Newtons4th Ltd

SLM3505

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 SLM3505 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.

Revision 2.66

06th June 2014

CONTENTS

1 Using remote control 1-1

1.1 Standard event status register 1-3
1.2 Serial Poll status byte 1-4
1.3 RS232 connections 1-5

2 Communication commands 2-1

*CLS 2-1
*ESE 2-2
*ESR? 2-3
*IDN? 2-4
*OPC? 2-5
*RST 2-6
*SRE 2-7
*STB? 2-9
*TRG 2-10
*TST? 2-11
*WAI 2-12
ABORT 2-13
AMPLIT 2-14
BEEP 2-15
BLANKI 2-16
CONFIG 2-17
DAV? 2-19
DAVER 2-20
FILTER 2-22
FRA 2-23
FREQUE 2-25
FSWEEP 2-26
GAINPH 2-27
HOLD 2-29
INPUT 2-30
KEYBOA 2-31
LCR 2-32
MARKER 2-34
MODE 2-35
OUTPUT 2-36
PHCONV 2-37
RANGE 2-39
RESOLU 2-40
RESULT 2-41

RESULT? RESULT? 2-42
REZERO 2-43
SCALE 2-44
SCREEN? 2-45
SLM 2-46
SPEED 2-48
START 2-49
STATUS? 2-50
STOP 2-51
TFA 2-52
USER? 2-54
VERSIO? 2-55
VSWR 2-56
WAVEFO 2-58
ZERO 2-59

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

LAN port number for IP communication =
10001 (ten thousand and one)

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:

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 for either the low level or hi level output.

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: HILEVEL POWER LOLEVEL BALANCE impedance: 50OHMS 75OHMS 600OHMS 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:	14 data values separated by commas: freq, mag1, mag2, impedance, phase, series R, series L, series C, Parallel R, Parallel L, Parallel C, tanδ, Q, reactance.
sweep reply:	8 data values per line per sweep result: freq,Q,tanδ,impedance,phase,L,C,R
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: SLM LCR VSWR FRA SCOPE
Reply:	none
Example:	MODE,SLM
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,impedance*

Arguments: command:
OFF
LOLEVEL
HILEVEL
impedance:
50OHMS
75OHMS
600OHMS
HIIMPEDANCE

Reply: none

Example: OUTPUT,LOLEVE,600OHM

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:

RESULT? **RESULT?**

Function: Access non volatile results stores.

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

Format: RESULT,*function?*

Arguments: function:
NAME
FILES
N4LFIL
TXTFIL

Reply: NAME - name of current program
FILES - list of names of stored files
N4LFIL– results in .N4L format
TXTFIL– results in .TXT format

Example: RESULT,N4LFIL?

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

SLM **SLM**

Function: Set up selective level meter.

Description: Set mode to selective level meter, and set up centre frequency.

Format: SLM,*bandwidth,scan,freq1,freq2*

Arguments:
bandwidth:
- WIDE
- 3100HZ
- 1950HZ
- 100HZ
- 360Hz
- 400Hz
- 25HZ
- 3HZ

scan:
- GENERATOR
- AFC
- FIXED
- DUAL
- INPUT

frequency1:
- centre frequency in Hz

frequency2:
- dual frequency in Hz

Reply: none

Examples: SLM,100HZ,SINGLE,1.50e5

Notes: It is not necessary to send all the arguments, but if they must be in the specified order.

SLM? **SLM?**

Function:	Read selective level meter results
Description:	Reads back latest selective level meter results. Sets voltmeter mode if not already set. Waits for next unread data if necessary. Clears new data available bit read by DAV?
Format: or:	SLM? SLM,SWEEP?
Arguments:	none
Reply:	single: 3 data values separated by commas freq,mag,dbm dual: 6 data values separated by commas freq1,mag1,dbm1,freq2,mag2,dbm2 sweep: one result as above per line
Example:	SLM,100HZ,FIXED,150e3 SLM? 1.5000E5,7.3508E-2,-9.6630E+0 SLM? 1.5000E5,7.3511E-2,-9.6627E+0
Notes:	As SLM? does not send the same data twice but waits instead for the next result, it is not necessary to check the data available bits before sending the SLM? command.

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
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:

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

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 SLM3505 #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

VSWR **VSWR**

Function:	Set up VSWR meter.
Description:	Set mode to VSWR level meter with specified method.
Format:	VSWR,*method,scale*
Arguments:	method: impedance directional scale: scale factor for directional coupler
Reply:	none
Examples:	VSWR,IMPEDA
Notes:	

VSWR? **VSRW?**

Function:	Read VSWR meter results
Description:	Reads back latest VSWR meter results. Sets VSWR mode if not already set. Waits for next unread data if necessary. Clears new data available bit read by DAV?
Format: or:	VSWR? VSWR,SWEEP?
Arguments:	none
Reply:	6 data values separated by commas frequency, forward power, VSWR, reflection %, reflection dB, reflected power
Example:	VSWR,IMPEDA VSWR? 6 data values returned
Notes:	As VSWR? does not send the same data twice but waits instead for the next result, it is not necessary to check the data available bits before sending the VSWR? command.

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)

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	
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, mag1, mag2, impedance, phase, R, L, C (series), R, L, C (parallel), tanδ, Q, reactance

LCR,SWEEP?	n lines of data: freq,Q,tanδ,impedance, phase,L,C,R
MARKER,on/off,frequency	
MODE,type	
OUTPUT,type,impedance	
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
SHUNT,channel,resistance	
SHUNT,channel?	single real data value
SPEED,speed	
START	
STATUS,channel?	range number,range text,over/low/ok
STOP	
TFA	
TFA?	freq,gain,phase,dB,mag1,mag2
TFA,SWEEP?	n lines of TFA? data
USER?	3 CR terminated text strings
VERSION?	datecode,type,cpu,dsp,fpga,boot
VRMS	
VRMS?	rms,dbm
VSWR,method	
VSWR?	freq,fdbm,vswr,r%,rdb,rdbm
VSWR,SWEEP?	n lines of VSWR? data
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=Selective Level Meter 1=Impedance Meter 2=Oscilloscope 3=VSWR Meter 4=Frequency Response Analyser
2	Interface, (Remote settings) 0=RS232 1=USB 2=LAN
3	Bandwidth auto or wide, (SLM Measurements) 0=Wide 1=3.1KHz 2=1.95KHz 3=600Hz 4=400 5=360Hz 6=100Hz 7=25Hz 8=3Hz 9=1Hz
6	Phase convention, (System Options) 0=-180° to +180° 1=0° to -360° 2=0° to +360°
7	Output , (Generator settings) 0=Off 1=Low Output 2=High Output

8 Step message, (System Options)
0=Disabled
1=Enabled

9 Keyboard beep on/off, (System Options)
0=Enabled
1=Disabled

11 Output impedance, 50 Ohm Model
0=50Ω
1=75Ω
5=600Ω

Output impedance, 75 Ohm & E Spec Models
1=75Ω
2=120Ω
4=150Ω
5=600Ω

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

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

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

24 Input, (Input Settings)

0=High Z
1=50Ω 18W
2=Low level
3=Balanced

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)

36 Input impedance, 50 Ohm Model

0=50Ω
1=75Ω
5=600Ω
6=High Impedance

Input impedance, 75 Ohm & E Spec Models

0=50Ω
1=75Ω
2=120Ω
4=150Ω
5=600Ω
6=High Impedance

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)

50 FSK Control, (Generator Settings)
0=Disabled
1=Enabled

51 Generator waveform, (Generator Settings)
0=Sinewave
1=Triangle
2=Squarewave
3=White 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
2=dBu

57 Guard time, (Generator Settings-FSK control-Enter figures)

58 FSK Frequency "0", (Generator Settings-FSK control-Enter figures)

59 FSK Fequency "1", (Generator Settings-FSK control-Enter figures)

60 Sweep type, (Sweep Settings +Step Type -SLM/VSWR/Output & Tune)
0=Logarithmic
1=Linear

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

62 Graph max, (Sweep settings-Enter figures)

63 Graph min, (Sweep settings-Enter figures)

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

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

66 Search for peak, (Sweep Settings, SLM Mode)
0=Off
1=On

67 AutoTune type, (Tune Settings)
0=3 stage autotune
1=Single stage retune

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

70 High output amplitude V, (Generator Settings-Output high-Enter figures)

71 High output amplitude dBm, (Generator Settings-Enter dBm figures)

73 Reference Impedance, (Generator Settings)
0=Auto
1=50Ω
2=75Ω
6=600 Ω

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

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

78 Centre frequency, (SLM Settings)
0=Generator frequency
1=AFC
2=Single fixed
3=Dual fixed
4=Input frequency

80 Centre frequency 1, (SLM/VSWR/Tune Settings-Center Freq-Dual-Enter figures)

81 Centre frequency 2, (SLM Settings-Center Freq-Dual-Enter figures)

82 Threshold, (SLM Settings-Enter figures)

83 Frequency step, (For Logarithmic Frequency step setting-Enter figures)

84 Peak level, (SLM Settings)
0=Off
1=On

85 Frequency step, (For Linear Frequency step setting-Enter figures)

87 AFC Gain, (SLM measurement settings-centre frequency-AFC-Enter figures)

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

100 Method, (VSWR Settings)
0=Impedance
1=Directional coupler

101 Scale Factor, (VSWR Settings-Directional coupler-Enter figures)

102 Bandwidth, (VSWR Settings-Directional coupler)
0=3.1KHz
1=1.95KHz
2=100Hz
3=360Hz
4=400Hz
5=25Hz
6=3Hz
7=1Hz

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

114 Reference impedance
0=50Ω
1=75 Ω
2=120Ω
3=135Ω
4=150Ω
5=600Ω

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

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

128 Bargraph, (SLM Settings)
0=Off
1=On

129 Bargraph max, (SLM settings-Bargraph-Enter numbers)

130 Bargraph min, (SLM settings-Bargraph-Enter numbers)

132 Set Clock, (System settings-Hours)

133 Set Clock, (System settings-Mins)

134 Set Clock, (System settings-Secs)

135 Set Date, (System settings-Day)

136 Set Date, (System settings-Month)

137 Set Date, (System settings-Year)

Newtons4th Ltd. contact details

Please direct all queries or comments regarding the SLM3505 instruments or this manual to:

Newtons4th Ltd.
1 Bede Island Road
Leicester
LE2 7EA
United Kingdom

Tel: (0116) 230 1066
International +44 116 230 1066

Fax: (0116) 230 1061
International +44 116 230 1061

E-mail address: sales@newtons4th.com
office@newtons4th.com

Web site: www.newtons4th.com

At Newtons4th Ltd. we have a policy of continuous product improvement and are always keen to hear comments, whether favourable or unfavourable, from users of our products. Please telephone, fax, write or e-mail with your comments.