HIOKI

Applied Functions
Instruction Manual

3506-10

C METER

HIOKI E. E. CORPORATION

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Application Functions

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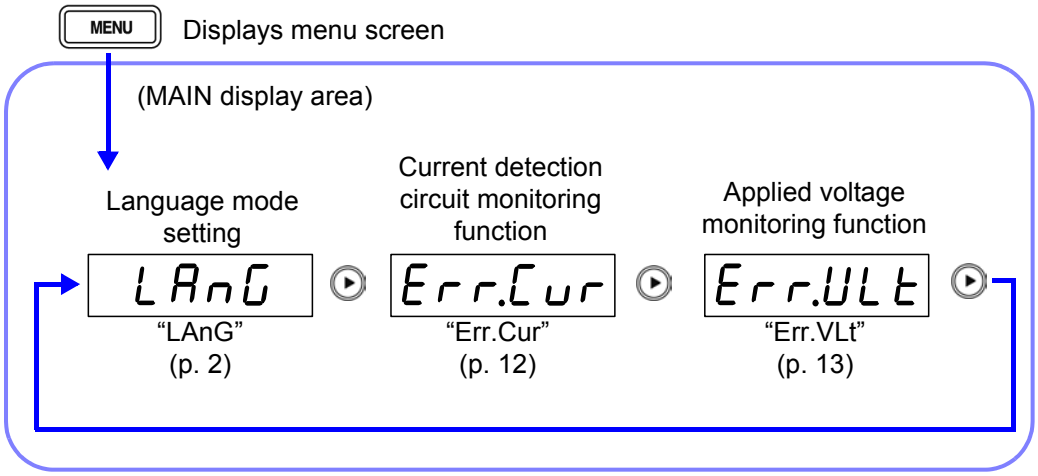
Menu display organization



Chapter 2 Using 4288A Commands

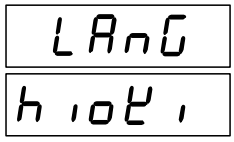
Commands Compatible with the Agilant 4288A

This device can carry out Agilant Technology 4288A Capacitance Meter commands. (Not all commands are compatible.) In order to use 4288A commands the device language mode must be set.

Language Mode Setting

1. **Press and hold the MENU key.**
The sub menu items are displayed at the top of the MAIN display area and the setting items are displayed at the bottom of the MAIN display area.

2. **Use ◀ or ▶ to select the "LAnG" menu item.**
(MAIN display area)

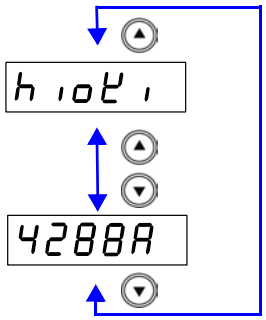


Sub menu content

Language mode (set in step 3)

Language mode setting screen

3. **Use ▲ and ▼ to select a setting item.**
Pressing ▲ or ▼ causes the display to change in the following manner.



"hioKi"
The device receives standard language commands.

"4288A"
The device receives Agilent 4288A language commands.

4. **Press ENTER to confirm the language mode as enabled or disabled.**
"Err.Cur" (Current detection circuit monitoring function setting screen) will be shown in the MAIN display area.

5. **Press MENU.**
Returns to measurement mode before displaying the SUB menu screen.

NOTE The device is initially set to "hioKi"

Table of Commands Compatible with the 4288A

1. Measurement Conditions

● : Fully compatible △ : Partially compatible × : Incompatible

Setting description		Agilent 4288A		HIOKI 3506-10	
		4288A Command	Parameter	Compatibility	Discrepancy
Reset		:SYST:PRES	_	●	Please refer to the corresponding instruction manual
Measurement Parameter setting	First	:CALC1:FORM	CP/ CS	●	←
	Second	:CALC2:FORM	D/ Q/ G/ RP/ RS	△	Only compatible with D/Q
Measurement Signal setting	Frequency	:SOUR:FREQ	1E3/ 1E6	●	←
	1 MHz Frequency shift	:SYST:FSH	-1 to 2	●	Compatible from -2 to 2
	Level	:SOUR:VOLT	100E-3 to 1	△	Set from 0 to 0.75:500 mV Set from 0.75 to :1 V
Measurement Range setting	Switch	:RANG:AUTO	ON/ OFF/ 1/ 0	△	When the comparator (BIN) is set to ON and when the execution error comparator is set to ON, AUTO range is set to OFF.
	Range	:RANG	-999.99 to 999.99	●	←
Measurement time setting		:APER	LONG/ SHORt	●	Set the SHOR:FAST Set the LONG:SLOW NORM setting possible
Averaging setting	ON/ OFF	:AVER	ON/ OFF/ 1/ 0	●	←
	Number of Times	:AVER:COUN	1 to 256	●	←
Cable length setting		:CAL:CABL	0 to 2	●	←

2. Circuit Compensation

● : Fully compatible △ : Partially compatible × : Incompatible

Setting description		Agilent 4288A		HIOKI 3506-10	
		4288A Command	Parameter	Compatibility	Discrepancy
Open Circuit Compensation ON/ OFF		:CORR:OPEN	ON/ OFF/ 1/ 0	●	←
Short Circuit Compensation ON/ OFF		:CORR:SHOR	ON/ OFF/ 1/ 0	●	←
Load Circuit Compensation ON/ OFF		:CORR:LOAD	ON/ OFF/ 1/ 0	●	←
Offset Circuit Compensation ON/ OFF		:CORR:OFFS	ON/ OFF/ 1/ 0	●	←
Open Circuit Compensation Data Parameter Format		:CORR:CKIT:STAN1:FORM	GB/ CPG	●	←
Short Circuit Compensation Data Parameter Format		:CORR:CKIT:STAN2:FORM	RX/ LSRS	●	←
Standard Definition for Load Compensation	Definition Value	:CORR:CKIT:STAN3	Reference value (1st), Reference value (2nd) Reference value (1st): -999.999 to 999.999 Reference value (2nd): -99.9999E9 to 99.9999E9	●	The number of valid setting value digits may decrease in accordance with the number of valid measurement range digits.
	Parameter Format	:CORR:CKIT:STAN3:FORM	CPD/ CPQ/ CPG/ CPRP/ CSD/ CSQ/ CSRS	△	Only compatible with CPD/ CSD/ CPQ/ CSQ
Compensation Data	Measurement	:CORR:COLL	STANdard1/ STANdard2/ STANdard3 STAN1:Open Circuit Compensation STAN2:Short Circuit Compensation STAN3:Load Circuit Compensation	●	←
	Setting and reading	:CORR:DATA	STANdard1/STANdard2/ STANdard3, Compensation value (1st), Compensation value (2nd) Compensation value (1st): -999.999 to 999.999 Compensation value (2nd): -99.9999E9 to 99.9999E9	●	The number of valid setting value digits may decrease in accordance with the number of valid measurement range digits.
Offset Compensation Data Setting		:CORR:OFFS:DATA	Compensation value (1st), Compensation value (2nd) Compensation value (1st): -999.999 to 999.999 Compensation value (2nd): -99.9999E9 to 99.9999E9	●	The number of valid setting value digits may decrease in accordance with the number of valid measurement range digits.

NOTE

The open circuit compensation and short circuit compensation value is saved at varying values depending on the measured frequency, signal level, and frequency shift settings.
If these settings are changed and a measurement value has not been taken with the changed measurement conditions, open circuit compensation and short circuit compensation will be turned OFF.
However, when the frequency shift or cable length setting is changed, open circuit compensation and short circuit compensation are set to OFF for all measurement conditions.

3. Scanner (Multi Compensation)

● : Fully compatible △ : Partially compatible × : Incompatible

Setting description	Agilent 4288A		HIOKI 3506-10	
	4288A Command	Parameter	Compati-bility	Discrepancy
ON/ OFF	:CORR:MULT	ON/ OFF/ 1/ 0	×	Compatible in panel load and save functions
Number of channels setting	:CORR:MULT:CHAN	0 to 63	×	
Setting the method for holding the load compensation basic value	:CORR:MULT:CKIT: STAN3	ON/ OFF/ 1/ 0	×	

4. Trigger

● : Fully compatible △ : Partially compatible × : Incompatible

Setting description		Agilent 4288A		HIOKI 3506-10	
		4288A Command	Parameter	Compati-bility	Discrepancy
Activate the trigger		:TRIG		△	Trigger mode active during EXT
		∗TRG		△	Trigger mode active during EXT No measurement value query
Trigger mode Setting		:TRIG:SOUR	INTernal/ MANual/ EXTernal/ BUS	△	Sets the INT : INT Sets the EXT : EXT/ MAN/ BUS
Trigger time delay setting		:TRIG:DEL	0 to 1	●	Compatible from 0 to 9.999
Trigger system	Reset	:ABOR		●	←
	Startup	:INIT		●	←
	Startup meth-od setting	:INIT:CONT	ON/ OFF/ 1/ 0	●	Upon returning to local mode, INIT:CONT is set to ON.

5. Measurement data output

● : Fully compatible △ : Partially compatible × : Incompatible

Setting description		Agilent 4288A		HIOKI 3506-10	
		4288A Command	Parameter	Compati-bility	Discrepancy
Data forwarding format setting		:FORM	ASCii/ REAL	●	←
Data reading	Measurement result	:FETC?		●	←
		:READ?		●	←
	Data buffer	:DATA?	BUF1/ BUF2/ BUF3	△	Only compatible with BUF3
	Measurement Signal level / Monitor result	:DATA?	IMON/ VMON	●	←
Data buffer setting	Feed data	:DATA:FEED	BUF1/ BUF2, "CALCulate1"/ "CALCulate2"/""	×	Incompatible
	Feed / Do not feed	:DATA:FEED:CONT	BUF1/ BUF2/ BUF3, AL-Ways/NEVer	△	Only compatible with BUF3
	Size(Points)	:DATA:POIN	BUF1/ BUF2/ BUF3, size Size : 1 to 200 (BUF1) 1 to 200 (BUF2) 1 to 1000 (BUF3)	△	Only compatible with BUF3

6. Comparator Function

● : Fully compatible △ : Partially compatible × : Incompatible

Setting description		Agilent 4288A		HIOKI 3506-10	
		4288A Command	Parameter	Compatibility	Discrepancy
ON/ OFF setting		:CALC:COMP	ON/ OFF/ 1/ 0	●	←
Clear limit range setting		:CALC:COMP:CLE		●	←
First parameter limit range	ON/ OFF setting	:CALC:COMP:PRIM:BIN{1-9}:STAT	ON/ OFF/ 1/ 0	●	←
	Range setting	:CALC:COMP:PRIM:BIN{1-9}	Lower limit Values, Upper limit Values Lower limit Values : -999.999 to 999.999 Upper limit Values : -999.999 to 999.999	●	The number of valid setting value digits may decrease in accordance with the number of valid measurement range digits.
	Specification method setting	:CALC:COMP:MODE	ABS/ DEV/ PCNT	●	The screen display method (absolute value, deviation, %) also changes in accordance with the judgment method setting.
	Reference value setting	:CALC:COMP:PRIM:NOM	-999.999 to 999.999	●	The number of valid setting value digits may decrease in accordance with the number of valid measurement range digits.
Second parameter limit range	ON/ OFF setting	:CALC:COMP:SEC:STAT	ON/ OFF/ 1/ 0	●	←
	Range setting	:CALC:COMP:SEC:LIM	Lower limit Values, Upper limit Values Lower limit Values : -99.9999E9 to 99.9999E9 Upper limit Values : -99.9999E9 to 99.9999E9	●	The number of valid setting value digits may decrease in accordance with the number of valid measurement range digits.
AUX BIN Function ON/ OFF setting		:CALC:COMP:AUXB	ON/ OFF/ 1/ 0	△	Always ON
Low C Reject Function	ON/ OFF	:CREJ	ON/ OFF/ 1/ 0	●	←
	Detection threshold value setting	:CREJ:LIM	0 to 10	●	←
BIN counter function	ON/ OFF setting	:CALC:COMP:COUN	ON/ OFF/ 1/ 0	×	All BIN count related commands are incompatible
	Clear count number	:CALC:COMP:COUN:CLE		×	
	Read count number	:CALC:COMP:COUN:DATA?		×	
	Read count value of auto load occurance	:CALC:COMP:COUN:OVLD?		×	
	Read count value of each channel	:CALC:COMP:COUN:MULT:DATA?		×	
	Read count value of auto load occurance for each channel	:CALC:COMP:COUN:MULT:OVLD?		×	

7. Measurement Signal Level Monitor

● : Fully compatible △ : Partially compatible
× : Incompatible

Setting description		Agilent 4288A		HIOKI 3506-10	
		4288A Command	Parameter	Com-patibility	Discrepancy
Monitor Function	ON/ OFF setting	:CALC3:MATH:STAT	ON/ OFF/ 1/ 0	△	Always ON
	ON/ OFF setting	:CALC4:MATH:STAT	ON/ OFF/ 1/ 0	△	Always ON

8. Save/ Recall

● : Fully compatible △ : Partially compatible × : Incompatible

Setting description	Agilent 4288A		HIOKI 3506-10	
	4288A Command	Parameter	Compati-bility	Discrepancy
Save	∗SAV	0 to 9	×	Incompatible
Recall	∗RCL	0 to 9	×	Incompatible

9. Display

● : Fully compatible △ : Partially compatible × : Incompatible

Setting description		Agilent 4288A		HIOKI 3506-10	
		4288A Command	Parameter	Compatibility	Discrepancy
ON/ OFF setting		:DISP	ON/ OFF/ 1/ 0	●	Turns off all LEDs other than mode display and remote display.
Display digits setting		:DISP:TEXT1:DIG	4 to 6	×	Incompatible
Fixed decimal point display	ON/ OFF	:DISP:TEXT1:FMSD	ON/ OFF/ 1/ 0	×	Incompatible
	Most significant digit value setting	:DISP:TEXT1:FMSD :DATA	Most significant digit (first parameter), most significant digit (second parameter)	×	Incompatible
Deviation measurement setting	ON/ OFF	:CALC1:MATH:STAT	ON/ OFF/ 1/ 0	×	Possible with comparator setting The second parameter measurement value will be the absolute deviation value from the standard value.
	ON/ OFF	:CALC2:MATH:STAT	ON/ OFF/ 1/ 0	×	
	Mode	:CALC1:MATH:EXPR :NAME	DEV/ PCNT	×	
	Mode	:CALC2:MATH:EXPR :NAME	DEV/ PCNT	×	
	Reference value	:DATA	REF1/ REF2, Reference value Reference value (for REF1) : -999.99 to 999.99 Reference value (for REF2) : -99.999E9 to 99.999E9	×	
Machine setting display page settings		:DISP:TEXT2:PAGE	1 to 34	×	Incompatible

10.Keylock

● : Fully compatible △ : Partially compatible × : Incompatible

Setting description	Agilent 4288A		HIOKI 3506-10	
	4288A Command	Parameter	Compatibility	Discrepancy
ON/ OFF	:SYST:KLOC	ON/ OFF/ 1/ 0	●	←

11.Beep output

● : Fully compatible △ : Partially compatible × : Incompatible

Setting description	Agilent 4288A		HIOKI 3506-10	
	4288A Command	Parameter	Compati-bility	Discrepancy
ON/ OFF	:CALC:COMP:BEEP	ON/ OFF/ 1/ 0	●	←
	:SYST:BEEP:STAT	ON/ OFF/ 1/ 0	●	←
Mode setting	:CALC:COMP:BEEP: COND	FAIL/ PASS	●	←
Beep tone output	:SYST:BEEP		●	←

12.Status report mechanism

● : Fully compatible △ : Partially compatible × : Incompatible

Setting description		Agilent 4288A		HIOKI 3506-10	
		4288A Command	Parameter	Compati-bility	Discrepancy
Clear		*CLS		●	←
Read status byte register value		*STB?		●	←
Service request enable register mask setting		*SRE		●	←
Standard event status register	Read register value	*ESR?		●	←
	OPC bit set-ting at time of operation completion	*OPC		●	←
	Mask setting for enable register	*ESE		●	←
Standard opera-tion status group	Clear	:STAT:PRES		×	Compatible with :ESR0 to :ESR3
	Read condi-tion register value	:STAT:OPER:COND?		×	
		:STAT:QUES:COND?		×	
	Mask setting for enable register	:STAT:OPERATION: ENAB	0 to 32767	×	
		:STAT:QUES:ENAB	0 to 32767	×	
	Read event register value	:STAT:OPER?		×	
		:STAT:QUES?		×	

13.Other

● : Fully compatible △ : Partially compatible × : Incompatible

Setting description		Agilent 4288A		HIOKI 3506-10	
		4288A Command	Parameter	Compati-bility	Discrepancy
Execute self test	Internal	∗TST?		●	Please refer to the corre-sponding instruction man-ual.
	External	:SYST:TEST?		×	Incompatible
Read product information		∗IDN?		△	The maker and model names differ.
Read option information		∗OPT?		×	Incompatible
Read 1 after operation completion		∗OPC?		●	←
Read generated errors		:SYST:ERR?		×	Incompatible
Read SCPI version		:SYST:VERS?		×	Incompatible
Wait for completion of command execution		∗WAI		●	←

Chapter 3 Monitor Measurement Signal

Current Detection Circuit Monitoring Function

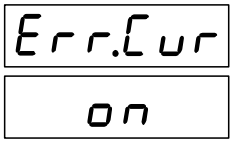
If the measurement range is set too low for the object being measured or the object being measured is in a SHORT state, a current wave outside the permissible range is generated. This can be detected as a measured current abnormality.

1. Press and hold the [MENU] key.

The sub menu items are displayed at the top of the MAIN display area and the setting items are displayed at the bottom of the MAIN display area.

2. Use ◀ or ▶ to select the "Err.Cur" menu item.

(MAIN display area)



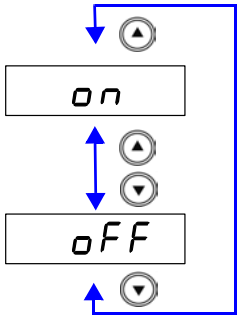
Sub menu content

"on" or "oFF" flashse.

(Current detection circuit monitoring function setting screen

3. Press ▲▼ to enable or disable the current detection circuit monitoring function.

It will toggle "on" and "oFF" each time ▲▼ is pressed.



"on"
If the current wave is outside of the acceptable range it is detected as an error.

"oFF"
The measurement value is displayed even if the current wave is outside the acceptable range.

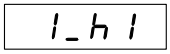
4. Press [ENTER] to confirm the current detection circuit monitoring function as enabled or disabled.

"Err.VLt" (Applied voltage value monitoring function settings screen) will be shown in the MAIN display area.

5. Press [MENU].

Returns to measurement mode before displaying the SUB menu screen.

NOTE

- If an error is detected, 

will be displayed in the MAIN display area.
- The device is initially set to "on"
- Outputs to BIT5 of the event status register ESR0.
  See in the main Instruction Manual "8.9 Messeage Reference"-"Query of Event Status Register 0"

Applied Voltage Value Monitoring Function

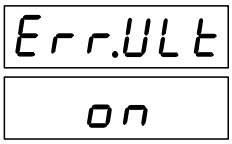
The measurement signal level of this device is intended for the measurement terminals being open. Due to the influence of the device's output impedance, the voltage applied to the sample will be less than the set signal level. With this function it can be detected as an error when the applied voltage is outside the set limit value.

1. Press and hold the MENU key.

The sub menu items are displayed at the top of the MAIN display area and the setting items are displayed at the bottom of the MAIN display area.

2. Use ◀ or ▶ to select the "Err.VLt" menu item.

(MAIN display area)



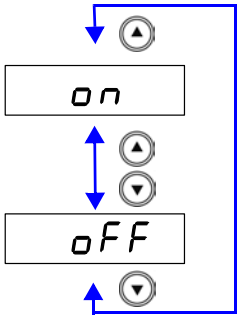
Sub menu content

"on" or "oFF" flashse

(Applied voltage value monitoring function settings screen)

3. Press ▲▼ to enable or disable the applied voltage value monitoring function.

It will toggle "on" and "oFF" each time ▲▼ is pressed.



"on"
It is detected as an error if the set limit range is exceeded.

"oFF"
Even if the set limit range is exceeded the measurement value will be displayed.

4. Press ENTER to confirm the applied voltage value monitoring function as enabled or disabled.

If "oFF" is selected, "LAnG" (Language mode setting screen) will be displayed in the MAIN display area.
If "on" is selected, the leftmost LED showing the limit value in the middle row of the SUB display area will flash.

5. When "on" is selected.

Enter the limit value using ▲▼ or the numeric keypad.

(When inputting with the numeric keypad, each digit moves one place to the right.)
Settable range : 0.01 to 100.00 (%)

Move to the digit..... ◀ and ▶

Change the number… ▲ and ▼

6. Press [ENTER] to confirm the limit value.

"LAnG" (Language mode setting screen) will be displayed in the MAIN display area.

If [ENTER] is not pressed the applied voltage value monitoring function setting will not be set.

7. Press [MENU].

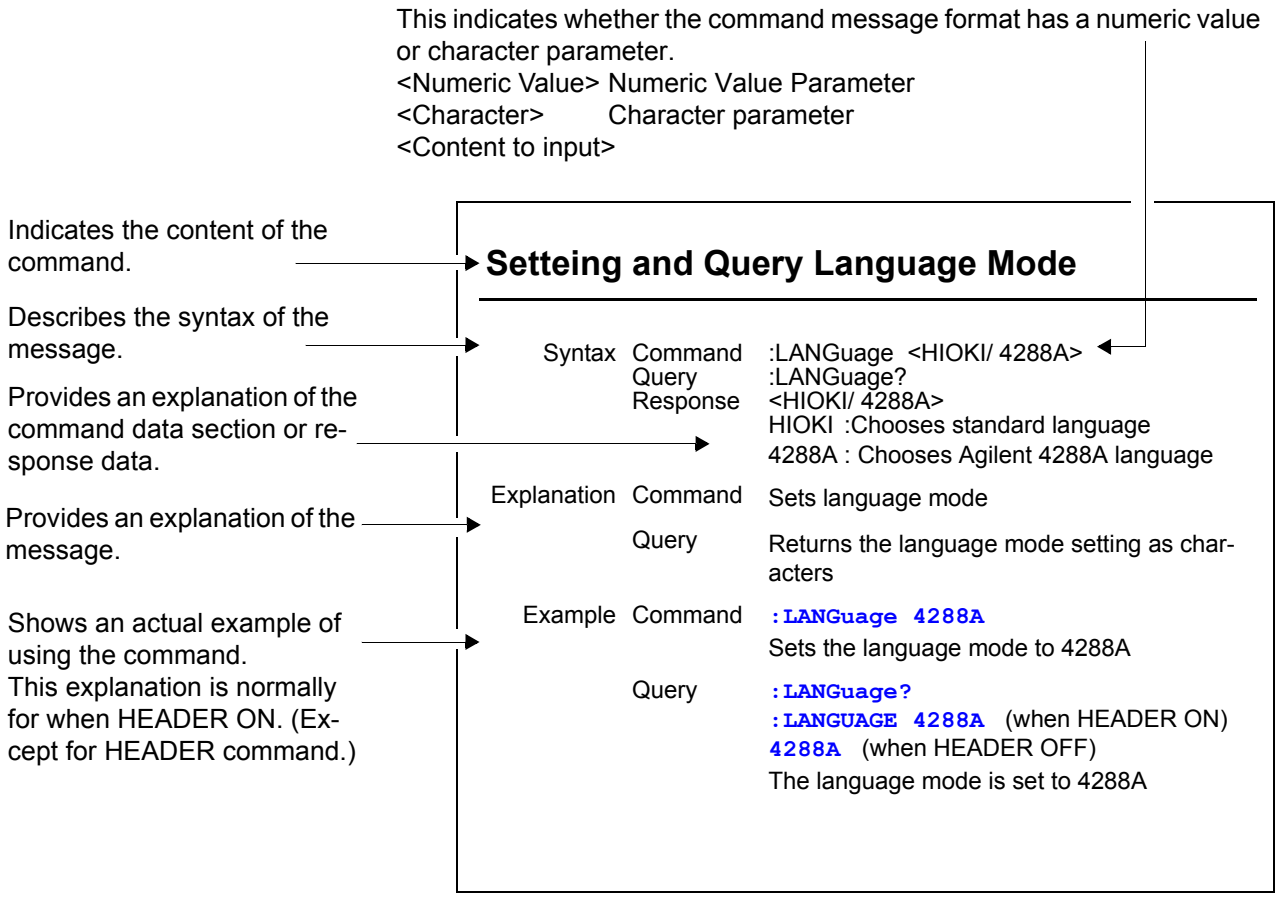
Returns to measurement mode before displaying the SUB menu screen.

NOTE

- If an error is detected, U_Lo will be displayed in the MAIN display area.
- The device is initially set to ON, limit value 25%. For example, if the current measurement signal level is 1 (V), the allowable range of change will be from 0.75 (V) to 1.25 (V).
- Outputs to BIT6 of the event status register ESR0.
  See in the main Instruction Manual "8.9 Messeage Reference"-"Query of Event Status Register 0"
- Applied voltage abnormalities are output via the EXT I/O.

Chapter 4 Message Reference

Refer to the following on how to read this section.



1. Setteing and Query Language Mode

Syntax

Command **:LANGuage** <HIOKI/ 4288A>
Query **:LANGuage?**
Response <HIOKI/ 4288A>
HIOKI : Chooses standard language.
4288A : Chooses Agilent 4288A language.

Explanation

Command Sets language mode.

Query Returns the language mode setting as characters.

Example

Command **:LANGuage 4288A**
Sets the language mode to 4288A.

Query **:LANGuage?**
Response **:LANGUAGE 4288A** (when HEADER ON)
4288A (when HEADER OFF)
The language mode is set to 4288A.

2. Setting and Query of Current Detection Circuit Monitoring Function

Syntax

Command **:ICHeck** <ON/ OFF>
Query **:ICHeck?**
Response <ON/ OFF>
ON : Starts monitoring of the current detection circuit.
OFF : Stops monitoring of the current detection circuit.

Explanation

Command Enables or disables the current detection circuit monitoring function.

Query Returns the current detection circuit monitoring function setting as ON or OFF.

Example

Command **:ICHeck ON**
Starts monitoring of the current detection circuit.

Query **:ICHeck?**
Response **:ICHECK ON** (when HEADER ON)
ON (when HEADER OFF)
Monitoring of current detection circuit is enabled.

3. Setting and Query of the Applied Voltage Value Monitoring Function

Syntax

Command **:VCHeck** <ON/ OFF>
Query **:VCHeck?**
Response <ON/ OFF>
ON : Starts monitoring of the applied voltage value.
OFF : Stops monitoring of the applied voltage value.

Explanation

Command: Enables or disables the applied voltage value monitoring function.

Query: Returns the applied voltage value monitoring function setting as ON or OFF.

Example

Command
`:VCHeck ON`
Starts monitoring of the applied voltage value.

Query `:VCHeck?`
Response `:VCHECK ON` (when HEADER ON)
`ON` (when HEADER OFF)
Monitoring of applied voltage value is enabled.

4. Setting and Query of the Applied Voltage Value Monitoring Function Limit Value

Syntax

Command **:VCHeck:LIMit** <Numeric Value>
Query **:VCHeck:LIMit?**
Response <Numeric Value> = 0.01 to 100.00 (NR2)

Explanation

Command: Sets the applied voltage value monitoring function limit value.
A numeric value in NRf format is accepted but non significant digits are rounded off so the numeric.

Query: Returns the applied voltage value monitoring function limit value setting.

Example

Command
`:VCHeck:LIMit 1.50`
An error will be detected if the absolute value of the amount of movement of the applied voltage value relative to the measurement signal is 1.50% or greater.

Query `:VCHeck:LIMit?`
Response `:VCHECK:LIMIT 1.50` (when HEADER ON)
`1.50` (when HEADER OFF)
The applied voltage value monitoring limit value is set to 1.50%.