SFRA45

Communications Manual

IMPORTANT SAFETY INSTRUCTIONS

This equipment is designed to comply with BSEN 61010-1 (Safety requirements for electrical equipment for measurement, control, and laboratory use) – observe the following precautions:

- Ensure that the supply voltage agrees with the rating of the instrument printed on the back panel ***before*** connecting the mains cord to the supply.
- This appliance ***must*** be earthed. Ensure that the instrument is powered from a properly grounded supply.
- The inputs must not be connected to signals greater than is indicated on the front panel.
- Keep the ventilation holes on the underneath and sides free from obstruction.
- Do not operate or store under conditions where condensation may occur or where conducting debris may enter the case.
- There are no user serviceable parts inside the instrument – do not attempt to open the instrument, refer service to the manufacturer or his appointed agent.

Note: Newtons4th Ltd. shall not be liable for any consequential damages, losses, costs or expenses arising from the use or misuse of this product however caused.

ABOUT THIS MANUAL

This manual gives details of the communication commands recognized by the SFRA45 series of instruments over RS232, USB, or LAN. For more general operating instructions for the instrument refer to the user manual.

Each command is listed alphabetically with details of any arguments and reply. A one line summary of each command is given in the appendix. Although most of the commands apply to all instruments in the range there are some commands that are specific to one instrument or another.

The information in this manual is believed to be accurate and complete but Newtons4th Ltd cannot accept any liability whatsoever for any consequential damage or losses arising from any errors, inaccuracies, or omissions.

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1 Using remote control

The instrument is fitted with an RS232 serial communications port and USB port as standard, and may have a LAN interface fitted as an option. All the interfaces use the same ASCII protocol with the following end of line terminators:

	Rx expects	Tx sends
RS232 USB LAN	carriage return (line feed ignored)	carriage return and line feed

All the functions of the instrument can be programmed via any interface, and results read back. The port to be used is selected by the REMOTE menu.

The commands are not case sensitive and white space characters are ignored (e.g. tabs and spaces). Replies from the instrument are always upper case, delimited by commas, without spaces.

Only the first six characters of any command are important – any further characters will be ignored. For example, the command to set the generator frequency is FREQUE but the full word FREQUENCY may be sent as the redundant NCY at the end will be ignored.

Fields within a command are delimited by comma, multiple commands can be sent on one line delimited with a semi-colon. Eg.

AMPLIT,1.5;OUTPUT,ON

Mandatory commands specified in the IEEE488.2 protocol have been implemented, (e.g. *IDN?, *RST) and all commands that expect a reply are terminated with a question mark.

The instrument maintains an error status byte consistent with the requirements of the IEEE488.2 protocol (called the standard event status register) that can be read by the mandatory command *ESR? (see section 5.1).

The instrument also maintains a status byte consistent with the requirements of the IEEE488.2 protocol, that can be read by the mandatory command *STB? (see section 5.2).

The keyboard is disabled when the instrument is set to “remote”. Press HOME to return to “local” operation.

RS232 data format is: start bit, 8 data bits (no parity), 1 stop bit. Flow control is RTS/CTS (see section 5.2), baud rate is selectable via the REMOTE menu.

A summary of the available commands is given in the Appendix. Details of each command are given in the communication command section of the manual.

Commands are executed in sequence except for two special characters that are immediately obeyed:

Control T (20) – reset interface (device clear)
Control U (21) – warm restart

1.1 Standard event status register

PON		CME	EXE	DDE	QYE		OPC

bit 0 OPC (operation complete)
cleared by most commands
set when data available or sweep complete
bit 2 QYE (unterminated query error)
set if no message ready when data read
bit 3 DDE (device dependent error)
set when the instrument has an error
bit 4 EXE (execution error)
set when the command cannot be executed
bit 5 CME (command interpretation error)
set when a command has not been recognised
bit 7 PON (power on event)
set when power first applied or unit has reset

The bits in the standard event status register except for OPC are set by the relevant event and cleared by specific command (*ESR?, *CLS, *RST). OPC is also cleared by most commands that change any part of the configuration of the instrument (such as MODE or START).

1.2 Serial Poll status byte

		ESB	MAV			SDV	RDV

bit 0 RDV (result data available)
set when results are available to be read as enabled by DAVER
bit 1 SDV (sweep data available)
set when sweep results are available to be read as enabled by DAVER
bit 2 not used
bit 3 not used)
bit 4 MAV (message available)
set when a message reply is waiting to be read
bit 5 ESB (standard event summary bit)
set if any bit in the standard event status register is set as well as the corresponding bit in the standard event status enable register (set by *ESE).

1.3 RS232 connections

The RS232 port on the instrument uses the same pinout as a standard 9 pin serial port on a PC or laptop (9-pin male ‘D’ type).

Pin	Function	Direction
1	DCD	in (+ weak pull up)
2	RX data	in
3	TX data	out
4	DTR	out
5	GND	
6	DSR	not used
7	RTS	out
8	CTS	in
9	RI	not used

The instrument will only transmit when CTS (pin 8) is asserted, and can only receive if DCD (pin 1) is asserted. The instrument constantly asserts (+12V) DTR (pin 4) so this pin can be connected to any unwanted modem control inputs to force operation without handshaking. The instrument has a weak pull up on pin 1 as many null modem cables leave it open circuit. In electrically noisy environments, this pin should be driven or connected to pin 4.

To connect the instrument to a PC, use a 9 pin female to 9 pin female null modem cable:

1 & 6	-	4
2	-	3
3	-	2
4	-	1 & 6
5	-	5
7	-	8
8	-	7

2 Communication commands

***CLS** ***CLS**

Function:	Clear status
Description:	Clears the *standard event status register.*
Format:	*CLS
Arguments:	none
Reply:	none
Example:	*CLS *ESR? 0
Notes:	

***ESE** ***ESE**

Function: Set standard event status enable register.

Description: Enable which bits of the *standard event status register* set the ESB bit in the serial poll status byte..

Format: *ESE, value

Arguments: decimal equivalent of bits in standard event status enable register

Reply: can be read by *ESE?

Example: *ESE, 60

Notes: The following bits in the standard event status enable register have been implemented:

bit 0 OPC (operation complete)
bit 2 QYE (unterminated query error)
bit 3 DDE (device dependent error)
bit 4 EXE (execution error)
bit 5 CME (command interpretation error)
bit 7 PON (power on event)

For example, *ESE, 60 enables all the error bits so that the ESB bit in the serial poll status byte is set in the event of any error.

***ESR?** ***ESR?**

Function: Standard event status register query

Description: Returns the contents of the *standard event status register* and clears it.

Format: *ESR?

Arguments: none

Reply: decimal equivalent of bits in standard event status register

Example: *ESR?
33

Notes: The following bits in the standard event status register have been implemented:

bit 0 OPC (operation complete)
bit 2 QYE (unterminated query error)
bit 3 DDE (device dependent error)
bit 4 EXE (execution error)
bit 5 CME (command interpretation error)
bit 7 PON (power on event)

For example, if a command is sent incorrectly and is not recognised, the CME bit will be set and the value of 33 will be returned.

***IDN?** ***IDN?**

Function:	Identify query
Description:	Returns a standard format identification string.
Format:	*IDN?
Arguments:	none
Reply:	An ASCII string in the IEEE488.2 format: manufacturer,model,serial no,version
Example:	*IDN? NEWTONS4TH,PSIMETRIQ,01234,1.00
Notes:	

***OPC?** ***OPC?**

Function:	Test for operation complete
Description:	Returns 1 if previous operation is completed, 0 if not.
Format:	*OPC?
Arguments:	none
Reply:	0 or 1
Example:	START *OPC? 0 *OPC? 0 *OPC? 1
Notes:	*OPC? can be used to indicate when data is available or when a frequency sweep has completed.

***RST** ***RST**

Function: Reset

Description: Resets the instrument to the default state and clears the *standard event status register*.

Format: *RST

Arguments: none

Reply: none

Example: *RST

Notes: The *RST command loads the default configuration. This is the same as loading the default configuration via the PROGRAM menu.

Any preceding setup commands will be overwritten.

*RST should be followed by an end of line not a message separator. It may be helpful to follow it with a short pause to allow the new configuration to become active before sending further commands.

***SRE** ***SRE**

Function:	Set service request enable register.
Description:	Enable which bits of the *status byte register* initiate a service request.
Format:	*SRE, value
Arguments:	decimal equivalent of bits in status byte register
Reply:	can be read by *SRE?
Example:	*SRE, 1 generate a service request when data available.
Notes:	

***SRE?** ***SRE?**

Function: Read service request enable register.

Description: Read back the present setting of the service request enable register.

Format: *SRE?

Arguments:

Reply: decimal equivalent of bits in status byte register that would generate a service request.

Example: *SRE?
1

Notes:

***STB?** ***STB?**

Function:	Read serial poll status byte
Description:	Returns the decimal value of the serial poll status byte.
Format:	*STB?
Arguments:	none
Reply:	decimal value of the serial poll status byte
Example:	*STB? 1
Notes:	The following bits in the serial poll status register have been implemented: bit 0 RDV (results data available) bit 1 SDV (sweep data available) bit 3 ALA (alarm active) bit 4 MAV (message available) bit 5 ESB (standard event summary bit)

***TRG** ***TRG**

Function:	Trigger
Description:	Initiates a new measurement, resets the ranging and filtering.
Format:	*TRG
Arguments:	none
Reply:	none
Example:	MODE,VRMS *TRG VRMS?
Notes:	

***TST?** ***TST?**

Function: Self test query

Description: Returns the results of self test

Format: *TST?

Arguments: none

Reply: single integer
bit 0 – set if uncalibrated
bit 1 – set if error with analogue zero
> 15 – major system error

Example: *TST?
0

Notes:

***WAI** ***WAI**

Function:	Wait for operation complete
Description:	Suspends communication until the previous operation has completed
Format:	*WAI
Arguments:	none
Reply:	none
Example:	GAINPH START *WAI GAINPH,SWEEP?
Notes:	In the example, the query command GAINPH,SWEEP? can be sent immediately after the *WAI command and the sweep data will be returned as soon as the sweep has completed.

ABORT **ABORT**

Function:	Abort sweep
Description:	Abort an active sweep.
Format:	ABORT
Arguments:	none
Reply:	none
Example:	FSWEEP,1000,1E5,5E5 START ABORT

Notes:

ACRMS **ACRMS**

Function:	Set up rms voltmeter.
Description:	Set mode to rms voltmeter.
Format:	ACRMS
Arguments:	none
Reply:	none
Examples:	ACRMS
Notes:	This has the same effect as MODE,ACRMS

ACRMS? **VRMS?**

Function: Read true rms voltmeter results

Description: Reads back latest voltmeter results.
Waits for next unread data if necessary.
Clears new data available status bit.

Format: ACRMS?

Arguments:

Reply: 10 data values separated by commas
Ch1 Vrms, Ch2 Vrms, Ch1 Vdbm, Ch2 Vdbm, Ch1 Pk, Ch2 Pk, Ch1 CF, Ch2 CF, Ch1 Surge ,Ch2 Surge

Example: ACRMS?

Notes:

ACTRIM **ACTRIM**

Function: Set ac control parameters

Description: Sets the specified signal level, tolerance and input channel. for the ac control (amplitude compression).

Format: ACTRIM,*channel,level,tolerance*

Arguments: channel:
DISABL
CH1
CH2
level:
required ac level in V or A or dBm
tolerance:
required accuracy in percent

Reply: none

Example: ACTRIM,CH1,1.0,5 (1.0V, 5%)

Notes: The level should be set in dBm if dBm mode is selected

It is not necessary to send all the arguments but those that are sent must be in the correct sequence.

AMPLIT **AMPLIT**

Function:	Set output amplitude
Description:	Sets the output amplitude in Volts or dBm for the generator.
Format:	AMPLIT,*amplitude*
Arguments:	peak amplitude in Volts or amplitude in dBm
Reply:	none
Example:	AMPLIT,0.5 (set peak amplitude to 0.5V)
Notes:	The amplitude may be Volts or dBm.

BEEP **BEEP**

Function: Sound the buzzer

Description: Makes a “beep” from the instrument.

Format: BEEP

Arguments: none

Reply: none

Example: BEEP

Notes:

BLANKI **BLANKI**

Function: Select blanking

Description: Enable or disable low value blanking.

Format: BLANKI,*value,threshold*

Arguments: value:
ON
OFF
threshold:
threshold in appropriate units

Reply: none

Example: BLANKI,OFF
BLANKI,ON,-35

Notes:

CONFIG **CONFIG**

Function:	Direct access of configuration parameters
Description:	Sets configuration parameter for which there may not be a direct command.
Format:	CONFIG,*index*,*data*
Arguments:	index is the number of the parameter data is the data for that parameter
Reply:	none
Example:	CONFIG,6,1 (set phase convention)
Notes:	The list of configurable parameters is given in the appendix. CONFIG goes through the same limit checking as when entering data from the menus.

CONFIG? **CONFIG?**

Function:	Configurable parameter query
Description:	Reads the present value of a single parameter.
Format: or:	CONFIG,*index?* CONFIG?*index*
Arguments:	index is the parameter number
Reply:	Value of parameter, real or integer as appropriate.
Example:	CONFIG,6? (read phase convention) 0 CONFIG,6,1 CONFIG,6? 1
Notes:	The list of configurable parameters is given in the appendix.

DAV? **DAV?**

Function: Data available query

Description: Returns data availability status.

Format: DAV?

Arguments: none

Reply: Decimal equivalent of data available bits:

bit0	new data available
bit1	data available
bit2	new full sweep data available
bit3	sweep data available
bit4	streaming data available
bit5	more streaming data to come
bit6	integration data available
bit7	datalog data available

Example:

```
START          (trigger sweep)
DAV?
0
DAV?
11             (first data available)
DAV?
11
DAV?
11
DAV?
15             (full sweep data available)
```

Notes: DAV? does not modify the status bits.

DAVER **DAVER**

Function: Set data available enable register

Description: Sets bits in the data available enable register to control which status bits set the data available bits in the status byte.

Format: DAVER,value

Arguments: decimal equivalent of data available bits
bit0 set bit 0 of status byte when new data available
bit1 set bit 0 of status byte when data available
bit2 set bit 1 of status byte when new full sweep data available
bit3 set bit 1 of status byte when sweep data available
bit4 set bit 2 of status byte when streaming data available
bit5 set bit 2 of status byte if more streaming data is to come

Reply: none

Example: DAVER, 4
set bit 1 in status byte only when full sweep data is ready

Notes: default value is 6:
bit 0 of status byte is set whenever data is available
bit 1 of status byte is set when full sweep data is available.

DAVER? **DAVER?**

Function:	Read data available enable register
Description:	Read back present setting of the data available enable register, which controls the status bits that set the data available bits in the status byte.
Format:	DAVER?
Arguments:	none
Reply:	decimal equivalent of bits
Example:	DAVER? 4
Notes:	

FILTER **FILTER**

Function: Select the filtering

Description: Sets the filter time constant and dynamic response.

Format: FILTER,*type,dynamics*

Arguments: type:
- NONE
- NORMAL
- SLOW

dynamics:
- AUTO
- FIXED

Reply: none

Example: FILTER,NORMAL,FIXED
FILTER,NONE

Notes: It is not necessary to send both parameters if it is only required to set the type. Both arguments must be sent to set the dynamics.

FRA **FRA**

Function:	Set frequency response analyser mode.
Description:	Set frequency response analyser mode.
Format:	FRA
Arguments:	
Reply:	none
Example:	FRA
Notes:	This command has the same effect as MODE,GAINPH. FRA, GAINPH, TFA are aliases for the same command.

FRA? **FRA?**

Function:	frequency response analyser query
Description:	Read frequency response analyser results. Sets frequency response analyser mode if not already set. Waits for next unread data if necessary. Clears new data available bit read by DAV?
Format: or: or:	FRA? FRA?SWEEP FRA,SWEEP?
Arguments:	none, or SWEEP
Reply:	6 data values separated by commas freq, mag1,mag2,db,phase,gain one line per result for sweep data
Example:	OUTPUT,ON FRA FSWEEP,20,10,20E3 START DAV? 3 DAV? 15 FRA?SWEEP data returned
Notes:	FRA? waits for next unread data. FRA?SWEEP does not wait for new data – data can be read multiple times. FRA, GAINPH, TFA are aliases for the same command

FREQUE **FREQUE**

Function:	Set the output frequency
Description:	Sets the generator output frequency in Hz.
Format:	FREQUE,*frequency*
Arguments:	frequency in Hz
Reply:	none
Example:	FREQUE,5e4 (set frequency to 50kHz)
Notes:	

FSWEEP **FSWEEP**

Function: Set the frequency sweep parameters

Description: Sets the start frequency in Hz, the end frequency, the number of steps and log/linear for the selected function.

Format: FSWEEP,*steps,start,end,type*

Arguments:
steps:
number of steps
start:
start frequency in Hz
end:
end frequency in Hz
type:
LOGARI
LINEAR

Reply: none

Example:
MODE,GAINPH
FSWEEP,50,1000,1e6
(set 50 steps between 1kHz and 1MHz)

Notes: It is not necessary to send all the arguments, but if they must be in the specified order.
The same command is used for all the functions – the data is applied to whichever function has been selected if valid (such as gain/phase analyser). If the selected mode is not valid (such as rms), then the command is ignored and an execution error is flagged in the standard event status register, sesr.

GAINPH **GAINPH**

Function:	Set gain/phase analyser mode.
Description:	Set gain/phase analyser mode.
Format:	GAINPH
Arguments:	
Reply:	none
Example:	GAINPH
Notes:	This command has the same effect as MODE,GAINPH. FRA, GAINPH, TFA are aliases for the same command.

GAINPH? **GAINPH?**

Function:	Gain/phase query
Description:	Read gain/phase analyser results. Sets gain/phase analyser mode if not already set. Waits for next unread data if necessary . Clears new data available bit read by DAV?
Format: or: or:	GAINPH? GAINPH?SWEEP GAINPH,SWEEP?
Arguments:	none, or SWEEP
Reply:	6 data values separated by commas freq, mag1,mag2,db,phase,gain one line per result for sweep data
Example:	OUTPUT,ON GAINPH FSWEEP,20,10,20E3 START DAV? 3 DAV? 15 GAINPH?SWEEP data returned
Notes:	GAINPH? waits for next unread data. GAINPH?SWEEP does not wait for new data – data can be read multiple times.

HOLD **HOLD**

Function: Set/clear HOLD mode

Description: HOLD mode stops the instrument from updating the measured values

Format: HOLD,*value*

Arguments: value:
ON
OFF

Reply: none

Example: HOLD,ON

Notes:

INPUT **INPUT**

Function:	Set input mode
Description:	Selects the input type of the instrument
Format:	INPUT,*type,impedance*
Arguments:	type: LOLEVEL impedance: 50OHMS HIIMPEDANCE
Reply:	none
Example:	INPUT,LOLEVE,HIIMPE
Notes:	The impedance value is only valid for the low level input

KEYBOA **KEYBOA**

Function: Disable front panel keyboard.

Description: The front panel keyboard can be disabled to prevent accidental operation.

Format: KEYBOARD*,value*

Arguments: value:
ENABLE
DISABLE

Reply: none

Example: KEYBOARD,DISABLE

Notes: The keyboard can be re-enabled from the front panel only by pressing the HOME key.

LCR **LCR**

Function: Set LCR meter mode.

Description: Set LCR mode and model.

Format: LCR,*model*

Arguments: model:
IMPEDANCE
SERIES
PARALLEL

Reply: none

Example: LCR, IMPEDA

Notes:

LCR?	**LCR?**
Function:	LCR meter query
Description:	Read LCR meter results. Sets LCR meter mode if not already set. Waits for next unread data if necessary. Clears new data available bit read by DAV?
Format: or: or:	LCR? LCR?SWEEP LCR,SWEEP?
Arguments:	none, or SWEEP
Reply:	5 data values separated by commas: frequency, resistance, reactance, impedance, phase one line per result for sweep data
Example:	OUTPUT,LOLEVE LCR? data returned
Notes:	LCR? waits for next unread data. LCR?SWEEP does not wait for new data – data can be read multiple times.

MARKER **MARKER**

Function: Set frequency marker

Description: Enable or disable frequency marker.

Format: MARKER,*value,frequency*

Arguments: value:
Off
Single
Dual
frequency:
marker frequency in Hz

Reply: none

Example: MARKER,OFF
MARKER,Single,25e3

Notes: It is not necessary to send the frequency when enabling the marker if it has already been set.

MODE **MODE**

Function:	Set mode
Description:	Sets the fundamental operating mode of the instrument.
Format:	MODE,*type*
Arguments:	type: ACRMS LCR FRA SCOPE
Reply:	none
Example:	MODE,LCR
Notes:	MODE sets the measurement mode of the instrument

OUTPUT **OUTPUT**

Function: Set output

Description: Turns the output on or off, or sets the level mode to dBm or voltage. Also specifies action at the end of a sweep

Format: OUTPUT,*type*

Arguments: command:
OFF
ON

Reply: none

Example: OUTPUT,ON

Notes: For safety, the output defaults to off and must be turned on explicitly.

PHCONV **PHCONV**

Function:	Set phase convention
Description:	Set phase convention
Format:	PHCONV,*convention*
Arguments:	convention: 180: -180 to +180 -360: 0 to -360 +360: 0 to +360
Reply:	none
Example:	PHCONV, -360
Notes:	
Notes:	Number 0 represents factory default, which can only be recalled.

PROGRA? **PROGRA?**

Function:	Identify current program.
Description:	Reads the name of the last program to be loaded or recalled.
Format:	PROGRA?
Arguments:	none
Reply:	text string
Example:	PROGRA? factory default
Notes:	

RANGE **RANGE**

Function: Set channel ranging.

Description: Select minimum range and range control for a given input channel.

Format: RANGE,*channel*,*ranging*,*range*

Arguments:
channel:
- CH1
- CH2

ranging:
- AUTO
- UPAUTO
- MANUAL

range:
- nominal range value

Reply: none

Example: RANGE,CH2,MANUAL,3V

Notes:

RESOLU **RESOLU**

Function: Set the data resolution

Description: Data is returned in scientific format with exponent and mantissa. The resolution of the mantissa may be selected to be 5 digit (NORMAL) or 6 digit (HIGH).

Format: RESOLU,*format*

Arguments: format:

NORMAL	(5 digit mantissa)
HIGH	(6 digit mantissa)
BINARY	(raw binary format)

Reply: none

Example: RESOLU,HIGH

Notes: The resolution only changes the real number replies.
Data format for NORMAL is:
[-]1.2345E[-]00
Data format for HIGH is:
[-]1.23456E[-]00
The signs of the mantissa and exponent, shown as [-] in the above examples, are only sent if they are negative.
Data format for BINARY is a proprietary floating point format which returns raw data in a minimum number of data bytes.

RESULT **RESULT**

Function: Access non volatile results stores.

Description: Recall, store or delete non-volatile results store.

Format: RESULT,*function,number*

Arguments: function:
- RECALL
- STORE
- DELETE

number
- 1-999

Reply: none

Example: RESULT,RECALL,13

Notes:

REZERO **REZERO**

Function:	Rezero front end
Description:	Request the DSP to re-compensate for dc offset and compute a new autozero
Format:	REZERO
Arguments:	none
Reply:	none
Example:	REZERO
Notes:	

SCALE **SCALE**

Function: Set channel scale factor.

Description: Set a multiplying scale factor for a given input channel.

Format: SCALE,*channel*,*factor*

Arguments: channel:
CH1
CH2
factor:
multiplying scale factor

Reply: none

Example: SCALE,CH2,10

Notes:

SCREEN? **SCREEN?**

Function:	Read the screen data
Description:	Returns a bit map of screen pixel display in ascii and hex format
Format:	SCREEN?
Arguments:	none
Reply:	Multiple data bit values
Example:	SCREEN? data returned

Notes: SCREEN? response:

ASCII coded Hex
(2 characters for each byte)
240 lines of 40 bytes (each line represents one line of the display) preceded by #H
Each byte represents 8 dots where the lsb is the leftmost dot of the display
The bit is set for on and cleared for off

SPEED **SPEED**

Function: Sets the measurement speed

Description: Sets the minimum window size for the measurement (FRA and LCR modes).

Format: SPEED,*value*
SPEED,WINDOW,*time*

Arguments: value:
- FAST
- MEDIUM
- SLOW
- VSLOW
- VFAST
- WINDOW

time:
- window time in seconds

Reply: none

Example: SPEED,SLOW

Notes:

START **START**

Function:	Start sweep
Description:	Initiate sweep in those functions that have a sweep or resets filtering in others.
Format:	START
Arguments:	none
Reply:	none
Example:	FSWEEP,100,50000,75000 START
Notes:	

STATUS? **STATUS?**

Function: Read back channel ranging status.

Description: Read back condition of selected channel:
- range number (1-16)
- range text
- overflow/underflow status

Format: STATUS,*channel*?
or: STATUS?*channel*

Arguments: channel:
- CH1
- CH2

Reply: range number,range text,over/under/ok
- 1-16
- range as per RANGE command
- OVER if overflow
- LOW if underflow
- OK if in range

Example: STATUS,CH1?
6,3V,OK

Notes:

STOP **STOP**

Function:	Stop sweep
Description:	Stop an active sweep.
Format:	STOP
Arguments:	none
Reply:	none
Example:	FSWEEP,100,50000,75000 START STOP

Notes:

TCOMM? **TCOMM?**

Function:	Read the Comments relating to tranformer
Description:	Comments
Format:	TCOMM?
Arguments:	none
Reply:	Transformer Reference terminal terminated by CR
Example:	TCOMM? abcdefg
Notes:	

TCOMM **TCOMM**

Function:	Transformer Comments
Description:	Comments to state the condition of the DUT during measurement
Format:	TCOMM,*Comments*
Arguments:	*Comments*
Reply:	none
Example:	TCOMM,abcd
Notes:	Max 20 Characters

TCON? **TCON?**

Function:	Read the Transformer Connected Terminals
Description:	Transformed Connected Terminals
Format:	TCON?
Arguments:	none
Reply:	Transformer ID terminated by CR
Example:	TCON? A1-B1-C1
Notes:	

TCON **TCON**

Function:	Set Transformer Connected Terminal
Description:	Sets the transformer Connected Terminal, the identification of all test objects terminals that were connected together during the measurement
Format:	TCON,*ConnTerminal*
Arguments:	*ConnTerminal*
Reply:	none
Example:	TCON,a1-b1-c1
Notes:	

TFA **TFA**

Function:	Set transfer function analyser mode.
Description:	Set transfer function analyser mode.
Format:	TFA
Arguments:	
Reply:	none
Example:	TFA
Notes:	This command has the same effect as MODE,GAINPH. FRA, GAINPH, TFA are aliases for the same command.

TFA? **TFA?**

Function:	transfer function analyser query
Description:	Read transfer function analyser results. Sets transfer function analyser mode if not already set. Waits for next unread data if necessary. Clears new data available bit read by DAV?
Format: or: or:	TFA? TFA?SWEEP TFA,SWEEP?
Arguments:	none, or SWEEP
Reply:	6 data values separated by commas freq, mag1,mag2,db,phase,gain one line per result for sweep data
Example:	OUTPUT,ON TFA FSWEEP,20,10,20E3 START DAV? 3 DAV? 15 TFA?SWEEP data returned
Notes:	TFA? waits for next unread data. TFA?SWEEP does not wait for new data – data can be read multiple times. FRA, GAINPH, TFA are aliases for the same command

TFLUID **TFLUID**

Function: Set transformer fluid filled

Description: Sets the transformer fluid filled ,Yes or NOPE depending on whether the test object was fully filled with the normal operating fluid during measurement

Format: TFLUID,*type*

Arguments: command:
YES
NOPE

Reply: none

Example: TFLUID,YES

Notes:

TID? **TID?**

Function: Read the Transformer ID

Description: Returns the transformer ID

Format: TID?

Arguments: none

Reply: Transformer ID terminated by CR

Example: TID?
0123456789

Notes:

TID **TID**

Function: Set Transformer ID

Description: Sets the transformer ID.

Format: TID,*ID*

Arguments: ID

Reply: none

Example: TID,234 (set transformer ID to 234)

Notes:

TMANU? **TMANU?**

Function:	Read the Transformer Manufacturer
Description:	Returns the transformer Manufacturer
Format:	TMANU?
Arguments:	none
Reply:	Transformer Manufacturer ID terminated by CR
Example:	TMANU? Transformer Sols
Notes:	

TMANU **TMANU**

Function:	Set Transformer Manufacturer ID
Description:	Sets the transformer manufacturer ID.
Format:	TMANU,*manID*
Arguments:	manID
Reply:	none
Example:	TMANU,ABCDEF (set transformer manufacturer ID to ABCDEF)
Notes:	

TOLTC **TOLTC**

Function:	Transformer OLTC
Description:	Sets the transformer OLTC tap position, the tap position indicated on the test object during measurement
Format:	TCOMM,*OLTC*
Arguments:	*Comments*
Reply:	none
Example:	TOLTC,21
Notes:	

TREF? **TREF?**

Function:	Read the Transformer Reference Terminal
Description:	Returns the transformer Reference Terminal, the identification of the test object terminal to which the reference and the source lead was connected
Format:	TREF?
Arguments:	none
Reply:	Transformer Reference terminal terminated by CR
Example:	TREF? abcdefg
Notes:	

TREF **TREF**

Function:	Set Transformer Reference Terminal
Description:	Sets the transformer Reference Terminal, the identification of the test object terminal to which the reference and the source lead was connected
Format:	TREF,*RefTerm*
Arguments:	Reftern
Reply:	none
Example:	TREF,abcd
Notes:	

TRES? **TRES?**

Function:	Read the Transformer Response Terminal
Description:	Returns the transformer Response Terminal, the identification of the test object terminal to which the response lead was connected
Format:	TRES?
Arguments:	none
Reply:	Transformer Response terminal terminated by CR
Example:	TRES? abcdefg
Notes:	

TRES **TRES**

Function: Set Transformer Response Terminal

Description: Sets the transformer Response Terminal, the identification of the test object terminal to which the response lead was connected

Format: TRES,*ResTerm*

Arguments: Restern

Reply: none

Example: TRES,abcd

Notes:

TSER? **TSER?**

Function:	Read the Transformer Serial Number
Description:	Returns the transformer Serial Number
Format:	TSER?
Arguments:	none
Reply:	Transformer Serial Number terminated by CR
Example:	TSER? 0123456789
Notes:	

TSER **TSER**

Function:	Set Transformer Serial Number
Description:	Sets the transformer Serial Number.
Format:	TSER,*ID*
Arguments:	ID
Reply:	none
Example:	TSER,234 (set transformer serial ID to 234)
Notes:	

TTEMP **TTEMP**

Function:	Set the temperature of the test object dielectric during measurement
Description:	Set the temperature of the test object dielectric during measurement
Format:	TTEMP,*temperature*
Arguments:	Temperature in degree Celsius
Reply:	none
Example:	TTEMP,23.2 (set temperature to 23.2°C)
Notes:	

TUNSHL **TUNSHL**

Function:	Set the length of unshielded Connection unit of the transformer
Description:	Set the length of unshielded Connection unit of the transformer in mm
Format:	TUNSHL,*length*
Arguments:	length in mm
Reply:	none
Example:	TUNSHL,22 (set length to 22mm)
Notes:	

USER? **USER?**

Function: Read the user data

Description: Returns up to 3 lines of user data

Format: USER?

Arguments: none

Reply: 3 lines of ASCII terminated by CR

Example: USER?
Newtons4th Ltd
R&D department
SFRA45 #4

Notes:

VERSIO? **VERSIO?**

Function:	Read the instrument code versions.
Description:	Returns an ASCII string with the details of the various parts of the instrument firmware.
Format:	VERSIO?
Arguments:	none
Reply:	date code, type, cpu, dsp, fpga, boot
Examples:	VERSION? PQ3504,1,2.01,2.20,2.20,2.02
Notes:	This data can be displayed on the screen by pressing SYSTEM then BACK

WAVEFO **WAVEFO**

Function: Set the output waveform

Description: Selects the output waveform for the signal generator.

Format: WAVEFO,*type*

Arguments: type:

SINEWA	(sine wave)
TRIANG	(triangle wave)
SQUARE	(square wave)
NOISE	(white noise)
RAMP	(ramp)

Reply: None

Example:
```
FREQUE,500
WAVEFO,TRIANG    (triangle wave)
OUTPUT,ON
```

Notes:

ZERO **ZERO**

Function: Apply or remove the zero

Description: Applies or removes a zero function depending on the measurement mode (same as pressing ZERO key).
Performs lead compensation in LCR mode.

Format:
ZERO
ZERO,DELETE
ZERO,DB,*offset*
ZERO,PHASE,*offset*

LCR compensation:
ZERO,SINGLE
ZERO,SWEEP,*steps,start,finish*
ZERO,OPEN
ZERO,SHORT
ZERO,STORE
ZERO,RECALL

Arguments:
offset:
offset value
steps:
LCR sweep compensation steps
start:
LCR compensation start frequency
stop:
LCR compensation stop frequency

Reply: none

Example:
ZERO,SWEEP,100,1e3,1e6
ZERO,OPEN
performs open circuit compensation

Notes:

Appendices

COMMAND SUMMARY

CONFIGURABLE PARAMETERS

command format	reply format
*CLS	
*ESE,value	
*ESE?	single integer data value
*ESR?	single integer data value
*IDN?	company,product,serial no,version
*OPC?	0 or 1
*RST	
*SRE,value	single integer data value
*SRE?	
*STB?	single integer data value
*TRG	
*TST?	single integer data value
*WAI	
ABORT	
ACRMS?	10 data values (RMS results)
ACRMS	
ACTRIM,channel, level, tol	
AMPLIT,amplitude	
BEEP	
BLANKI,on/off,threshold	
CONFIG,parameter,data	
CONFIG,parameter?	single integer or real data value
DAV?	single integer data value
DAVER,value	
DAVER?	single integer data value
FILTER,type,dynamics	
FRA	
FRA?	freq,gain,phase,dB,mag1,mag2
FRA,SWEEP?	n lines of FRA? data
FREQUE,frequency	
FSWEEP,steps,start,end,log	
GAINPH	
GAINPH?	freq,mag1,mag2,db,phase,gain
GAINPH,SWEEP?	n lines of GAINPH? data
HOLD,on/off	
INPUT,type,impedance	
KEYBOA,value	
LCR,conditions,param,head	
LCR?	freq, resistance, reactance, impedance, phase
LCR,SWEEP?	n lines of data:

MARKER,on/off,frequency	
MODE,type	
OUTPUT,on/off	
PHCONV,convention	
PROGRAM,function,number	
PROGRAM?	CR terminated text string
RANGE,ch,ranging,range	
RESOLU.format	
RESULT,function,number	
REZERO	
SCALE,channel,factor	
SCALE,channel?	single real data value
SCREEN?	Multiple data bit values
SPEED,speed	
START	
STATUS,channel?	range number,range text,over/low/ok
STOP	
TCOMM, comments	
TCOMM?	Comments
TCON, conterminal	
TCOM?	Connected Terminals
TFA	
TFA?	freq,gain,phase,dB,mag1,mag2
TFA,SWEEP?	n lines of TFA? Data
TFLUID,yes/no	
TID, identifier	
TID?	Identifier
TMANU, manufacturer	
TMANU?	Manufacturer
TOLTC, oltc	
TREF, refterm	
TREF?	Reference Terminal
TRES, resterm	
TRES?	Response Terminal
TSER, serial No	
TSER?	Serial Number
TTEMP, temperature	
TTEMP?	Temperature
TUNSHL, length	
USER?	3 CR terminated text strings
VERSION?	datecode,type,cpu,dsp,fpga,boot

WAVEFO,type
ZERO
ZERO,DELETE

calibration commands

CALAPP	
CALCOM,freq	
CALDCO,value	
CALFIL,index,value	
CALFIL?	six real data values
CALFRQ,index,freq	
CALFRQ?	seven real data values
CALHF,index,value	
CALIBR,index,value	
CALIBR?	single integer data value
CALIDS,string	
CALIDS?	string
CALOUT,index,value	
CALPHA,index	
CALRES	
CALSAV,password	
CALSNO,serial number	
CALSTR,string	
CALSTR?	string

Appendix B – Configurable parameters

All parameters can be accessed using the CONFIG command:
CONFIG,*parameter,data*

Number	Function
	System parameters
1	Operating mode, (Sets main mode) 0=AC RMS Voltmeter 1=Impedance Meter 2=Oscilloscope 4=Frequency Response Analyser
2	Interface, (Remote settings) 0=RS232 1=USB 2=LAN
3	Bandwidth auto or wide, (Acquisition Settings) 0=Wide 1=Low 2=Auto
6	Phase convention, (System Options) 0=-180° to +180° 1=0° to -360° 2=0° to +360°
7	Output , (Generator settings) 0=Off 1=On
8	Step message, (System Options) 0=Disabled 1=Enabled
9	Keyboard beep on/off, (System Options) 0=Enabled 1=Disabled

12 User Window, (FRA/LCR Measurement Settings – enter figure in sec)

13 Speed, (FRA/LCR Measurement Settings)
0=Very Slow
1=Slow
2=Medium
3=Fast
4=Very Fast
5=Window

14 Filter, (FRA/LCR Measurement Settings)
0=Normal
1=Slow
2=None
3=None + fast response

16 Baud rate, (Remote Settings "RS232")
0=38400
1=19200
2=9600
3=1200

18 Sweep steps, (Sweep Settings Enter step number figures)

19 Sweep start frequency, (Sweep Settings-Enter figures)

20 Sweep stop frequency, (Sweep Settings-Enter figures)

21 Sweep type, (Sweep Settings)
0=Single
1=Continuous

22 Resolution, (Remote Settings)
0=Normal
1=High

28 CH1 input ranging, (Input Settings)
0=Full Autorange
1=Range Up Only
2=Manual

29 CH2 input ranging, (Input Settings FRA Only)
0=Full Autorange
1=Range Up Only
2=Manual

32 CH1 scale factor, (Input Settings-Enter figures)

33 CH2 scale factor, (Input Settings-Enter figures)

39 Brightness, (System Options)
0=Low
1=High

40 Display, (System Options)
0=Colour
1=White on black
2=Black on white

42 Enlarge results, (System Options)
0=Off
1=On

47 Display type, (Sweep Settings)
0=Real time
1=Table
2=Graph

48 Generator frequency, (Generator Settings-Enter figures)

49 Low output amplitude V, (Generator Settings-Low output-Enter figures)

51 Generator waveform, (Generator Settings)
0=Sinewave
1=Square wave
2=Triangle
3=Ramp
4=Noise

52 Frequency step, (Generator Settings-Enter figures)

53 Amplitude Step, (Generator Settings-Enter figures)

54 Low output amplitude dBm, (Generator Settings-Enter dBm figures)

55 Amplitude step, (Generator Settings-Enter dB figures)

56 Amplitude control, (Generator Settings)
0=Volts
1=dBm

60 Sweep type, (Sweep Settings +Step Type)
0=Logarithmic
1=Linear

61 Gain Graph scaling, (Sweep Settings)
0=Auto
1=Manual

62 Gain Graph max, (Sweep settings-Enter figures)

63 Gain Graph min, (Sweep settings-Enter figures)

64 Frequency marker, (Sweep Settings)
0=Off
1=Single
2=Dual

65 Marker frequency 1, (Sweep Settings-Marker on-Enter figures)

66 Search for peak, (Sweep Settings)
0=Disable
1=Single
2=Dual

67 N4L Clamps, (Ch1/Ch2 Inputs)
0=No
1=Yes

68 Marker frequency 2, (Sweep Settings-Marker on-Enter figures)

75 Graph, (FRA Settings)
0=Dual
1=Gain
2=Phase

76 Computation, (FRA Settings)
0=CH2/CH1
1=CH1/CH2

88 Timebase, (Oscilloscope Settings-Enter figures)

89 Trigger level, (Oscilloscope Settings-Enter figures)

90 Pretrigger, (Oscilloscope Settings)
0=None
1=25%
2=50%
3=75%

91 Trigger polarity, (Oscilloscope Settings)
0=Rising edge
1=Falling edge

92 Trigger mode, (Oscilloscope Settings)
0=Auto
1=Normal
2=Single shot

94 Traces, (Oscilloscope Settings)
0=Single
1=Dual
2=CH2 Current

95 Trigger channel, (Oscilloscope Settings)
0=CH1
1=CH2

104 Measurement, (LCR Settings)
0=Impedance magnitude
1=Parallel circuit
2=series circuit

110 Search for peak, (Sweep Settings, LCR Mode)

0=Off
1=Single
2=Dual

112 Initial settings, (System settings)
0=Program 1
1=Factory default
2=As last used

113 Peak hold, (Sweep Settings)
0=Off
1=On

117 IP Address, (Remote settings-LAN-Entee address numbers)

121 Language, (System Settings)
0=English
1=Italian

161 AC Trim Enable, (Trim Settings)
0=Disabled
1=Ch1
2=Ch2

162 AC Trim Level (Trim Settings-Enter numbers)

163 AC Trim Tolerance (Trim Settings-Enter numbers)

164 Transformer Unshielded Length, (DUT-Enter figures)

165 Transformer Temperature, (DUT-Enter figures)

166 Transformer Fluid Filled, (DUT Settings)
0=Yes
1=No

169 Transformer OLTC, (DUT-Enter figures)

170 DUT Mode, (DUT Settings)
0=None
1=Power Transformers

171 Phase Graph scaling, (Sweep Settings)
0=Auto

1=Manual

172 Phase Graph max, (Sweep settings-Enter figures)

173 Phase Graph min, (Sweep settings-Enter figures)

174 Zero Offset

177 Memory, (Program)
0=Internal
1=USB Memory stick

178 Data, (Program)
0=Program
1=Results

179 Action, (Program)
0=Recall
1=Store
2=Delete

180 Location, (Program - Enter figures as required)

185 Set clock hours, (System – Enter figures as required)

186 Set clock minutes, (System – Enter figures as required)

187 Set clock Seconds, (System – Enter figures as required)

188 Set date day, (System – Enter figures as required)

189 Set date month, (System – Enter figures as required)

190 Set date year, (System – Enter figures as required)

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