Alarm data is retrieved in first-in-first-out (FIFO) order. The first alarm returned is the first alarm that was stored.
- Up to 20 alarms can be logged in the alarm queue. If more than 20 alarms are generated, they will be lost (only the first 20 alarms are saved).
- To retrieve scanned readings and alarm data from reading memory without clearing the information, use the FETCh? command.
- The alarm queue is cleared by the *CLS (clear status) command, when power is cycled, and by reading all of the entries. A Factory Reset (*RST command) or Instrument Preset (SYSTem:PRESet command) does not clear the alarm queue.

Return Format

The query returns one string each time it is executed. It also reads the alarm data and clears one alarm event from the alarm queue.

The query returns a string in the form shown below (independent of FORMat:READing commands):



Example

The following query reads one message from the alarm queue and removes that message from the queue.

SYST:ALAR?

Typical Response: -1.17616000E-04 VDC,2004,11,21,15,54,50.184,103,1,3 See Also

SYSTem Subsystem Introduction

SYSTem:CPON

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

Syntax

SYSTem:CPON <slot>

Description

This command resets the module in the specified slot to its power-on state (CPON means "card power on"). See Factory Reset State for a complete listing of the instrument's Factory configuration.

Parameters

Name	Туре	Range of Values	Default Value
<slot></slot>	Discrete	{100 200 300 ALL}	This is a required parameter.

Remarks

• The various module cards are affected as follows:

Module	Effect
34901A	If any channel is configured for a measurement, this command has no effect. If no channel is configured, this command opens all channels.
34902A	If any channel is configured for a measurement, this command has no effect. If no channel is configured, this command opens all channels.
34903A	This command opens all channels.
34904A	This command opens all channels.
34905A	This command closes channels 11 and 21.
34906A	This command closes channels 11 and 21.
34907A	This command resets all channels not involved in scan to the power-on state.

34908A	If any channel is
	configured for a
	measurement, this
	command has no effect. If
	no channel is configured,
	this command opens all
	channels.

- This command does not reset the internal DMM.
- The instrument will produce an error if you are actively scanning and try to execute a SYSTem:CPON for a card that is involved in the scan.
- To reset the modules in all three slots in the instrument, use the ALL keyword shown above.

Example

The following command resets the module in slot 200.

SYST:CPON 200

See Also

SYSTem Subsystem Introduction

SYSTem:PRESet

*RST

SYSTem:CTYPe?

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

Syntax

SYSTem:CTYPe? <slot>

Description

This query returns the identity of the plug-in module in the specified slot. The table below shows the plug-in modules available for the Keysight 34970A/34972A.

Model Number	Module Description
34901A	20 Channel Multiplexer (2/4-wire) Module
34902A	16 Channel Multiplexer (2/4-wire) Module
34903A	20 Channel Actuator/GP Switch Module
34904A	4 x 8 Two-Wire Matrix Module
34905A	2 GHz Dual 1:4 RF Mux, 50 Ohm Module
34906A	2 GHz Dual 1:4 RF Mux, 75 Ohm Module
34907A	Multifunction Module
34908A	40 Channel Single-Ended Multiplexer

	Module
--	--------

Parameters

Name	Туре	Range of Values	Default Value
<slot></slot>	Numeric	{100 200 300}	This is a required parameter.

Return Format

• The query returns comma-delimited fields of ASCII characters, as shown below. To read the string into your computer, be sure to dimension a string variable with at least 43 characters.

<Company Name>,<Card Model Number>,<Serial Number>,<Firmware Rev>

- For the 34970A, the <*Company Name*> is HEWLETT-PACKARD. For the 34972A, the <*Company Name*> is Keysight Technologies. If you have used the SYSTem:LANGuage command to set the language to "34970A", the query will also return the company name as HEWLETT-PACKARD.
- The <*Card Model Number*> is either a number from 34901A through 34908A. The number 0 is returned for the <*Serial Number*> field. The Firmware Revision has the form R.R and indicates the revision of firmware currently in use on the specified module.
- If the specified slot is empty, the command responds with either Keysight Technologies,0,0,0 (34972A) or HEWLETT-PACKARD,0,0,0 (34970A).

Example

The following command returns the identity of the module in slot 300 of a 34972A.

SYST:CTYP? 300

Typical Response: Keysight Technologies,34907A,0,1.0

See Also

SYSTem Subsystem Introduction

SYSTem:CTYPe?

*IDN?

SYSTem:DATE

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

Syntax

SYSTem:DATE <*yyyy*>,<*mm*>,<*dd*>

SYSTem:DATE?

Description

During a scan, the instrument stores all readings and alarms with the current time and date. This command sets the instrument calendar.

Parameters

Name	Туре	Range of Values	Default Value
<уууу>	Numeric	The current year	This is a required parameter.
<mm></mm>	Numeric	The current month	This is a required parameter.
<dd></dd>	Numeric	The current day of the current month	This is a required parameter.

Remarks

- When shipped from the factory, the instrument is set to the current time and date for Greenwich Mean Time (GMT).
- The calendar setting is stored in non-volatile memory, and does not change when power has been off, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

The query returns three comma-separated values in the form "yyyy,mm,dd".

Examples

The following command sets the instrument date to September 12, 2009.

SYST:DATE 2009,09,12

The following query returns the date.

SYST:DATE?

Typical Response: 2009,09,12

See Also

SYSTem Subsystem Introduction

SYSTem:TIME

SYSTem:ERRor?

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

Syntax

SYSTem:ERRor?

Description

This query reads and clears one error from the instrument's *error queue*. A record of up to 10 errors (34970A) or 20 errors (34972A) is stored in the instrument's error queue. Errors are retrieved in first-in-first-out (FIFO) order. The error queue is cleared by the *CLS (clear status) command or when power is cycled. The errors are also cleared when you read the queue.

For a complete listing of the error messages for the Keysight 34970A/34972A, see SCPI Error Messages.

Remarks

- The instrument beeps once each time a command syntax or hardware error is generated. The front-panel ERROR annunciator turns on when one or more errors are currently stored in the error queue.
- Errors are retrieved in first-in-first-out (FIFO) order. The first error returned is the first error that was stored. Once you have read all of the interface-specific errors, the errors in the global error queue are retrieved.
- Errors are cleared as you read them. When you have read all errors from the interface-specific error queue (errors from the current I/O session) and global error queue (errors from any I/O session), the ERROR annunciator turns off and the errors are cleared.
- If more than the maximum number of errors have occurred (10 errors on the 34970A or 20 errors on the 34972A), the last error stored in the queue (the most recent error) is replaced with -350,"Error queue overflow". No additional errors are stored until you remove errors from the queue. If no errors have occurred when you read the error queue, the instrument responds with +0,"No error".
- The front panel reports errors from all I/O sessions as well as the global error queue. To read the error queue from the front panel, use the View key.
- Error conditions are also summarized in the Status Byte Register. For more information on the Status System for the instrument, see Status System Introduction.
- The interface-specific and global error queues are cleared by the *CLS (Clear Status) command and when power is cycled. The errors are also cleared when you read the error queue. The error

queue is not cleared by a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

Return Format

The query reads and clears one error string from the error queue. The error string may contain up to 160 characters and consists of an error number and an error string enclosed in double quotes. For example:

-113,"Undefined header"

Example

The following query reads and clears one error.

SYST:ERR?

Typical Response: -101,"Invalid character"

See Also

SYSTem Subsystem Introduction

*SRE

SYSTem:INTerface

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

This functionality is available on the 34970A only.

Syntax

SYSTem:INTerface {GPIB|RS232}

SYSTem:INTerface?

Description

This command/query selects the remote interface for the instrument. Only one interface can be enabled at a time. The GPIB interface is selected when the instrument is shipped from the factory.

Remarks

- This command only has effect on the 34970A. The 34972A will accept the command, but the command will have no effect. Both the parameters and the response to the query are meaningless.
- The non-selected interface is disabled immediately.

Return Format

The query returns GPIB or RS232. On the 34972A, the (meaningless) response is GPIB.

Examples

The following command sets the remote interface to RS-232 on a 34970A.

SYST: INT RS232

The following query returns the remote interface for a 34970A.

SYST: INT?

Typical Response: RS232

See Also

SYSTem Subsystem Introduction

SYSTem:LOCal

SYSTem:REMote

SYSTem:LANGuage

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

This functionality is available on the 34972A only.

Syntax

SYSTem:LANGuage < language >

SYSTem:LANGuage?

Description

This command allows you to specify whether the instrument should behave as a 34970A or a 34972A.

Parameters

Name	Туре	Range of Values	Default Value
<language></language>	Discrete	{"34970A" "34972A"}	This is a required parameter.

Remarks

- This command only affects the output of the *IDN? and SYSTem:CTYPe? queries.
- If you do not specify 34970A or 34972A, the instrument will dispatch an error message.

Return Format

The query returns "34970A" or "34972A".

Examples

The following command sets the language to 34970A.

SYST:LANG "34970A"

The following query returns the current *<language>* setting for the instrument.

SYST:LANG?

Typical Response: "34970A"

See Also

SYSTem Subsystem Introduction

*IDN?

SYSTem:CTYPe?

SYSTem:LFRequency?

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

Syntax

SYSTem:LFRequency?

Description

This command returns the current power-line reference frequency used by the instrument. When you apply power to the instrument, the instrument automatically detects the power-line frequency (50 Hz, 60 Hz, or 400 Hz) and uses this value to determine the integration time used.

Remarks

- If the detected power line frequency is 400 Hz, the 50 Hz reference value is actually used (a subharmonic of 400 Hz).
- The instrument uses this information in determining integration time in NPLC commands.
- The reference frequency setting is stored in volatile memory and will be lost when power is turned off. The instrument automatically measures the power-line frequency (50 Hz, 60 Hz, or 400 Hz) at power-on.

Return Format

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

Example

The following query returns the power line frequency.

SYST:LFR?

Typical Response: +60

See Also

SYSTem Subsystem Introduction

SYSTem:LOCal SYSTem:REMote SYSTEM:RWLock

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

Syntax

SYSTem:LOCal

SYSTem:REMote

SYSTem:RWLock

Description

These commands place the instrument in either the local, remote or local lockout (LLO) mode.

Remarks

- In the LOCal mode, all keys on the front panel are fully functional.
- In the REMote mode, most keys on the front panel are disabled. The exceptions are the Local, Mon and View keys. Also, the knob and the arrows above it are enabled.
- In the local lockout mode (RWLock), all keys on the front panel are disabled, including the Local key.
- These commands are not allowed over GPIB on the 34970A.

Examples

The following command puts the instrument in local mode.

SYST:LOC

The following command puts the instrument in remote mode.

SYST:REMote

See Also

- SYSTem Subsystem Introduction
- SYSTem:INTerface

SYSTem:LOCK:NAME?

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

This functionality is available on the 34972A only.

Syntax

SYSTem:LOCK:NAME?

Description

This query returns the I/O interface name of the I/O session sending the query. You can use the returned name to determine whether the I/O session owns the interface lock by comparing it to the value returned by SYSTem:LOCK:OWNer?.

Remarks

- Use this command to determine the lock name for the interface that you are using. Then use the SYSTem:LOCK:OWNer? command to determine which interface, if any, has the lock. Once you have executed both of these commands, you can compare the results to determine whether you have the lock.
- This query is sometimes confused with the SYSTem:LOCK:OWNer? query. The difference is that SYSTem:LOCK:OWNer? returns the name of the interface that has the lock, and SYSTem:LOCK:NAME? returns the name of the current interface, regardless of whether it has the lock.

Return Format

The query returns USB or LAN<*IP Address*> indicating the I/O interface being used by the querying computer. The IP address is four integers separated by periods, such as 156.140.79.29, and there is no space between the word LAN and the *<IP Address*>. Therefore, a typical LAN with an IP address would be returned as LAN156.140.79.29.

Example

The following query returns the name of the I/O interface in use by the querying computers.

SYST:LOCK:NAME?

Typical Response: "LAN169.254.149.35"

See Also

SYSTem:LOCK:OWNer?

SYSTem:LOCK:RELease

SYSTem:LOCK:REQuest?

SYSTem:LOCK:OWNer?

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

This functionality is available on the 34972A only.

Syntax

SYSTem:LOCK:OWNer?

Description

This query returns the name of the I/O interface that currently has a lock.

Remarks

- If the value returned by this query matches the value returned by SYSTem:LOCK:NAME?, then the I/O session sending this query owns the lock.
- When a lock is active, Bit 10 in the Standard Operation Register will be set (see STATus:OPERation:CONDition? command). When there is no active lock on any I/O interface, this bit will be cleared.
- This query is sometimes confused with the SYSTem:LOCK:NAME? query. The difference is that SYSTem:LOCK:OWNer? returns the name of the interface that has the lock, and SYSTem:LOCK:NAME? returns the name of the current interface, regardless of whether it has the lock.

Return Format

The query returns USB or LAN<*IP Address*> indicating the I/O interface that currently has a lock. If no interface has a lock, the query returns NONE. The IP address is four integers separated by periods, such as 156.140.79.29, and there is no space between the word LAN and the <*IP Address*>. Therefore, a typical LAN with an IP address would be returned as LAN156.140.79.29.

Example

The following query returns the name of the I/O interface that currently has a lock.

SYST:LOCK:OWN?

Typical Response: "USB"

See Also

SYSTem:LOCK:NAME?

SYSTem:LOCK:RELease

SYSTem:LOCK:REQuest?

SYSTem:LOCK:RELease

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

This functionality is available on the 34972A only.

Syntax

SYSTem:LOCK:RELease

Description

This command decrements the lock count by one and releases the instrument lock.

Remarks

• When a lock is active, Bit 10 in the Standard Operation Register will be set (see STATus:OPERation:CONDition? command). When the lock is released, this bit is cleared.

Examples

The following command decreases the lock count by one.

SYST:LOCK:REL

The following series of commands illustrates usage.

Initial State = unlocked, Count = 0	
<pre><from usb=""> SYST:LOCK:REQ? (request successful)</from></pre>	returns +1
State = locked, Count = 1	
<pre><from lan=""> SYST:LOCK:REQ? because USB has lock</from></pre>	returns +0
State = locked, Count = 1	
<pre><from usb=""> SYST:LOCK:REQ? (request successful)</from></pre>	returns +1
State = locked, Count = 2	
<pre><from usb=""> SYST:LOCK:REL</from></pre>	
State = locked, Count = 1	
<pre><from usb=""> SYST:LOCK:REL</from></pre>	
State = unlocked, Count = 0	

Note that for each successful lock request, a lock release is required. Two requests require two releases.

See Also

SYSTem:LOCK:NAME? SYSTem:LOCK:OWNer?

SYSTem:LOCK:REQuest?

SYSTem:LOCK:REQuest?

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

This functionality is available on the 34972A only.

Syntax

SYSTem:LOCK:REQuest?

Description

This command issues a request to lock the instrument's configuration to a single I/O interface. This allows you to lock the instrument or share the instrument with other computers.

Remarks

- When a request is granted, only I/O sessions from the interface which was granted the lock will be allowed to change the state of the instrument. From the other I/O interfaces, you can query the state of the instrument but no instrument configuration changes or measurements are allowed.
- Lock requests can be nested and each request will increase the lock count by 1. For every request, you will need a release from the same I/O interface (see SYSTem:LOCK:RELease command).
- Instrument locks are handled at the I/O interface level (USB or sockets) and you are responsible for all coordination between threads and/or programs on that interface.
- Locks from socket sessions will be automatically released when a socket disconnect is detected.
- When a lock is granted, Bit 10 in the Standard Operation Register will be set (see STATus:OPERation:CONDition? command).

Return Format

The command immediately returns +1 if the lock request is granted or +0 if denied.

Examples

The following command requests a lock of the current I/O interface.

```
SYST:LOCK:REQ?
```

```
Typical Response: +1
```

The following series of commands illustrates usage.

Initial State = unlocked, Count = 0				
<from usb=""> SYST:LOCK:REQ? (request successful)</from>	returns +1			
State = locked, Count = 1				
<from lan=""> SYST:LOCK:REQ? because USB has lock</from>	returns +0			
State = locked, Count = 1				
<pre><from usb=""> SYST:LOCK:REQ? (request successful)</from></pre>	returns +1			
State = locked, Count = 2				
<pre><from usb=""> SYST:LOCK:REL</from></pre>				
State = locked, Count = 1				
<pre><from usb=""> SYST:LOCK:REL</from></pre>				

State = unlocked, Count = 0

Note that for each successful lock request, a lock release is required. Two requests require two releases. See Also

SYSTem:LOCK:NAME? SYSTem:LOCK:OWNer?

SYSTem:LOCK:RELease

SYSTem:PRESet

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

Syntax

SYSTem:PRESet

Description

This command presets the instrument to a known configuration.

Remarks

- See Instrument Preset State for a complete listing of the instrument's preset state.
- This command is equivalent to selecting PRESET from the frontpanel Sto/Rcl Menu.

Example

The following command returns the instrument to its preset state.

SYST: PRES

See Also

SYSTem Subsystem Introduction

*RST

SYSTem:CPON

SYSTem:SECurity:IMMediate

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

This functionality is available on the 34972A only.

Syntax

SYSTem:SECurity:IMMediate

Description

This command clears and sanitizes all instrument memory except for the instrument's firmware, MAC address, calibration parameters, and serial number. It then reboots the instrument to the new memory state. This command is typically used to clear all memory before removing the instrument from a secure area.

NOTE

This command is not recommended for use in routine applications because of the possibility of unintended loss of data.

Remarks

- This command initializes all instrument settings to their Factory Reset (*RST command) values.
- All I/O settings, such as the IP address, are returned to their factory settings.
- This command will not clear an attached USB storage device.
- The command clears and sanitizes all user files on the internal file system.

Example

The following command clears all instrument memory other than the instrument's firmware, MAC address, calibration parameters, and serial number.

SYST:SEC:IMM

See Also

SYSTem Subsystem Introduction

*RST

SYSTem:TIME

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

Syntax

SYSTem:TIME <hh>,<mm>,<ss.sss>

SYSTem:TIME?

Description

During a scan, the instrument stores all readings and alarms with the current time and date. This command sets the instrument clock (based on a 24-hour clock).

Parameters

Name	Туре	Range of Values	Default Value
<hh>></hh>	Numeric	The hour in 24- hour clock format, from 0 to 23	This is a required parameter.
<i><mm></mm></i>	Numeric	The minutes, from 0 to 59	This is a required parameter.
< <u>s</u> s.sss>	Numeric	The seconds, with 1 ms resolution, from 00.000 to 59.999	This is a required parameter.

Remarks

- When shipped from the factory, the instrument is set to the current time and date for Greenwich Mean Time (GMT).
- The clock setting is stored in non-volatile memory, and does not change when power has been off, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

The query returns three comma-separated values in the form "hh,mm,sss.ss".

Examples

The following command sets the clock to 3:30:23.000 PM.

SYST:TIME 15,30,23.000

The following query returns the current time.

SYST:TIME?

Typical Response: 15,30,23.000

See Also

SYSTem Subsystem Introduction

SYSTem:DATE

SYSTem:TIME

SYSTem:TIME:SCAN?

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

Syntax

SYSTem:TIME:SCAN?

Description

This query returns the time at the start of the scan.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34907A Multifunction Module (digital input and totalizer channels only)
- 34908A 40 Channel Single-Ended Multiplexer Module

Remarks

- You can read the time at any time, even during a scan.
- This command is not affected by the FORMat:READing:TIME:TYPE command, which selects the time format for storing scanned data in memory (absolute time versus relative time).
- This command is not affected by the CALCulate:AVERage:CLEar command, which clears all values from the statistics registers.
- The instrument clears all stored data on all channels when a new scan is started, after a Factory Reset (*RST command), or after an Instrument Preset (SYSTem:PRESet command).

Return Format

The query returns a string indicating the time and date at the start of the most recent scan.

The string returned has the form yyyy,mm,dd,hh,mm,ss.sss:

yyyy is the year
mm is the month
dd is the day of the month
hh is the hour in 24-hour format
mm is the minutes
ss.sss is the seconds (with 1 ms resolution)

For example:

2004, 11, 21, 10, 07, 11.364 November 21, 2004 10:07:11.364 AM

Example

The following query returns the time and date at the start of the most recent scan.

SYST:TIME:SCAN?

Typical Response: 2009,07,26,22,03,10.314

See Also

SYSTem Subsystem Introduction

SYSTem:DATE

SYSTem:TIME

SYSTem:VERSion?

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

Syntax

SYSTem:VERSion?

Description

This query returns the version of the SCPI (Standard Commands for Programmable Instruments) standard with which the instrument is in compliance. The instrument complies with the rules and conventions of the indicated version of the SCPI standard.

NOTE

You cannot query the SCPI version from the front panel.

Return Format

The instrument returns the version in the form YYYY.V, where YYYY is the year and V is the version number.

Example

The following query returns the version number of the software.

SYST:VERS?

Typical Response: 1994.0

See Also

SYSTem Subsystem Introduction

TRIGger Subsystem Introduction

Command Summary

TRIGger:COUNt

TRIGger:COUNt?

TRIGger:SOURce

TRIGger:SOURce?

TRIGger:TIMer

TRIGger:TIMer?

TRIGger:COUNt

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

Syntax

TRIGger:COUNt {<count>|MIN|MAX|INFinity}

TRIGger:COUNt?

Description

This command specifies the number of times to sweep through the scan list. A *sweep* is one pass through the scan list. The scan stops when the number of specified sweeps has occurred.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34907A Multifunction Module (digital input and totalizer channels only)
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<count></count>	Numeric	An integer from 1 to 50,000 triggers, or continuous (INFinity). MIN = 1 MAX = 50,000	This is a required parameter.

Remarks

- After setting the trigger count, you must place the internal DMM in the "wait-for-trigger" state using the INITiate or READ? command. A trigger will not be accepted from the selected trigger source (see TRIGger:SOURce command) until the internal DMM is in the "wait-for-trigger" state.
- a. For the BUS source, the trigger count sets the number of *TRG commands that will be accepted before returning to the "idle" trigger state.
- b. For the EXTernal source, the trigger count sets the number of external pulses that will be accepted before returning to the "idle" trigger state.
- c. For the ALARmx source, the trigger count sets the number of alarms that will be accepted before returning to the "idle" trigger state.
- d. For the TIMer source, the trigger count sets the number of times the instrument will sweep through the scan list and therefore determines the overall duration of the scan.
 - You can store at least 50,000 readings in memory and all readings are automatically time stamped. If memory overflows, the new readings will overwrite the first (oldest) readings stored; the most recent readings are always preserved.
 - To set the trigger-to-trigger interval (in seconds) for measurements on the channels in the present scan list, use the TRIGger:TIMer command.
 - The CONFigure and MEASure? commands automatically set the trigger count to 1.
 - The instrument sets the trigger count to 1 after a Factory Reset

(*RST command). An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does not change the setting.

Return Format

The query returns the scan count in the form "+1.0000000E+01". For a continuous trigger (INFinity), the count is returned as "9.90000200E+37".

Examples

The following program segment configures two channels for DC voltage measurements, puts the channels in the scan list (the scan list is redefined), and sets the trigger count to 10. For each trigger received, one reading is returned for each channel (20 readings total).

```
CONF:VOLT:DC 10,0.003,(@103,108)
ROUT:SCAN (@103,108)
TRIG:COUN 10
INIT
```

The following program segment configures the current scan list for an AC voltage measurement and sets the trigger count to 5. For each trigger received, one reading is returned (5 readings total).

```
CONF:VOLT:AC 10,0.001,(@205,206,208)
TRIG:COUN 5
INIT
```

The following query returns the current trigger count.

TRIG:COUN?

Typical Response: +5.0000000E+00

See Also

TRIGger Subsystem Introduction ROUTe:CHANnel:ADVance:SOURce ROUTe:SCAN TRIGger:SOURce TRIGger:TIMer

TRIGger:SOURce

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

Syntax

TRIGger:SOURce <source>

TRIGger:SOURce?

Description

Select the trigger source to control the onset of each sweep through the scan list (a *sweep* is one pass through the scan list). The instrument will accept a software (bus) command, an immediate (continuous) scan trigger, an external TTL trigger pulse, an alarm-initiated action, or an internally paced timer.

Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34907A Multifunction Module (digital input and totalizer channels only)
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<source/>	Discrete	{BUS IMMediate EXTernal ALARm1 ALARm2 ALARm3 ALARm4 TIMer} IMMediate = Continuous scan trigger BUS = Software trigger BUS = Software trigger EXTernal = An external TTL pulse trigger ALARm = Trigger on an alarm TIMer = Internally paced timer trigger	This is a required parameter. The factory default is IMMediate.

Remarks

- For the *IMMediate* (continuous) source, the trigger signal is always present. When you place the instrument in the "wait-for-trigger" state, the trigger is issued immediately.
- The READ? and MEASure commands and queries cannot be used to take readings when the trigger source is BUS. This is called a trigger deadlock condition.
- For the BUS (software) source, the instrument is triggered by the *TRG command received over the remote interface. The *TRG command will not be accepted unless the instrument is in the "wait-for-trigger" state (see INITiate command). If the instrument receives an external trigger before the next "waiting for trigger" state, it will buffer one *TRG command and then ignore any additional triggers received (no error is generated).
- For the *EXTernal* source, the instrument will accept a hardware trigger applied to the rear-panel *Ext Trig Input* line (Pin 6). The instrument takes one sweep through the scan list each time a low-true TTL pulse is received. If the instrument receives an external trigger but is not in the "wait-for-trigger" state, it will buffer one trigger and then ignore any additional triggers received (no error is generated). Also, if the trigger source is BUS, you can use the scan button as a trigger.
- For the ALARmx source, the instrument is triggered each time a reading crosses an alarm limit on a channel. See the OUTPut:ALARm<n>:SOURce command for more information. With this source, you can use the Monitor mode (see ROUTe:MONitor:STATe command) to continuously take readings on a selected channel and wait for an alarm on that channel. Digital input and totalizer channels do *not* have to be part of the active scan list to be monitored.

- For the *TIMer* source, you control the trigger-to-trigger interval (in seconds) for measurements on the channels in the present scan list. Use the TRIGger:TIMer command to set the wait period.
- After selecting the trigger source, you must place the instrument in the "wait-for-trigger" state using the INITiate or READ? command. A trigger will not be accepted from the selected trigger source until the instrument is in the "wait-for-trigger" state.
- Although the TRIGger:SOURce command shares some of the same signals as the ROUTe:CHANnel:ADVance:SOURce command (used for external scanning), they cannot be set to the same source (except IMMediate). If you attempt to select the same source, an error is generated and the TRIGger:SOURce is reset to IMMediate.
- The CONFigure and MEASure? commands automatically set the trigger source to IMMediate.
- The instrument selects the immediate trigger source after a Factory Reset (*RST command). An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does *not* change the setting.

Return Format

The query returns the trigger source as "BUS", "IMM", "EXT", "ALAR1", "ALAR2", "ALAR3", "ALAR4", or "TIM".

Examples

The following program segment selects the external trigger source. In this configuration, the instrument sweeps through the scan list once each time a low-true TTL pulse is received on the rear-panel *Ext Trig Input* line (Pin 6).

TRIG:SOUR EXT INIT

The following program segment selects the bus (software) trigger source. Note that the ***TRG** command will not be accepted unless the internal DMM is in the "wait-for-trigger" state.

TRIG:SOUR BUS INIT *TRG

The following program segment selects the alarm source and configures the instrument to scan when an alarm is reported on Alarm 1. The Monitor mode is used to evaluate alarm conditions on the selected channel.

The following program segment selects the timer source and sets the scan interval to 30 milliseconds.

TRIG:SOUR TIMER	!Select trigger
source	
TRIG:TIM 30E-03	!Scan interval is 30
ms	
INIT	

The following query returns the trigger source currently selected.

TRIG:SOUR?

Typical Response: EXT

See Also

TRIGger Subsystem Introduction

*TRG

OUTPut:ALARm{1|2|3|4}:SOURce

ROUTe:CHANnel:ADVance:SOURce

ROUTe:MONitor:STATe

TRIGger:TIMer

TRIGger:TIMer

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

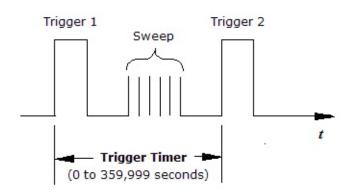
Syntax

TRIGger:TIMer {<seconds>|MIN|MAX}

TRIGger:TIMer? [{MIN|MAX}]

Description

This command sets the trigger-to-trigger interval (in seconds) for measurements on the channels in the present scan list. This command defines the time from the start of one trigger to the start of the next trigger, up to the specified trigger count (see TRIGger:COUNt command).



Used With:

- 34901A 20 Channel Multiplexer (2/4-wire) Module
- 34902A 16 Channel Multiplexer (2/4-wire) Module
- 34907A Multifunction Module (digital input and totalizer channels only)
- 34908A 40 Channel Single-Ended Multiplexer Module

Parameters

Name	Туре	Range of Values	Default Value
<seconds></seconds>	Numeric	A number from 0 seconds to 359,999 with 1 ms resolution. MIN = 0 seconds, MAX = 359,999 seconds Note that 359,999 is one second less than 100 hours.	This is a required parameter.

Remarks

- The scan interval applies to the TIMer trigger source as set by the TRIGger:SOURce command.
- If you are using the multiplexer modules, an error is generated if the internal DMM is disabled (see INSTrument:DMM command) or not installed in the mainframe. The internal DMM is *not* required for operations on the digital modules.
- If the scan interval is less than the time required to measure all channels in the scan list, the instrument will scan continuously, as fast as possible (no error is generated).
- The CONFigure and MEASure? commands automatically set the trigger interval to 1 second and the trigger count to 1 sweep.
- The instrument sets the scan interval to immediate (0 seconds) after a Factory Reset (*RST command). An Instrument Preset (SYSTem:PRESet command) or Card Reset (SYSTem:CPON command) does not change the setting.

Return Format

The query returns the scan-to-scan interval in seconds in the form "+1.00000000E+01".

Examples

The following program segment sets the trigger interval to 30 milliseconds.

TRIG:SOUR TIMER TRIG:TIM 30E-03

The following query returns the trigger interval in seconds.

TRIG:TIM?

Typical Response: +3.0000000E-02

See Also

TRIGger Subsystem Introduction

TRIGger:COUNt

TRIGger:SOURce

Commands A-Z A-C|D-L|M-R|S|T-W **A** ABORt

С

CALCulate:AVERage:AVERage? CALCulate:AVERage:CLEar CALCulate:AVERage:COUNt? CALCulate:AVERage:MAXimum? CALCulate:AVERage:MAXimum:TIME? CALCulate:AVERage:MINimum? CALCulate:AVERage:MINimum:TIME? CALCulate:AVERage:PTPeak?

CALCulate:COMPare:DATA CALCulate:COMPare:DATA? CALCulate:COMPare:MASK CALCulate:COMPare:MASK? CALCulate:COMPare:STATe CALCulate:COMPare:STATe? CALCulate:COMPare:TYPE CALCulate:COMPare:TYPE?

CALCulate:LIMit:LOWer CALCulate:LIMit:LOWer? CALCulate:LIMit:LOWer:STATe CALCulate:LIMit:LOWer:STATe? CALCulate:LIMit:UPPer CALCulate:LIMit:UPPer? CALCulate:LIMit:UPPer:STATe CALCulate:LIMit:UPPer:STATe?

CALCulate:SCALe:GAIN CALCulate:SCALe:GAIN? CALCulate:SCALe:OFFSet CALCulate:SCALe:OFFSet? CALCulate:SCALe:OFFSet:NULL CALCulate:SCALe:STATe CALCulate:SCALe:STATe? CALCulate:SCALe:UNIT CALCulate:SCALe:UNIT?

C TOP

CALibration? CALibration:COUNt? CALibration:SECure:CODE CALibration:SECure:STATe CALibration:SECure:STATe? CALibration:STRing CALibration:STRing? CALibration:VALue CALibration:VALue?

*CLS

CONFigure? CONFigure:CURRent:AC CONFigure:CURRent:DC CONFigure:DIGital:BYTE CONFigure:FREQuency CONFigure:FRESistance CONFigure:PERiod CONFigure:RESistance CONFigure:TEMPerature CONFigure:TOTalize CONFigure:VOLTage:AC CONFigure:VOLTage:DC

🔿 ТОР

D

DATA:LAST? DATA:POINts? DATA:POINts:EVENt:THReshold DATA:POINts:EVENt:THReshold? DATA:REMove?

DIAGnostic:DMM:CYCLes? DIAGnostic:DMM:CYCLes:CLEar DIAGnostic:PEEK:SLOT:DATA? DIAGnostic:POKE:SLOT:DATA DIAGnostic:RELay:CYCLes? DIAGnostic:RELay:CYCLes:CLEar

DISPlay DISPlay? DISPlay:TEXT DISPlay:TEXT? DISPlay:TEXT:CLEar

E			
*ESE			
*ESE?			
*ESR?			

C TOP

FETCh?

FORMat:READing:ALARm FORMat:READing:ALARm? FORMat:READing:CHANnel FORMat:READing:CHANnel? FORMat:READing:TIME FORMat:READing:TIME? FORMat:READing:TIME:TYPE FORMat:READing:TIME:TYPE? FORMat:READing:UNIT

F

*IDN?

L.

INITiate

INPut:IMPedance:AUTO INPut:IMPedance:AUTO?

INSTrument:DMM INSTrument:DMM? INSTrument:DMM:INSTalled? L

LXI:IDENtify[:STATe] LXI:IDENtify[:STATe]? LXI:RESet LXI:RESTart

ОТОР

Μ

MEASure:CURRent:AC? MEASure:CURRent:DC? MEASure:DIGital:BYTE? MEASure:FREQuency? MEASure:FRESistance? MEASure:PERiod? MEASure:RESistance? MEASure:TEMPerature? MEASure:TOTalize? MEASure:VOLTage:AC? MEASure:VOLTage:DC?

MEMory:STATe:DELete MEMory:STATe:NAME MEMory:STATe:NAME? MEMory:STATe:RECall:AUTO MEMory:STATe:RECall:AUTO? MEMory:STATe:VALid?

MMEMory:EXPort? MMEMory:FORMat:READing:CSEParator MMEMory:FORMat:READing:CSEParator? MMEMory:FORMat:READing:RLIMit MMEMory:FORMat:READing:RLIMit? MMEMory:IMPort:CATalog? MMEMory:IMPort:CONFig? MMEMory:LOG[:ENABle] MMEMory:LOG[:ENABle]? Ο

*OPC *OPC?

OUTPut:ALARm:CLEar:ALL OUTPut:ALARm:MODE OUTPut:ALARm:MODE? OUTPut:ALARm:SLOPe OUTPut:ALARm:SLOPe? OUTPut:ALARm{1|2|3|4}:CLEar OUTPut:ALARm{1|2|3|4}:SOURce Ρ

*PSC

*PSC?

C TOP

R

R?

*RCL

READ?

ROUTe:CHANnel:ADVance:SOURce ROUTe:CHANnel:ADVance:SOURce? ROUTe:CHANnel:DELay **ROUTe:CHANnel:DELay?** ROUTe:CHANnel:DELay:AUTO ROUTe:CHANnel:DELay:AUTO? **ROUTe:CHANnel:FWIRe ROUTe:CHANnel:FWIRe? ROUTe:CLOSe ROUTe:CLOSe?** ROUTe:CLOSe:EXCLusive **ROUTe:DONE? ROUTe: MONitor ROUTe: MONitor? ROUTe: MONitor: DATA?** ROUTe:MONitor:STATe **ROUTe: MONitor: STATe? ROUTe:OPEN**

ROUTe:OPEN? ROUTe:SCAN ROUTe:SCAN? ROUTe:SCAN:SIZE?

*RST

C TOP

*SAV

S

[SENSe:]CURRent:AC:BANDwidth [SENSe:]CURRent:AC:BANDwidth? [SENSe:]CURRent:AC:RANGe [SENSe:]CURRent:AC:RANGe? [SENSe:]CURRent:AC:RANGe:AUTO [SENSe:]CURRent:AC:RANGe:AUTO? [SENSe:]CURRent:AC:RESolution [SENSe:]CURRent:AC:RESolution [SENSe:]CURRent:DC:APERture [SENSe:]CURRent:DC:APERture? [SENSe:]CURRent:DC:NPLC [SENSe:]CURRent:DC:NPLC? [SENSe:]CURRent:DC:RANGe [SENSe:]CURRent:DC:RANGe? [SENSe:]CURRent:DC:RANGe:AUTO [SENSe:]CURRent:DC:RANGe:AUTO? [SENSe:]CURRent:DC:RESolution [SENSe:]CURRent:DC:RESolution?

[SENSe:]DIGital:DATA:{BYTE|WORD}?

[SENSe:]FREQuency:APERture

[SENSe:]FREQuency:APERture? [SENSe:]FREQuency:RANGe:LOWer [SENSe:]FREQuency:RANGe:LOWer? [SENSe:]FREQuency:VOLTage:RANGe [SENSe:]FREQuency:VOLTage:RANGe:AUTO [SENSe:]FREQuency:VOLTage:RANGe:AUTO?

[SENSe:]FRESistance:APERture [SENSe:]FRESistance:NPLC [SENSe:]FRESistance:NPLC? [SENSe:]FRESistance:OCOMpensated [SENSe:]FRESistance:OCOMpensated? [SENSe:]FRESistance:RANGe [SENSe:]FRESistance:RANGe? [SENSe:]FRESistance:RANGe:AUTO [SENSe:]FRESistance:RANGe:AUTO? [SENSe:]FRESistance:RESolution

C TOP

[SENSe:]FUNCtion [SENSe:]FUNCtion? [SENSe:]PERiod:APERture [SENSe:]PERiod:APERture? [SENSe:]PERiod:VOLTage:RANGe [SENSe:]PERiod:VOLTage:RANGe? [SENSe:]PERiod:VOLTage:RANGe:AUTO [SENSe:]PERiod:VOLTage:RANGe:AUTO?

[SENSe:]RESistance:APERture [SENSe:]RESistance:APERture? [SENSe:]RESistance:NPLC [SENSe:]RESistance:NPLC? [SENSe:]RESistance:OCOMpensated [SENSe:]RESistance:OCOMpensated? [SENSe:]RESistance:RANGe [SENSe:]RESistance:RANGe? [SENSe:]RESistance:RANGe:AUTO [SENSe:]RESistance:RANGe:AUTO? [SENSe:]RESistance:RESolution

[SENSe:]TEMPerature:APERture [SENSe:]TEMPerature:APERture? [SENSe:]TEMPerature:NPLC [SENSe:]TEMPerature:NPLC? [SENSe:]TEMPerature:RJUNction? [SENSe:]TEMPerature:TRANsducer:FRTD:OCOMpensated [SENSe:]TEMPerature:TRANsducer:FRTD:OCOMpensated? [SENSe:]TEMPerature:TRANsducer:FRTD:RESistance[:REFerence] [SENSe:]TEMPerature:TRANsducer:FRTD:RESistance[:REFerence]? [SENSe:]TEMPerature:TRANsducer:FRTD:TYPE [SENSe:]TEMPerature:TRANsducer:FRTD:TYPE? [SENSe:]TEMPerature:TRANsducer:RTD:OCOMpensated [SENSe:]TEMPerature:TRANsducer:RTD:OCOMpensated? [SENSe:]TEMPerature:TRANsducer:RTD:RESistance[:REFerence] [SENSe:]TEMPerature:TRANsducer:RTD:RESistance[:REFerence]? [SENSe:]TEMPerature:TRANsducer:RTD:TYPE [SENSe:]TEMPerature:TRANsducer:RTD:TYPE? [SENSe:]TEMPerature:TRANsducer:TCouple:CHECk [SENSe:]TEMPerature:TRANsducer:TCouple:CHECk? [SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction [SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction? [SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction:TYPE [SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction:TYPE? [SENSe:]TEMPerature:TRANsducer:TCouple:TYPE [SENSe:]TEMPerature:TRANsducer:TCouple:TYPE? [SENSe:]TEMPerature:TRANsducer:THERmistor:TYPE [SENSe:]TEMPerature:TRANsducer:THERmistor:TYPE? [SENSe:]TEMPerature:TRANsducer:TYPE [SENSe:]TEMPerature:TRANsducer:TYPE?

[SENSe:]TOTalize:CLEar:IMMediate [SENSe:]TOTalize:DATA? [SENSe:]TOTalize:SLOPe [SENSe:]TOTalize:SLOPe? [SENSe:]TOTalize:STARt[:IMMediate] [SENSe:]TOTalize:STOP[:IMMediate] [SENSe:]TOTalize:TYPE [SENSe:]TOTalize:TYPE?

[SENSe:]VOLTage:AC:RANGe [SENSe:]VOLTage:AC:RANGe? [SENSe:]VOLTage:AC:RANGe:AUTO [SENSe:]VOLTage:AC:RANGe:AUTO? [SENSe:]VOLTage:AC:BANDwidth [SENSe:]VOLTage:AC:BANDwidth? [SENSe:]VOLTage:DC:APERture [SENSe:]VOLTage:DC:APERture? [SENSe:]VOLTage:DC:NPLC [SENSe:]VOLTage:DC:NPLC? [SENSe:]VOLTage:DC:RANGe [SENSe:]VOLTage:DC:RANGe? [SENSe:]VOLTage:DC:RANGe:AUTO [SENSe:]VOLTage:DC:RANGe:AUTO? [SENSe:]VOLTage:DC:RESolution [SENSe:]VOLTage:DC:RESolution?

[SENSe:]ZERO:AUTO [SENSe:]ZERO:AUTO?

SOURce:DIGital:DATA[:{BYTE|WORD}] SOURce:DIGital:DATA[:{BYTE|WORD}]? SOURce:DIGital:STATe? SOURce:VOLTage SOURce:VOLTage?

*SRE

*SRE?

C TOP

STATus:ALARm:CONDition? STATus:ALARm:ENABle STATus:ALARm:ENABle? STATus:ALARm[:EVENt]? STATus:OPERation:CONDition? STATus:OPERation:ENABle STATus:OPERation:ENABle? STATus:OPERation[:EVENt]? STATus:PRESet STATus:QUEStionable:CONDition? STATus:QUEStionable:ENABle STATus:QUEStionable:ENABle? STATus:QUEStionable[:EVENt]?

*STB?

SYSTem:ALARm?

SYSTem:COMMunicate:LAN:CONTrol? SYSTem:COMMunicate:LAN:DHCP SYSTem:COMMunicate:LAN:DHCP? SYSTem:COMMunicate:LAN:DNS SYSTem:COMMunicate:LAN:DNS? SYSTem:COMMunicate:LAN:DOMain? SYSTem:COMMunicate:LAN:GATEway SYSTem:COMMunicate:LAN:GATEway? SYSTem:COMMunicate:LAN:HOSTname SYSTem:COMMunicate:LAN:HOSTname? SYSTem:COMMunicate:LAN:IPADdress SYSTem:COMMunicate:LAN:IPADdress? SYSTem:COMMunicate:LAN:MAC? SYSTem:COMMunicate:LAN:SMASk SYSTem:COMMunicate:LAN:SMASk? SYSTem:COMMunicate:LAN:TELNet:PROMpt SYSTem:COMMunicate:LAN:TELNet:PROMpt? SYSTem:COMMunicate:LAN:TELNet:WMESsage SYSTem:COMMunicate:LAN:TELNet:WMESsage? SYSTem:COMMunicate:LAN:UPDate

C TOP

SYSTem:CPON

SYSTem:CTYPe?

SYSTem:DATE

SYSTem:DATE?

SYSTem:ERRor?

SYSTem:INTerface

SYSTem:INTerface?

SYSTem:LANGuage

SYSTem:LANGuage?

SYSTem:LFRequency?

SYSTem:LOCal

SYSTem:LOCK:NAME?

SYSTem:LOCK:OWNer?

SYSTem:LOCK:RELease

SYSTem:LOCK:REQuest?

SYSTem:PRESet

SYSTem:REMote

SYSTem:RWLock

SYSTem:SECurity[:IMMediate]

SYSTem:TIME

SYSTem:TIME? SYSTem:TIME:SCAN? SYSTem:VERSion?

ОТОР

Т

*TRG

TRIGger:COUNt

TRIGger:COUNt?

TRIGger:SOURce

TRIGger:SOURce?

TRIGger:TIMer

TRIGger:TIMer?

*TST?

UNIT:TEMPerature UNIT:TEMPerature?

U

W

*WAI

C TOP

Keysight 34970A/34972A Command Quick Reference

Printable PDF Version

Syntax Conventions

- Braces (**{ }**) enclose the parameter choices for a given command string. The braces are not sent with the command string.
- A vertical bar () separates multiple parameter choices for a given command string. The bar is not sent with the command string.
- Angle brackets (< >) indicate that you must specify a value for the enclosed parameter. For example, the above syntax statement shows the <*range*> parameter enclosed in triangle brackets. The brackets are not sent with the command string. You must specify a value for the parameter (e.g., "VOLT:DC:RANG 10").
- Some parameters are enclosed in square brackets ([]). The square brackets indicate that the parameter is optional and can be omitted. The brackets are not sent with the command string. If you do not specify a value for an optional parameter, the instrument chooses a default value.

CALCulate Subsystem

CALCulate:AVERage:AVERage? [(@<ch_list>)] CALCulate:AVERage:CLEar [(@<ch_list>)] CALCulate:AVERage:COUNt? [(@<ch_list>)] CALCulate:AVERage:MAXimum? [(@<ch_list>)] CALCulate:AVERage:MAXimum:TIME? [(@<ch_list>)] CALCulate:AVERage:MINimum? [(@<ch_list>)] CALCulate:AVERage:MINimum:TIME? [(@<ch_list>)] CALCulate:AVERage:PTPeak? [(@<ch_list>)]

CALCulate:COMPare:DATA <data>[,(@<ch_list>)] CALCulate:COMPare:DATA? [(@<ch_list>)] CALCulate:COMPare:MASK <mask>[,(@<ch_list>)] CALCulate:COMPare:MASK? [(@<ch_list>)] CALCulate:COMPare:STATe <state>[,(@<ch_list>)] CALCulate:COMPare:STATe? [(@<ch_list>)] CALCulate:COMPare:TYPE <mode>[,(@<ch_list>)] CALCulate:COMPare:TYPE? [(@<ch_list>)] CALCulate:LIMit:LOWer <lo_limit>[,(@<ch_list>)] CALCulate:LIMit:LOWer? [(@<ch_list>)] CALCulate:LIMit:LOWer:STATe <mode>,(@<ch_list>) CALCulate:LIMit:LOWer:STATe? (@<ch_list>) CALCulate:LIMit:UPPer <hi_limit>[,(@<ch_list>)] CALCulate:LIMit:UPPer? [(@<ch_list>)] CALCulate:LIMit:UPPer:STATe <mode>,(@<ch_list>) CALCulate:LIMit:UPPer:STATe? (@<ch_list>)

CALCulate:SCALe:GAIN <*gain*>[,(@<*ch_list*>)] CALCulate:SCALe:GAIN? [(@<*ch_list*>)] CALCulate:SCALe:OFFSet <*offset*>[,(@<*ch_list*>)] CALCulate:SCALe:OFFSet? [(@<*ch_list*>)] CALCulate:SCALe:OFFSet:NULL [(@<*ch_list*>)] CALCulate:SCALe:STATe <*state*>[,(@<*ch_list*>)] CALCulate:SCALe:STATe? [(@<*ch_list*>)] CALCulate:SCALe:UNIT <*quoted_string*>[,(@<*ch_list*>)] CALCulate:SCALe:UNIT? [(@<*ch_list*>)]

CALibration Subsystem

CALibration? CALibration:COUNt? CALibration:SECure:CODE <*new_code*> CALibration:SECure:STATe <*state*>,<*code*> CALibration:SECure:STATe? CALibration:STRing <*quoted_string*> CALibration:STRing? CALibration:VALue <*value*> CALibration:VALue?

CONFigure Subsystem

- CONFigure? [(@<ch_list>)]
- CONFigure:CURRent:AC [{<*range*>|AUTO|MIN|MAX|DEF}], {<*resolution*>|MIN|MAX|DEF}],] (@<*scan_list*>)
- CONFigure:CURRent:DC [{<*range*>|AUTO|MIN|MAX|DEF}], {<*resolution*>|MIN|MAX|DEF}],] (@<*scan_list*>)
- CONFigure:DIGital:BYTE (@<scan_list>)
- CONFigure:FREQuency [{<*range*>|AUTO|MIN|MAX|DEF}], {<*resolution*>|MIN|MAX|DEF}],] (@<*scan_list*>)
- CONFigure:FRESistance [{<*range*>|AUTO|MIN|MAX|DEF}], {<*resolution*>|MIN|MAX|DEF}],] (@<*scan_list*>)
- CONFigure:PERiod [{<*range*>|AUTO|MIN|MAX|DEF}], {<*resolution*>|MIN|MAX|DEF}],] (@<*scan_list*>)
- CONFigure:RESistance [{<*range*>|AUTO|MIN|MAX|DEF}], {<*resolution*>|MIN|MAX|DEF}],] (@<*scan_list*>)
- CONFigure:TEMPerature {<probe_type>|DEF},{<type>|DEF}[,1[, {<resolution>|MIN|MAX|DEF}]],(@<scan_list>)
- CONFigure:TOTalize <mode>,(@<scan_list>)
- CONFigure:VOLTage:AC [{<*range*>|AUTO|MIN|MAX|DEF}], {<*resolution*>|MIN|MAX|DEF}],] (@<*scan_list*>)
- CONFigure:VOLTage:DC [{<*range*>|AUTO|MIN|MAX|DEF}], {<*resolution*>|MIN|MAX|DEF}],] (@<*scan_list*>)

DATA Subsystem

- DATA:LAST? [<num_rdgs>,](@<channel>)
- DATA:POINts?
- DATA:POINts:EVENt:THReshold <num_rdgs>
- DATA:POINts:EVENt:THReshold?

DATA:REMove? <num_rdgs>

DIAGnostic Subsystem

DIAGnostic:DMM:CYCLes? DIAGnostic:DMM:CYCLes:CLEar {1|2|3} DIAGnostic:PEEK:SLOT:DATA? {100|200|300} DIAGnostic:POKE:SLOT:DATA? {100|200|300}, <quoted_string> DIAGnostic:RELay:CYCLes? (@<ch_list>) DIAGnostic:RELay:CYCLes:CLEar (@<ch_list>)

DISPlay Subsystem

- DISPlay <state>
- **DISPlay?**
- DISPlay:TEXT <quoted_string>
- DISPlay:TEXT?
- DISPlay:TEXT:CLEar
- **FORMat Subsystem**

FORMat:READing:ALARm <*state*> FORMat:READing:ALARm? FORMat:READing:CHANnel <*mode*> FORMat:READing:CHANnel? FORMat:READing:TIME <*mode*> FORMat:READing:TIME? FORMat:READing:TIME:TYPE <*format*> FORMat:READing:TIME:TYPE? FORMat:READing:UNIT <*format*> FORMat:READing:UNIT?

IEEE-488 Subsystem

*CLS

*ESE <enable_val>

*ESE?

*ESR?

*IDN?

*OPC

*OPC?

*PSC <state>

*PSC?

*RCL {0|1|2|3|4|5}

*RST

*SAV {0|1|2|3|4|5}

*SRE <enable_val>

*SRE?

*STB?

*TRG

*TST?

*WAI

INSTrument Subsystem

INSTrument:DMM <*state*> INSTrument:DMM? INSTrument:DMM:INSTalled? LXI Subsystem

LXI:IDENtify[:STATe] <*state*> LXI:IDENtify[:STATe]? LXI:RESet LXI:RESTart

MEASure Subsystem

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

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

MEASure:DIGital:BYTE? (@<scan_list>)

MEASure:FREQuency? [{<*range*>|AUTO|MIN|MAX|DEF}], {<*resolution*>|MIN|MAX|DEF}],] (@<*scan_list*>)

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

MEASure:PERiod? [{<*range*>|AUTO|MIN|MAX|DEF}[, {<*resolution*>|MIN|MAX|DEF}],] (@<*scan_list*>)

MEASure:RESistance? [{<*range*>|AUTO|MIN|MAX|DEF}], {<*resolution*>|MIN|MAX|DEF}],] (@<*scan_list*>)

MEASure:TEMPerature? {<probe_type>|DEF},{<type>|DEF}[,1[, {<resolution>|MIN|MAX|DEF}]],(@<scan_list>)

MEASure:TOTalize? <mode>,(@<scan_list>)

MEASure:VOLTage:AC? [{<*range*>|AUTO|MIN|MAX|DEF}], {<*resolution*>|MIN|MAX|DEF}],] (@<*scan_list*>)

MEASure:VOLTage:DC? [{<*range*>|AUTO|MIN|MAX|DEF}[, {<*resolution*>|MIN|MAX|DEF}],] (@<*scan_list*>)

MEMory Subsystem

MEMory:NSTates?

MEMory:STATe:DELete <location>

MEMory:STATe:NAME <location>[,<name>]

MEMory:STATe:NAME? </ocation>

MEMory:STATe:RECall:AUTO < mode>

MEMory:STATe:RECall:AUTO? MEMory:STATe:VALid? </ocation>

MMEMory Subsystem

MMEMory:EXPort? MMEMory:FORMat:READing:CSEParator <*column_separator*> MMEMory:FORMat:READing:CSEParator? MMEMory:FORMat:READing:RLIMit <*row_limit*> MMEMory:FORMat:READing:RLIMit? MMEMory:IMPort:CATalog? MMEMory:IMPort:CONFig? "<*configuration_file*>" MMEMory:LOG[:ENABle] <*state*> MMEMory:LOG[:ENABle]?

Other Commands

ABORt

FETCh?

INITiate

INPut:IMPedance:AUTO <state>[,(@<ch_list>)]

INPut:IMPedance:AUTO? [(@<ch_list>)]

R? [<max_count>

READ? [(@<scan_list>]

UNIT:TEMPerature <units>[,(@<ch_list>)]

UNIT:TEMPerature? [(@<ch_list>)]

OUTPut Subsystem

OUTPut:ALARm:CLEar:ALL

OUTPut:ALARm:MODE < mode>

OUTPut:ALARm:MODE? OUTPut:ALARm:SLOPe <*edge*> OUTPut:ALARm:SLOPe? OUTPut:ALARm{1|2|3|4}:CLEar OUTPut:ALARm{1|2|3|4}:SOURce (@*<ch_list*>) OUTPut:ALARm{1|2|3|4}:SOURce?

ROUTe Subsystem

ROUTe:CHANnel:ADVance:SOURce < source > ROUTe:CHANnel:ADVance:SOURce? ROUTe:CHANnel:DELay <seconds>,(@<ch list>) ROUTe:CHANnel:DELay? (@<ch_list>) ROUTe:CHANnel:DELay:AUTO <state>[,(@<ch_list>)] ROUTe:CHANnel:DELay:AUTO? [(@<ch_list>)] ROUTe:CHANnel:FWIRe <state>[,(@<ch_list>)] ROUTe:CHANnel:FWIRe? [(@<ch_list>)] ROUTe:CLOSe (@<ch list>) ROUTe:CLOSe? (@<ch list>) ROUTe:CLOSe:EXCLusive (@<ch_list>) **ROUTe:DONE?** ROUTe:MONitor (@<channel>) **ROUTe: MONitor? ROUTe: MONitor: DATA?** ROUTe:MONitor:STATe < mode> **ROUTe: MONitor: STATe?** ROUTe:OPEN (@<ch list>)

ROUTe:OPEN? (@<ch_list>) ROUTe:SCAN (@<scan_list>) ROUTe:SCAN? ROUTe:SCAN:SIZE? SENSe Subsystem

[SENSe:]CURRent:AC:BANDwidth {<*filter*>|MIN|MAX}[,(@<*ch_list*>)] [SENSe:]CURRent:AC:BANDwidth? [{(@<ch_list>)|MIN|MAX}] [SENSe:]CURRent:AC:RANGe {<range>|MIN|MAX}[,(@<ch_list>)] [SENSe:]CURRent:AC:RANGe? [{(@<ch_list>)|MIN|MAX}] [SENSe:]CURRent:AC:RANGe:AUTO <*state*>[,(@<*ch_list*>)] [SENSe:]CURRent:AC:RANGe:AUTO? [(@<ch_list>)] [SENSe:]CURRent:AC:RESolution {<resolution>|MIN|MAX|DEF}[, (@<ch_list>)] [SENSe:]CURRent:AC:RESolution? {<*ch_list*>|MIN|MAX} [SENSe:]CURRent:DC:APERture {<time>|MIN|MAX}[,(@<ch_list>)] [SENSe:]CURRent:DC:APERture? [{(@<ch_list>)|MIN|MAX}] [SENSe:]CURRent:DC:NPLC {<*PLCs*>|MIN|MAX}[,(@<*ch_list*>)] [SENSe:]CURRent:DC:NPLC? [{(@<ch_list>)|MIN|MAX}] [SENSe:]CURRent:DC:RANGe {<range>|MIN|MAX}[,(@<ch_list>)] [SENSe:]CURRent:DC:RANGe? [{(@<ch_list>)|MIN|MAX}] [SENSe:]CURRent:DC:RANGe:AUTO <*state*>[,(@<*ch_list*>)] [SENSe:]CURRent:DC:RANGe:AUTO? [(@<ch_list>)] [SENSe:]CURRent:DC:RESolution{<resolution>|MIN|MAX}[, (@<ch_list>)] [SENSe:]CURRent:DC:RESolution? [{(@<ch_list>)|MIN|MAX}]

[SENSe:]DIGital:DATA:{BYTE|WORD}? [(@<ch_list>)]

[SENSe:]FREQuency:APERture {<seconds>|MIN|MAX}[,(@<ch_list>)]

[SENSe:]FREQuency:APERture? [{(@<ch_list>)|MIN|MAX}]

[SENSe:]FREQuency:RANGe:LOWer {<*filter*>|MIN|MAX}[, (@<*ch_list*>)]

[SENSe:]FREQuency:RANGe:LOWer? [{(@<ch_list>)|MIN|MAX}]

[SENSe:]FREQuency:VOLTage:RANGe {<*range*>|MIN|MAX}[, (@<*ch_list*>)]

[SENSe:]FREQuency:VOLTage:RANGe? [{(@<ch_list>)|MIN|MAX}]

[SENSe:]FREQuency:VOLTage:RANGe:AUTO <*state*>[,(@<*ch_list*>)]

[SENSe:]FREQuency:VOLTage:RANGe:AUTO? [(@<ch_list>)]

[SENSe:]FRESistance:APERture {<time>|MIN|MAX}[,(@<ch_list>)] [SENSe:]FRESistance:APERture? [{(@<ch_list>)|MIN|MAX}] [SENSe:]FRESistance:NPLC {<PLCs>|MIN|MAX}[,(@<ch_list>)] [SENSe:]FRESistance:OCOMpensated <state>[,(@<ch_list>)] [SENSe:]FRESistance:OCOMpensated? [(@<ch_list>)] [SENSe:]FRESistance:RANGe {<range>|MIN|MAX}[,(@<ch_list>)] [SENSe:]FRESistance:RANGe? [{(@<ch_list>)|MIN|MAX}] [SENSe:]FRESistance:RANGe? [{(@<ch_list>)|MIN|MAX}] [SENSe:]FRESistance:RANGe:AUTO <state>[,(@<ch_list>)] [SENSe:]FRESistance:RANGe:AUTO? [(@<ch_list>)] [SENSe:]FRESistance:RESolution {<resolution>|MIN|MAX}[, (@<ch_list>)] [SENSe:]FRESistance:RESolution? [{(@<ch_list>)|MIN|MAX}]

[SENSe:]FUNCtion "<function>"[,(@<ch_list>)] [SENSe:]FUNCtion? [(@<ch_list>)]

[SENSe:]PERiod:APERture {<seconds>|MIN|MAX}[,(@<ch_list>)] [SENSe:]PERiod:APERture? [{(@<ch_list>)|MIN|MAX}] [SENSe:]PERiod:VOLTage:RANGe {<range>|MIN|MAX}[,(@<ch_list>)] [SENSe:]PERiod:VOLTage:RANGe? [{(@<ch_list>)|MIN|MAX}] [SENSe:]PERiod:VOLTage:RANGe:AUTO <state>[,(@<ch_list>)] [SENSe:]PERiod:VOLTage:RANGe:AUTO? [(@<ch_list>)] [SENSe:]RESistance:APERture {<time>|MIN|MAX}[,(@<ch_list>)] [SENSe:]RESistance:APERture? [{(@<ch_list>)|MIN|MAX}] [SENSe:]RESistance:NPLC {<PLCs>|MIN|MAX}[,(@<ch_list>)] [SENSe:]RESistance:OCOMpensated <state>[,(@<ch_list>)] [SENSe:]RESistance:OCOMpensated? [(@<ch_list>)] [SENSe:]RESistance:RANGe {<range>|MIN|MAX}[,(@<ch_list>)] [SENSe:]RESistance:RANGe {<range>|MIN|MAX}[,(@<ch_list>)] [SENSe:]RESistance:RANGe? [{(@<ch_list>)|MIN|MAX}] [SENSe:]RESistance:RANGe:AUTO <state>[,(@<ch_list>)] [SENSe:]RESistance:RANGe:AUTO? [(@<ch_list>)] [SENSe:]RESistance:RESolution {<resolution>|MIN|MAX}[, (@<ch_list>)] [SENSe:]RESistance:RESolution? [{(@<ch_list>)|MIN|MAX}]

[SENSe:]TEMPerature:APERture {<*time*>|MIN|MAX|DEF}[, (@<*ch_list*>)]

[SENSe:]TEMPerature:APERture? {(@<ch_list>)|MIN|MAX}

[SENSe:]TEMPerature:NPLC {<*PLCs*>|MIN|MAX}[,(@<*ch_list*>)]

[SENSe:]TEMPerature:NPLC? [{(@<ch_list>)|MIN|MAX}]

[SENSe:]TEMPerature:RJUNction? [(@<ch_list>)]

[SENSe:]TEMPerature:TRANsducer:FRTD:OCOMpensated <*state*>[, (@<*ch_list*>)]

[SENSe:]TEMPerature:TRANsducer:FRTD:OCOMpensated? [(@<ch_list>)]

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

[SENSe:]TEMPerature:TRANsducer:FRTD:RESistance[:REFerence]? [(@<ch_list>)]

[SENSe:]TEMPerature:TRANsducer:FRTD:TYPE <*type*>[, (@<*ch_list*>)]

[SENSe:]TEMPerature:TRANsducer:FRTD:TYPE? [(@<ch_list>)]

[SENSe:]TEMPerature:TRANsducer:RTD:OCOMpensated <*state*>[, (@<*ch_list*>)]

[SENSe:]TEMPerature:TRANsducer:RTD:OCOMpensated? [(@<ch_list>)]

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

[SENSe:]TEMPerature:TRANsducer:RTD:RESistance[:REFerence]? [(@<ch_list>)]

[SENSe:]TEMPerature:TRANsducer:RTD:TYPE <*type*>[, (@<*ch_list*>)]

[SENSe:]TEMPerature:TRANsducer:RTD:TYPE? [(@<ch_list>)]

[SENSe:]TEMPerature:TRANsducer:TCouple:CHECk <*state*>[, (@<*ch_list*>)]

[SENSe:]TEMPerature:TRANsducer:TCouple:CHECk? [(@<ch_list>)]

[SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction {<temperature>|MIN|MAX}[,(@<ch_list>)]

[SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction? [(@<ch_list>)]

[SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction:TYPE <*type*>[,(@*<ch_list*>)]

[SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction:TYPE? [(@<ch_list>)]

[SENSe:]TEMPerature:TRANsducer:TCouple:TYPE <*type*>[, (@<*ch_list*>)]

[SENSe:]TEMPerature:TRANsducer:TCouple:TYPE? [(@<ch_list>)]

[SENSe:]TEMPerature:TRANsducer:THERmistor:TYPE <*type*>[, (@<*ch_list*>)]

[SENSe:]TEMPerature:TRANsducer:THERmistor:TYPE? [(@<ch_list>)]

[SENSe:]TEMPerature:TRANsducer:TYPE {TCouple|RTD|FRTD|THERmistor|DEF}[,(@<ch_list>)]

[SENSe:]TEMPerature:TRANsducer:TYPE? [(@<ch_list>)]

[SENSe:]TOTalize:CLEar:IMMediate [(@<ch_list>)] [SENSe:]TOTalize:DATA? [(@<ch_list>)] [SENSe:]TOTalize:SLOPe <edge>[,(@<ch_list>)] [SENSe:]TOTalize:SLOPe? [(@<ch_list>)] [SENSe:]TOTalize:STARt[:IMMediate] [(@<ch_list>)] [SENSe:]TOTalize:STOP[:IMMediate] [(@<ch_list>)] [SENSe:]TOTalize:TYPE <mode>[,(@<ch_list>)] [SENSe:]TOTalize:TYPE? [(@<ch_list>)]

[SENSe:]VOLTage:AC:RANGe {<*range*>|MIN|MAX}[,(@<*ch_list*>)] [SENSe:]VOLTage:AC:RANGe? [{(@<*ch_list*>)|MIN|MAX}] [SENSe:]VOLTage:AC:RANGe:AUTO <*state*>[,(@<*ch_list*>)] [SENSe:]VOLTage:AC:RANGe:AUTO? [(@<*ch_list*>)] [SENSe:]VOLTage:AC:BANDwidth {<*filter*>|MIN|MAX}[,(@<*ch_list*>)]

```
[SENSe:]VOLTage:AC:BANDwidth? [{(@<ch_list>)|MIN|MAX}]
[SENSe:]VOLTage:DC:APERture {<time>|MIN|MAX}[,(@<ch_list>)]
[SENSe:]VOLTage:DC:APERture? [{(@<ch_list>)|MIN|MAX}]
[SENSe:]VOLTage:DC:NPLC {<PLCs>|MIN|MAX}[,(@<ch_list>)]
[SENSe:]VOLTage:DC:NPLC? [{(@<ch_list>)|MIN|MAX}]
[SENSe:]VOLTage:DC:RANGe {<range>|MIN|MAX}[,(@<ch_list>)]
[SENSe:]VOLTage:DC:RANGe? [{(@<ch_list>)|MIN|MAX}]
[SENSe:]VOLTage:DC:RANGe:AUTO <state>[,(@<ch_list>)]
[SENSe:]VOLTage:DC:RANGe:AUTO? [(@<ch_list>)]
[SENSe:]VOLTage:DC:RANGe:AUTO? [(@<ch_list>)]
[SENSe:]VOLTage:DC:RESolution {<resolution>|MIN|MAX}[,
(@<ch_list>)]
[SENSe:]VOLTage:DC:RESolution? [{(@<ch_list>)|MIN|MAX}]
```

[SENSe:]ZERO:AUTO {OFF|ONCE|ON}[,(@<ch_list>)] [SENSe:]ZERO:AUTO? [(@<ch_list>)]

SOURce Subsystem

```
SOURce:DIGital:DATA[:{BYTE|WORD}] <data>,(@<ch_list>)
SOURce:DIGital:DATA[:{BYTE|WORD}]? (@<ch_list>)
SOURce:DIGital:STATe? (@<ch_list>)
SOURce:VOLTage <voltage>,(@<ch_list>)
SOURce:VOLTage? (@<ch_list>)
```

STATus Subsystem

STATus:ALARm:CONDition? STATus:ALARm:ENABle <enable_val> STATus:ALARm:ENABle? STATus:ALARm[:EVENt]? STATus:OPERation:CONDition? STATus:OPERation:ENABle <enable_val> STATus:OPERation[:EVENt]? STATus:PRESet STATus:QUEStionable:CONDition? STATus:QUEStionable:ENABle <enable_val>

SYSTEM Subsystem - LAN Configuration

SYSTem:COMMunicate:LAN:CONTrol?

SYSTem:COMMunicate:LAN:DHCP < mode>

SYSTem:COMMunicate:LAN:DHCP?

SYSTem:COMMunicate:LAN:DNS "<address>"

SYSTem:COMMunicate:LAN:DNS? [{CURRent|STATic}]

SYSTem:COMMunicate:LAN:DOMain? [{CURRent|STATic}]

SYSTem:COMMunicate:LAN:GATEway "<address>"

SYSTem:COMMunicate:LAN:GATEway? [{CURRent|STATic}]

SYSTem:COMMunicate:LAN:HOSTname "<name>"

SYSTem:COMMunicate:LAN:HOSTname? [{CURRent|STATic}]

SYSTem:COMMunicate:LAN:IPADdress "<address>"

SYSTem:COMMunicate:LAN:IPADdress? [{CURRent|STATic}]

SYSTem:COMMunicate:LAN:MAC?

SYSTem:COMMunicate:LAN:SMASk "<mask>"

SYSTem:COMMunicate:LAN:SMASk? [{CURRent|STATic}]

SYSTem:COMMunicate:LAN:TELNet:PROMpt "<string>"

SYSTem:COMMunicate:LAN:TELNet:PROMpt?

SYSTem:COMMunicate:LAN:TELNet:WMESsage "<string>"

SYSTem:COMMunicate:LAN:TELNet:WMESsage?

SYSTem:COMMunicate:LAN:UPDate

SYSTem Subsystem - Other Commands

SYSTem:ALARm?

SYSTem:CPON <slot>

SYSTem:CTYPe? <*slot*>

SYSTem:DATE <*yyyy*>,<*mm*>,<*dd*>

SYSTem:DATE?

SYSTem:ERRor?

SYSTem:INTerface {GPIB|RS232}

SYSTem:INTerface?

SYSTem:LANGuage < language >

SYSTem:LANGuage?

SYST:LFRequency?

SYSTem:LOCal

SYSTem:LOCK:NAME?

SYSTem:LOCK:OWNer?

SYSTem:LOCK:RELease

SYSTem:LOCK:REQuest?

SYSTem:PRESet

SYSTem:REMote

SYSTem:RWLock

SYSTem:SECurity[:IMMediate]

SYSTem:TIME <hh>,<mm>,<ss.sss>

SYSTem:TIME?

SYSTem:TIME:SCAN?

SYSTem:VERSion?

TRIGger Subsystem

TRIGger:COUNt {<count>|MIN|MAX|INFinity}

TRIGger:COUNt?

TRIGger:SOURce <source>

TRIGger:SOURce?

TRIGger:TIMer {<seconds>|MIN|MAX}

TRIGger:TIMer? [{MIN|MAX}]

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Error Messages

-350-99 IEEE and Parser Errors | 100-299 General Errors | 300-399 Module and Channel Errors | 400-449 Mass Storage Errors | 450-499 USB Logging Errors | 500-599 Serious Instrument Errors | 600-649 Selftest Errors | 700-799 Calibration Errors | 811 Operation Not Implemented | 900-999 Module Errors

- The instrument beeps once each time a command syntax or hardware error is generated. The front-panel ERROR annunciator turns on when one or more errors are currently stored in the error queue.
- Errors are retrieved in first-in-first-out (FIFO) order. The first error returned is the first error that was stored. Once you have read all of the interface-specific errors, the errors in the global error queue are retrieved.
- Errors are cleared as you read them. When you have read all errors from the interface-specific and global error queues, the ERROR annunciator turns off and the errors are cleared.
- If more than 20 errors have occurred, the last error stored in the queue (the most recent error) is replaced with -350,"Error queue overflow". No additional errors are stored until you remove errors from the queue. If no errors have occurred when you read the error queue, the instrument responds with +0,"No error".
- The front panel reports errors from all I/O sessions as well as the global error queue. To read the error queue from the front panel, use the View key.
- Error conditions are also summarized in the Status Byte Register. For more information on the Status System for the instrument, see Status System Introduction.
- The interface-specific and global error queues are cleared by the

*CLS (Clear Status) command and when power is cycled. The errors are also cleared when you read the error queue. The error queue is not cleared by a Factory Reset (*RST command) or an Instrument Preset (SYSTem:PRESet command).

• The query reads and clears one error string from the error queue. The error string may contain up to 160 characters and consists of an error number and an error string enclosed in double quotes. For example:

-113,"Undefined header"

-350-99 IEEE and Parser Errors

- -350 "Error queue overflow"
- -330 "Self test failed"
- -256 "File or folder name not found"
- -231 "Internal software error"
- -230 "Data stale"
- -224 "Data questionable"
- -224 "Illegal parameter value ranges must be positive"
- -222 "Data out of range"
- -221 "Settings conflict"
- -214 "Trigger deadlock"
- -213 "INIT ignored"
- -211 "Trigger ignored"
- -123 "Numeric overflow"
- -114 "Subopcode out of range"
- -110 "Internal communications timeout"
- -56 "System error"

C TOP

100-299 General Errors

100	"Network Error"
111	"Channel list: slot number out of range"
112	"Channel list: channel number out of range"
113	"Channel list: empty scan list"
201	"Memory lost: stored state"
202	"Memory lost: power-on state"
203	"Memory lost: stored readings"
204	"Memory lost: time and date"
221	"Settings conflict: calculate limit state forced off"
222	"Settings conflict: module type does not match state"
223	"Settings conflict: trig source changed to IMM"
224	"Settings conflict: chan adv source changed to IMM"
225	"Settings conflict: DMM disabled or missing"
226	"Settings conflict: DMM enabled"
251	"Unsupported temperature transducer type"
261	"Not able to execute while scan initiated"
262	"Not able to abort scan"
271	"Not able to accept unit names longer than 3 characters"
272	"Not able to accept character in unit name"
281	"Not able to perform on more than one channel"
291	"Not able to recall state: it is empty"
292	"Not able to recall state: DMM enable changed"

C TOP

300-399 Module and Channel Errors

- 301 "Module currently committed to scan"
- 302 "No module was detected in this slot"
- 303 "Module is not able to perform requested operation"
- 304 "Does not exist"
- 305 "Not able to perform requested operation"
- 306 "Part of a 4-wire pair"
- 307 "Incorrectly configured ref channel"
- 308 "Channel not able to perform requested operation"
- 309 "Incorrectly formatted channel list"

400-449 Mass Storage Errors

- 401 "Mass storage error: failed to create file"
- 402 "Mass storage error: failed to open file"
- 403 "Mass storage error: failed to close file"
- 404 "Mass storage error: file write error"
- 405 "Mass storage error: file read error"
- 406 "Mass storage error: file write error"
- 407 "Mass storage error: failed to remove file"
- 408 "Mass storage error: failed to create directory"
- 409 "Mass storage error: failed to remove directory"
- 410 "Not enough disk space"
- 411 "No external disk detected"
- 412 "External disk has been detached"
- 413 "File already exists"
- 414 "Directory already exists"
- 415 "File not found"
- 416 "Path not found"
- 417 "File not opened for writing"
- 418 "File not opened for reading"

C TOP

450-499 USB Logging Errors

450	"Overrun during data collection: readings lost in USB transfer"
451	"Overrun during USB output: readings lost in USB transfer"
452	"Reading memory export aborted due to measurement reconfig"
453	"Not able to execute while logging data to USB"
454	"Not able to execute while copying data to USB"
455	"Not able to execute while importing a configuration from USB"
456	(none)
457	"Logging request ignored: USB device is busy"
458	"External USB drive is inaccessible"
459	"Logging to USB was stopped"
460	"Logging to USB was stopped after 2^32 sweeps of data"
461	"Memory lost: non-volatile settings; USB drive"
462	"Configuration import aborted"
463	"Configuration import failed"
464	"Invalid import file"
465	"Import file cardset does not match instrument"
466	"Operation not allowed in a configuration import file"
467	"No readings to export"
468	"Unable to fetch measurement config from internal processor"
469	"Internal processor returned an invalid measurement config"
470	"Measurement was reconfigured; Cannot save configuration data"
471	"USB operation aborted; Cannot save configuration data"
472	"One or more blcfg file names invalid; files inaccessible"
473	"Disk contains too many blcfg files; oldest files inaccessible"

500-599 Serious Instrument Errors

514	"RS-232 only: unable to execute using HP-IB" (34970A
	only)
514	"Not allowed; Instrument locked by another I/O
	session" (34972A only)
521	"Communications: input buffer overflow"
522	"Communications: output buffer overflow"
532	"Not able to achieve requested resolution"
540	"Not able to null channel in overload"
550	"Not able to execute command in local mode"

C TOP

600-649 Self-test Errors

601	"Self-test: front panel not responding"

- 602 "Self-test: RAM read/write"
- 603 "Self-test: A/D sync stuck"
- 604 "Self-test: A/D slope convergence"
- 605 "Self-test/Cal: not able to calibrate rundown gain"
- 606 "Self-test/Cal: rundown gain out of range"
- 607 "Self-test: rundown too noisy"
- 608 "Self-test: serial configuration readback failed"
- 609 "Self-test: DC gain x1 failed"
- 610 "Self-test: DC gain x10 failed"
- 611 "Self-test: DC gain x100 failed"
- 612 "Self-test: Ohms 500 nA source failed"
- 613 "Self-test: Ohms 5 uA source failed"
- 614 "Self-test: DC 300V zero failed"
- 615 "Self-test: Ohms 10 uA source failed"
- 616 "Self-test: DC current sense failed"
- 617 "Self-test: Ohms 100 uA source failed"
- 618 "Self-test: DC high voltage attenuator failed"
- 619 "Self-test: Ohms 1 mA source failed"
- 620 "Self-test: AC rms zero failed"
- 621 "Self-test: AC rms full scale failed"
- 622 "Self-test: frequency counter failed"
- 623 "Self-test: cannot calibrate precharge"
- 624 "Self-test: unable to sense line frequency"
- 625 "Self-test: I/O processor does not respond"
- 626 "Self-test: I/O processor failed self-test"

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700-799	Calibration Errors
701	"Cal security disabled by jumper"
702	"Cal: secured"
703	"Cal: invalid secure code"
704	"Cal: secure code too long"
705	"Cal: aborted"
706	"Cal: value out of range"
707	"Cal: signal measurement out of range"
708	"Cal: signal frequency out of range"
709	"Cal: no cal for this function or range"
710	"Cal: full scale correction out of range"
720	"Cal: DCV offset out of range"
721	"Cal: DCI offset out of range"
722	"Cal: RES offset out of range"
723	"Cal: FRES offset out of range"
724	"Cal: extended resistance self cal failed"
725	"Cal: 300V DC correction out of range"
730	"Cal: precharge DAC convergence failed"
731	"Cal: A/D turnover correction out of range"
732	"Cal: AC flatness DAC convergence failed"
733	"Cal: AC low frequency convergence failed"
734	"Cal: AC low frequency correction out of range"
735	"Cal: AC rms converter noise correction out of range"
736	"Cal: AC rms 100th scale correction out of range"
740	"Cal data lost: secure state"
741	"Cal data lost: string data"
742	"Cal data lost: DCV corrections"
743	"Cal data lost: DCI corrections"
744	"Cal data lost: RES corrections"
745	"Cal data lost: FRES corrections"
746	"Cal data lost: AC corrections"
747	"Config data lost: HP-IB address" (34970A only)
747	"Calibration failed" (34972A only)
748	"Config data lost: RS-232" (34970A only)
748	"Cal checksum failed internal data" (34972A only)
749	"DMM relay count data lost"

OTOP

811 Operation Not Implemented

811 "Operation not implemented"

900-999 Module Errors

901	"Module hardware: unexpected data received"
902	"Module hardware: missing stop bit"
903	"Module hardware: data overrun"
904	"Module hardware: protocol violation"
905	"Module hardware: early end of data"
906	"Module hardware: missing end of data"
907	"Module hardware: module SRQ signal stuck low"
908	"Module hardware: not responding"
910	"Module reported an unknown module type"
911	"Module reported command buffer overflow"
912	"Module reported command syntax error"
913	"Module reported nonvolatile memory fault"
914	"Module reported temperature sensor fault"
915	"Module reported firmware defect"
916	"Module reported incorrect firmware installed"

C TOP

Factory Reset State

The following tables show the state of the instrument after a **FACTORY RESET** from the *Sto/Rcl* menu, or *****RST from the remote interface.

Measurement Configuration	Factory Reset State
Function	DC Volts
Range	Autorange
Resolution	5½ Digits
Integration Time	1 PLC
Input Resistance	10 MΩ (fixed for all DCV ranges)
Channel Delay	Automatic Delay
Totalizer Reset Mode	Count Not Reset When Read

Totalizer Edge Detect	Rising Edge

Scanning Operations	Factory Reset State
Scan List	Empty
Reading Memory	All Readings are Cleared
Min, Max, and Average	Not Changed
Scan Trigger Source	Immediate
Scan Interval (used with TRIGger:SOURce TIMer)	10 Seconds
Scan Count	1
Scan Reading Format	Reading Only (No Units, Channel, Time)

Monitor in Progress	Stopped

Mx+B Scaling	Factory Reset State
Gain Factor ("M")	1
Offset Factor ("B")	0
Scale Label	VDC

Alarm Limits	Factory Reset State
Alarm Queue	Not Cleared
Alarm State	Off
HI and LO Alarm Limits	0

Alarm Output	Alarm 1
Alarm Output Configuration	Latched Mode
Alarm Output State	Output Lines are Cleared
Alarm Output Slope	Fail = Low

Module Hardware	Factory Reset State
34901A, 34902A, 34908A	All Channels Open
34903A, 34904A	All Channels Open
34905A, 34906A	Channels s 11 and s 21 Selected
34907A	Both DIO Ports = Input, Totalizer Count = 0, Both DACs = 0 VDC

System-Related Operations	Factory Reset State
Display State	On
Error Queue	Errors Not Cleared
Stored States	No Change

Instrument Preset State

The following tables show the state of the instrument after a **PRESET** from the *Sto/Rcl* menu or a **SYSTem:PRESet** command from the remote interface.

Measurement Configuration	Instrument Preset State
Function	No Change
Range	No Change
Resolution	No Change
Advanced Settings	No Change
Totalizer Reset Mode	Count Not Reset When Read
Totalizer Edge Detect	Rising Edge

Scanning Operations	Instrument Preset State

Scan List	No Change
Reading Memory	All Readings are Cleared
Min, Max, and Average	No Change
Scan Interval Source	No Change
Scan Interval	No Change
Scan Count	No Change
Scan Reading Format	No Change
Monitor in Progress	Stopped

Mx+B Scaling	Instrument Preset State
Gain Factor	No Change

("M")	
Offset Factor ("B")	No Change
Scale Label	No Change

Alarm Limits	Instrument Preset State
Alarm Queue	No Change
Alarm State	No Change
HI and LO Alarm Limits	No Change
Alarm Output Configuration	No Change
Alarm Output State	Output Lines are Cleared
Alarm Output Slope	No Change

Module Hardware	Instrument Preset State
34901A, 34902A, 34908A	All Channels Open
34903A, 34904A	All Channels Open
34905A, 34906A	Channels s 11 and s 21 Selected
34907A	Both DIO Ports = Input, Totalizer Count = 0, Both DACs = 0 VDC

System-Related Operations	Instrument Preset State
Display State	No Change
Error Queue	Errors Not Cleared
Stored States	No Change

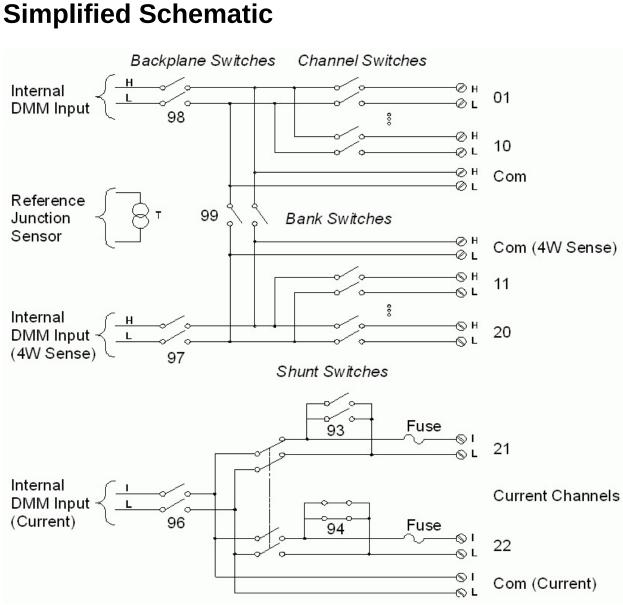
34970A/34972A Module Details

The links below take you to summary information for the Keysight 34970A/34972A plug-in modules.

34901A 20-Channel Armature Multiplexer
34902A 16-Channel Reed Multiplexer
34903A 20-Channel Actuator/General-Purpose Switch
34904A 4x8 Two-Wire Matrix Switch
34905A/34906A Dual 4-Channel RF Multiplexers
34907A Multifunction Module
34908A 40-Channel Single-Ended Multiplexer

Keysight 34901A Module Summary

20-Channel Armature Multiplexer (2/4-wire) Module



SCPI Commands Used

CALCulate:AVERage:AVERage?

CALCulate:AVERage:CLEar

CALCulate:AVERage:COUNt?

CALCulate:AVERage:MAXimum?

CALCulate:AVERage:MAXimum:TIME?

CALCulate:AVERage:MINimum?

CALCulate:AVERage:MINimum:TIME?

CALCulate:AVERage:PTPeak?

CALCulate:LIMit:LOWer

CALCulate:LIMit:LOWer:STATe

CALCulate:LIMit:UPPer

CALCulate:LIMit:UPPer:STATe

CALCulate:SCALe:GAIN

CALCulate:SCALe:OFFSet

CALCulate:SCALe:OFFSet:NULL

CALCulate:SCALe:STATe

CALCulate:SCALe:UNIT

CONFigure?

CONFigure:CURRent:AC

CONFigure:CURRent:DC

CONFigure:FREQuency

CONFigure:FRESistance

CONFigure:PERiod

CONFigure:RESistance

CONFigure:TEMPerature

CONFigure:VOLTage:AC

CONFigure:VOLTage:DC

DIAGnostic:RELay:CYCLes?

DIAGnostic:RELay:CYCLes:CLEar

MEASure:CURRent:AC?

MEASure:CURRent:DC?

MEASure:FREQuency?

MEASure:FRESistance?

MEASure:PERiod?

MEASure:RESistance?

MEASure: TEMPerature?

MEASure:VOLTage:AC?

MEASure:VOLTage:DC?

ROUTe:CHANnel:DELay

ROUTe:CHANnel:DELay:AUTO

ROUTe:CHANnel:FWIRe

ROUTe:CLOSe

ROUTe:CLOSe:EXCLusive

ROUTe:MONitor

ROUTe:MONitor:DATA?

ROUTe:OPEN

ROUTe:SCAN

[SENSe:]CURRent:AC:BANDwidth

[SENSe:]CURRent:AC:RANGe

[SENSe:]CURRent:AC:RANGe:AUTO

[SENSe:]CURRent:DC:APERture

[SENSe:]CURRent:DC:NPLC

[SENSe:]CURRent:DC:RANGe

[SENSe:]CURRent:DC:RANGe:AUTO

[SENSe:]CURRent:DC:RESolution

[SENSe:]FREQuency:APERture

[SENSe:]FREQuency:RANGe:LOWer

[SENSe:]FREQuency:VOLTage:RANGe

[SENSe:]FREQuency:VOLTage:RANGe:AUTO

[SENSe:]FRESistance:APERture

[SENSe:]FRESistance:NPLC

[SENSe:]FRESistance:OCOMpensated

[SENSe:]FRESistance:RANGe

[SENSe:]FRESistance:RANGe:AUTO

[SENSe:]FRESistance:RESolution

[SENSe:]PERiod:APERture

[SENSe:]PERiod:VOLTage:RANGe

[SENSe:]PERiod:VOLTage:RANGe:AUTO

[SENSe:]RESistance:APERture

[SENSe:]RESistance:NPLC

[SENSe:]RESistance:OCOMpensated

[SENSe:]RESistance:RANGe

[SENSe:]RESistance:RANGe:AUTO

[SENSe:]RESistance:RESolution

[SENSe:]TEMPerature:NPLC

[SENSe:]TEMPerature:RJUNction?

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

[SENSe:]TEMPerature:TRANsducer:FRTD:TYPE

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

[SENSe:]TEMPerature:TRANsducer:RTD:TYPE

[SENSe:]TEMPerature:TRANsducer:TCouple:CHECk

[SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction

[SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction:TYPE

[SENSe:]TEMPerature:TRANsducer:TCouple:TYPE

[SENSe:]TEMPerature:TRANsducer:THERmistor:TYPE

[SENSe:]TEMPerature:TRANsducer:TYPE

[SENSe:]VOLTage:AC:BANDwidth

[SENSe:]VOLTage:AC:RANGe

[SENSe:]VOLTage:AC:RANGe:AUTO

[SENSe:]VOLTage:DC:APERture

[SENSe:]VOLTage:DC:NPLC

[SENSe:]VOLTage:DC:RANGe

[SENSe:]VOLTage:DC:RANGe:AUTO

[SENSe:]VOLTage:DC:RESolution

[SENSe:]ZERO:AUTO

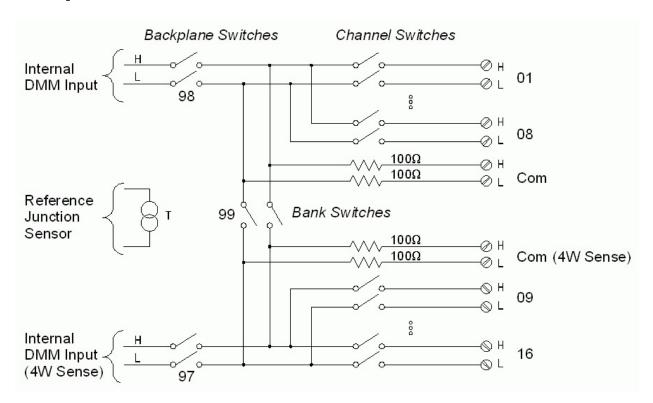
SYSTem:CPON

SYSTem:CTYPe?

UNIT: TEMPerature

Keysight 34902A Module Summary

16-Channel Reed Multiplexer (2/4-wire) Module



Simplified Schematic

SCPI Commands Used

CALCulate:AVERage:AVERage? CALCulate:AVERage:CLEar CALCulate:AVERage:COUNt? CALCulate:AVERage:MAXimum? CALCulate:AVERage:MAXimum:TIME? CALCulate:AVERage:MINimum? CALCulate:AVERage:MINimum:TIME?

CALCulate:AVERage:PTPeak?

CALCulate:LIMit:LOWer

CALCulate:LIMit:LOWer:STATe

CALCulate:LIMit:UPPer

CALCulate:LIMit:UPPer:STATe

CALCulate:SCALe:GAIN

CALCulate:SCALe:OFFSet

CALCulate:SCALe:OFFSet:NULL

CALCulate:SCALe:STATe

CALCulate:SCALe:UNIT

CONFigure?

CONFigure:FREQuency

CONFigure:FRESistance

CONFigure:PERiod

CONFigure:RESistance

CONFigure:TEMPerature

CONFigure:VOLTage:AC

CONFigure:VOLTage:DC

DIAGnostic:RELay:CYCLes?

DIAGnostic:RELay:CYCLes:CLEar

MEASure:FREQuency?

MEASure:FRESistance?

MEASure:PERiod?

MEASure:RESistance?

MEASure: TEMPerature?

MEASure:VOLTage:AC?

MEASure:VOLTage:DC?

ROUTe:CHANnel:DELay

ROUTe:CHANnel:DELay:AUTO

ROUTe:CHANnel:FWIRe

ROUTe:CLOSe

ROUTe:CLOSe:EXCLusive

ROUTe:MONitor

ROUTe:MONitor:DATA?

ROUTe:OPEN

ROUTe:SCAN

[SENSe:]FREQuency:APERture

[SENSe:]FREQuency:RANGe:LOWer

[SENSe:]FREQuency:VOLTage:RANGe

[SENSe:]FREQuency:VOLTage:RANGe:AUTO

[SENSe:]FRESistance:APERture

[SENSe:]FRESistance:NPLC

[SENSe:]FRESistance:OCOMpensated

[SENSe:]FRESistance:RANGe

[SENSe:]FRESistance:RANGe:AUTO

[SENSe:]FRESistance:RESolution

[SENSe:]PERiod:APERture

[SENSe:]PERiod:VOLTage:RANGe

[SENSe:]PERiod:VOLTage:RANGe:AUTO

[SENSe:]RESistance:APERture

[SENSe:]RESistance:NPLC

[SENSe:]RESistance:OCOMpensated

[SENSe:]RESistance:RANGe

[SENSe:]RESistance:RANGe:AUTO

[SENSe:]RESistance:RESolution

[SENSe:]TEMPerature:NPLC

[SENSe:]TEMPerature:RJUNction?

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

[SENSe:]TEMPerature:TRANsducer:FRTD:TYPE

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

[SENSe:]TEMPerature:TRANsducer:RTD:TYPE

[SENSe:]TEMPerature:TRANsducer:TCouple:CHECk

[SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction

[SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction:TYPE

[SENSe:]TEMPerature:TRANsducer:TCouple:TYPE

[SENSe:]TEMPerature:TRANsducer:THERmistor:TYPE

[SENSe:]TEMPerature:TRANsducer:TYPE

[SENSe:]VOLTage:AC:BANDwidth

[SENSe:]VOLTage:AC:RANGe

[SENSe:]VOLTage:AC:RANGe:AUTO

[SENSe:]VOLTage:DC:APERture

[SENSe:]VOLTage:DC:NPLC

[SENSe:]VOLTage:DC:RANGe

[SENSe:]VOLTage:DC:RANGe:AUTO

[SENSe:]VOLTage:DC:RESolution

[SENSe:]ZERO:AUTO

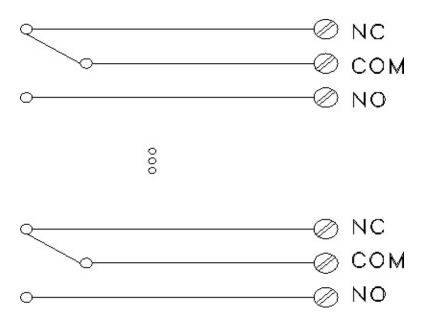
SYSTem:CPON

SYSTem:CTYPe? UNIT:TEMPerature

Keysight 34903A Module Summary

20-Channel Actuator/GP Switch Module

Simplified Schematic

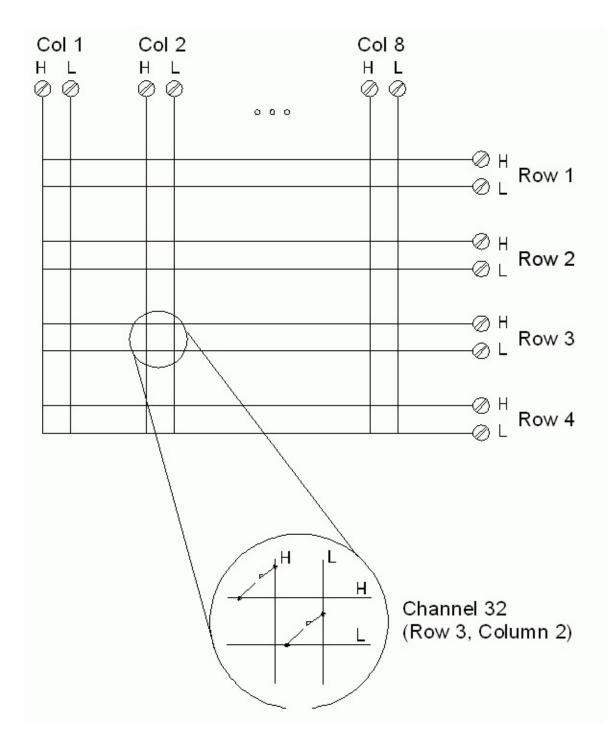


SCPI Commands Used

DIAGnostic:RELay:CYCLes? DIAGnostic:RELay:CYCLes:CLEar ROUTe:CLOSe ROUTe:CLOSe:EXCLusive ROUTe:OPEN SYSTem:CPON SYSTem:CTYPe? **Keysight 34904A Module Summary**

4x8 Two-Wire Matrix Module

Simplified Schematic



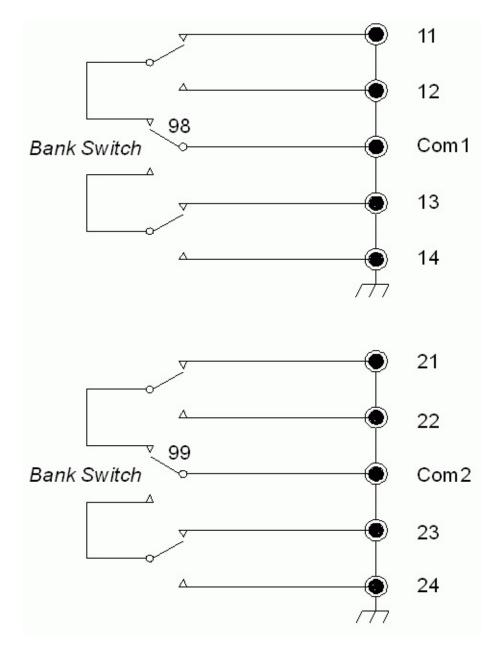
SCPI Commands Used

DIAGnostic:RELay:CYCLes? DIAGnostic:RELay:CYCLes:CLEar ROUTe:CLOSe ROUTe:CLOSe:EXCLusive ROUTe:OPEN SYSTem:CPON SYSTem:CTYPe? Keysight 34905A/34906A Module Summary

2 GHz Dual 1:4 RF Mux, 50 Ohm Module (34905A)

2 GHz Dual 1:4 RF Mux, 75 Ohm Module (34906A)

Simplified Schematic



SCPI Commands Used

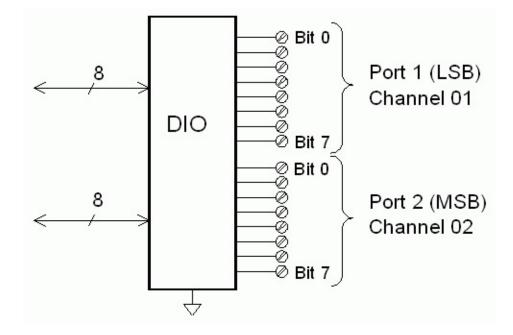
DIAGnostic:RELay:CYCLes? DIAGnostic:RELay:CYCLes:CLEar ROUTe:CLOSe ROUTe:CLOSe:EXCLusive SYSTem:CPON

SYSTem:CTYPe?

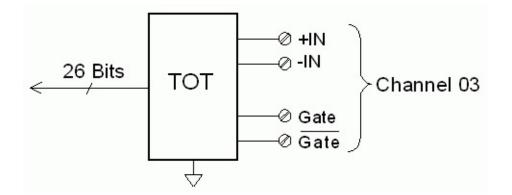
Keysight 34907A Module Summary

Multifunction Module

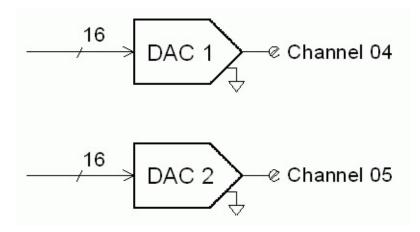
Simplified Schematic - Digital Input/Output



Simplified Schematic - Totalize Input



Simplified Schematic - Analog Output (DAC)



SCPI Commands Used

CALCulate:AVERage:AVERage? CALCulate:AVERage:CLEar CALCulate: AVERage: COUNt? CALCulate:AVERage:MAXimum? CALCulate:AVERage:MAXimum:TIME? CALCulate:AVERage:MINimum? CALCulate:AVERage:MINimum:TIME? CALCulate:AVERage:PTPeak? CALCulate:COMPare:DATA CALCulate:COMPare:MASK CALCulate:COMPare:STATe CALCulate:COMPare:TYPE CALCulate:LIMit:LOWer CALCulate:LIMit:UPPer CALibration? **CALibration:VALue**

CONFigure?

CONFigure:DIGital:BYTE

CONFigure:TOTalize

MEASure:DIGital:BYTE?

MEASure:TOTalize?

ROUTe:CHANnel:DELay

ROUTe:CHANnel:DELay:AUTO

ROUTe:MONitor

ROUTe:MONitor:DATA?

ROUTe:SCAN

[SENSe:]DIGital:DATA:{BYTE|WORD}?

[SENSe:]TOTalize:CLEar:IMMediate

[SENSe:]TOTalize:DATA?

[SENSe:]TOTalize:SLOPe

[SENSe:]TOTalize:TYPE

SOURce:DIGital:DATA[:{BYTE|WORD}]

SOURce:DIGital:STATe?

SOURce:VOLTage

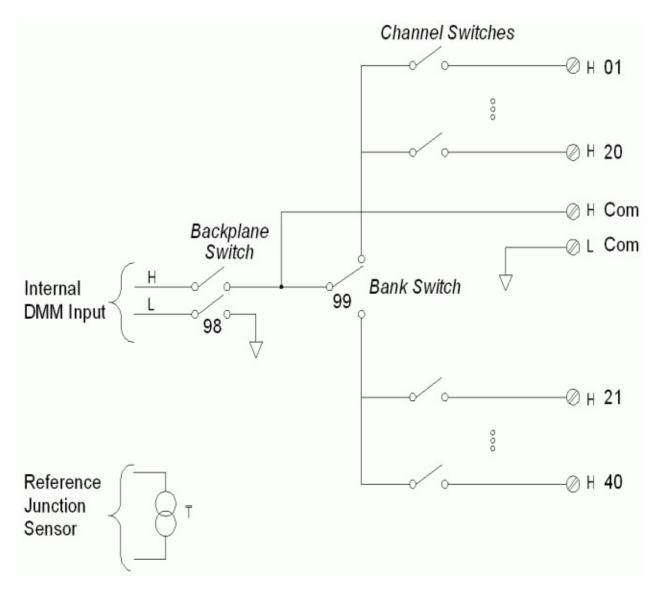
SYSTem:CPON

SYSTem:CTYPe?

Keysight 34908A Module Summary

40 Channel Single-Ended Multiplexer Module

Simplified Schematic



SCPI Commands Used

CALCulate:AVERage:AVERage?

CALCulate:AVERage:CLEar

CALCulate:AVERage:COUNt?

CALCulate:AVERage:MAXimum?

CALCulate:AVERage:MAXimum:TIME?

CALCulate:AVERage:MINimum?

CALCulate:AVERage:MINimum:TIME?

CALCulate:AVERage:PTPeak?

CALCulate:LIMit:LOWer

CALCulate:LIMit:LOWer:STATe

CALCulate:LIMit:UPPer

CALCulate:LIMit:UPPer:STATe

CALCulate:SCALe:GAIN

CALCulate:SCALe:OFFSet

CALCulate:SCALe:OFFSet:NULL

CALCulate:SCALe:STATe

CALCulate:SCALe:UNIT

CALibration?

CONFigure?

CONFigure:FREQuency

CONFigure:PERiod

CONFigure:RESistance

CONFigure:TEMPerature

CONFigure:VOLTage:AC

CONFigure:VOLTage:DC

DIAGnostic:RELay:CYCLes?

DIAGnostic:RELay:CYCLes:CLEar

MEASure:FREQuency?

MEASure:PERiod?

MEASure:RESistance?

MEASure: TEMPerature?

MEASure:VOLTage:AC?

MEASure:VOLTage:DC?

ROUTe:CHANnel:DELay

ROUTe:CHANnel:DELay:AUTO

ROUTe:CHANnel:FWIRe

ROUTe:CLOSe

ROUTe:CLOSe:EXCLusive

ROUTe: MONitor

ROUTe:MONitor:DATA?

ROUTe:OPEN

ROUTe:SCAN

[SENSe:]FREQuency:APERture

[SENSe:]FREQuency:RANGe:LOWer

[SENSe:]FREQuency:VOLTage:RANGe

[SENSe:]FREQuency:VOLTage:RANGe:AUTO

[SENSe:]FRESistance:APERture

[SENSe:]PERiod:APERture

[SENSe:]PERiod:VOLTage:RANGe

[SENSe:]PERiod:VOLTage:RANGe:AUTO

[SENSe:]RESistance:APERture

[SENSe:]RESistance:NPLC

[SENSe:]RESistance:OCOMpensated

[SENSe:]RESistance:RANGe

[SENSe:]RESistance:RANGe:AUTO

[SENSe:]RESistance:RESolution

[SENSe:]TEMPerature:NPLC

[SENSe:]TEMPerature:RJUNction?

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

[SENSe:]TEMPerature:TRANsducer:FRTD:TYPE

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

[SENSe:]TEMPerature:TRANsducer:RTD:TYPE

[SENSe:]TEMPerature:TRANsducer:TCouple:CHECk

[SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction

[SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction:TYPE

[SENSe:]TEMPerature:TRANsducer:TCouple:TYPE

[SENSe:]TEMPerature:TRANsducer:THERmistor:TYPE

[SENSe:]TEMPerature:TRANsducer:TYPE

[SENSe:]VOLTage:AC:BANDwidth

[SENSe:]VOLTage:AC:RANGe

[SENSe:]VOLTage:AC:RANGe:AUTO

[SENSe:]VOLTage:DC:APERture

[SENSe:]VOLTage:DC:NPLC

[SENSe:]VOLTage:DC:RANGe

[SENSe:]VOLTage:DC:RANGe:AUTO

[SENSe:]VOLTage:DC:RESolution

[SENSe:]ZERO:AUTO

SYSTem:CPON

SYSTem:CTYPe? UNIT:TEMPerature

Introduction to the Command Language

This document describes the SCPI command language for the Keysight 34970A/34972A multifunction switch/measure unit. These commands are based on a hierarchical tree system in which associated commands are grouped together under a common node or root to form *subsystems*. A portion of the INPut subsystem is shown below to illustrate the tree system.

INPut: COUPling:

IMPedance:

INPut is the root keyword of the command, and **COUPling** and **IMPedance** are second-level keywords. A colon (:) separates a command keyword from a lower-level keyword.

Syntax Conventions

The format used to show commands is illustrated below:

```
MEASure:INSTall:DELete {</abel>|ALL}
```

The command syntax shows most commands (and some parameters) as a mixture of upper- and lower-case letters. The upper-case letters indicate the abbreviated spelling for the command. For shorter program lines, you can send the abbreviated form. For better program readability, you can send the long form.

For example, in the above syntax statement, MEAS and MEASure are both acceptable forms. You can use upper- or lower-case letters. Therefore, MEASure, meas, and Meas are all acceptable. Other forms, such as MEA and MEASUR, are not valid and will generate an error.

- Braces (**{ }**) enclose the parameter choices for a given command string. The braces are not sent with the command string.
- A vertical bar () separates multiple parameter choices for a given command string. For example, {<*label*>|ALL} in the above command indicates that you can specify a *<label*>, or "ALL". The bar is not sent with the command string.
- Angle brackets (< >) indicate that you must specify a value for the enclosed parameter. For example, the above syntax statement shows the <*label*> parameter enclosed in angle brackets. The brackets are not sent with the command string. You must specify a value for the parameter (for example, MEASure:INSTall:DELete "MEZ_25") unless you select one of the other options shown in the syntax (for example, MEASure:INSTall:DELete ALL).
- Some parameters are enclosed in square brackets ([]). This indicates that the parameter is optional. The brackets are not sent with the command string. If you do not specify a value for an optional parameter, the instrument chooses a default value.

Command Separators

A colon (:) separates 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:

```
MEASure: THResholds: ABSolute (@1:4), 90, 50, 10
```

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

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

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

TRIG:SOUR EXT TRIG:COUNT 10

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

TRIG:COUN MIN;:SAMP:COUN MIN

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 turns protection on for channels 1 through 4.

CONFigure:CHANnel:PROTection (@1:4),1

You can then query the protection by sending:

```
CONFigure:CHANnel:PROTection? (@1:4)
```

This would return +1,+1,+1,+1.

Command Terminators

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

NOTE

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

IEEE-488.2 Common Commands

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

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

Parameter Types

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

Numeric Parameters

Commands that require numeric parameters will accept all commonly used decimal representations of numbers including optional signs, decimal points, and scientific notation. You can also send engineering unit suffixes with numeric parameters (e.g., M, k, m, or u). If a command accepts only certain specific values, the instrument will automatically round the input numeric parameters to the accepted values. The following command requires numeric parameters for the *<vHigh>*, *<vMid>* and *<vLow>* parameters.

MEASure:THResholds:ABSolute (@<ch_list>)[,<vHigh>,<vMid>, <vLow>]

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

Discrete Parameters

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

CONFigure:TRIGger:SOURce {IMMediate|SOFTware|EXTernal|CHANnel|OR}

Boolean Parameters

Boolean parameters represent a single binary condition that is either true or false. For a false condition, the instrument will accept "OFF" or 0. For a true condition, the instrument will accept "ON" or "1". When you query a Boolean setting, the instrument will always return 0 or 1. The following command requires a Boolean parameter:

CALibration:SECure:STATe {OFF|0|ON|1}

ASCII String Parameters

String parameters can contain virtually any set of ASCII characters. A string must begin and end with matching quotes; either with a single quote or a double quote. You can include the quote delimiter as part of the string by typing it twice without any characters in between. The following command uses a string parameter:

DISPlay:TEXT <quoted string>

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

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

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

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

Using Device Clear

Device Clear is an IEEE-488 low-level bus message that you can use to return the instrument to a responsive state. Different programming languages and IEEE-488 interface cards provide access to this capability through their own unique commands. The status registers, the error queue, and all configuration states are left unchanged when a Device Clear message is received.

Device Clear performs the following actions:

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

NOTE

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

LAN Port Usage

The Keysight 34972A uses the following LAN ports:

- Port 5024 is used for SCPI Telnet sessions.
- Port 5025 is used for Socket sessions.

DHCP

Short for *Dynamic Host Configuration Protocol*, a protocol for assigning dynamic IP addresses to devices on a network. With dynamic addressing, a device can have a different IP address every time it connects to the network.