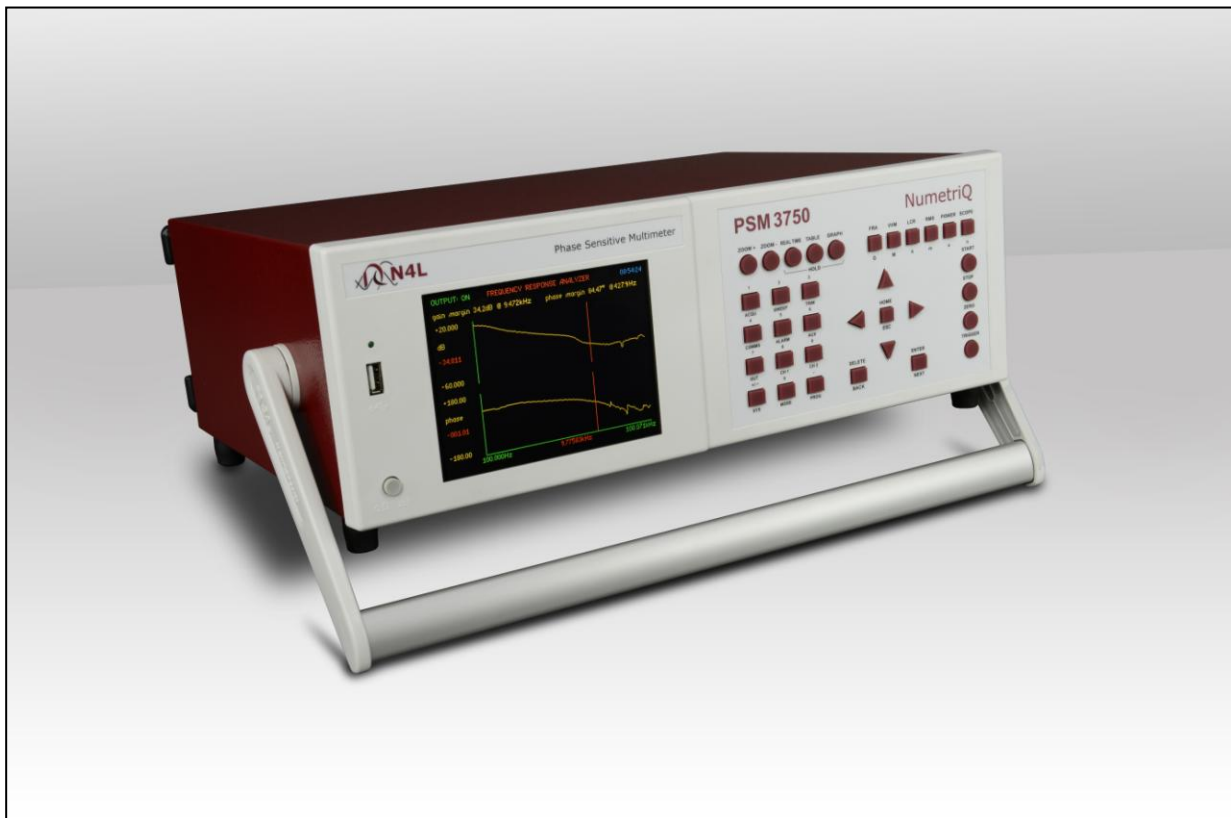




N4L Newtons4th Ltd

PSM3750 - *NumetriQ*

COMMUNICATIONS MANUAL



Revision 1.17

08th June 2017

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:

- This appliance ***must*** be earthed. Ensure that the instrument is powered from a properly grounded supply.
- The input connectors are High Voltage safety types for use up to 500V peak input from earth, overvoltage category II. Do not exceed 500V peak on any input connection. Only use test leads that are fitted with approved High Voltage safety connectors when working with hazardous voltages.
- 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 PSM3750 instrument over RS232, USB, LAN or GPIB. For more general operating instructions for the instrument refer to the specific 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 1.17

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APPENDICES

Appendix A – Command Summary

Appendix B – Configurable Parameters

Appendix C – Multilog Parameters

Appendix D – Contact Details

1 Using remote control

The instrument is fitted with an RS232 serial communications port as standard, and may have an IEEE488 (GPIB) interface or LAN interface fitted as an option. All the interfaces use the same ASCII protocol with the exception of the end of line terminators:

	Rx expects	Tx sends
RS232, LAN, USB	carriage return (line feed ignored)	carriage return and line feed
IEEE488	carriage return or line feed or EOI	carriage return with EOI

All the functions of the instrument can be programmed via either interface, and results read back. When the IEEE488 interface is set to 'remote' the RS232 port is ignored.

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 (query commands) are terminated with a question mark.

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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 either with the IEEE488 serial poll function or by the mandatory command *STB? over RS232 or IEEE or LAN (see section 5.2).

The IEEE address defaults to 23 and can be changed via the COMMS menu.

The keyboard is disabled when the instrument is set to "remote" using the IEEE. 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 COMMS 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	ALM		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 3 ALA (alarm active)
set when an alarm is active and enabled by ALARMER
- 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,PSM3750,01234,1.00

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,50,1000,1e6
OUTPUT,ON
START
ABORT

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
 CH3
 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 (OUTPUT,DBM)

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

ALARM

ALARM

Function: Set common controls for alarm1 and alarm2.

Description: Set the alarm latch and sounder control.

Format: *ALARM,latch,sounder*

Arguments: latch:
 ON
 OFF
 sounder:
 ENABLED
 DISABLED

Reply: none

Example: ALARM,ON,DISABLED

Notes:

ALARM?

ALARM?

Function: Read alarm status.

Description: Reads the status of the measurements and 2 alarms.

Format: ALARM?

Arguments: none

Reply: single integer
bit 0 data available
bit 1 data error
bit 2 alarm 1
bit 3 alarm 2

Example: ALARM?
1

Notes: An alarm is present if bit 0 is high (data is available) and either alarm 1 or alarm 2 bits are high.

ALARM1

ALARM1

Function: Set parameters for alarm1.

Description: Set alarm1 type and thresholds.

Format: ALARM1,DISABLED
ALARM1,*type,data,high,low*

Arguments: type:
HIGH
LOW
INSIDE
OUTSIDE
LINEAR
data
1-4
high:
high threshold
low:
low threshold

Reply: None

Example: ALARM1,HIGH,1,2,0
ALARM1,DISABLED

Notes: DISABLED does not have any further arguments otherwise both thresholds must be sent even if only one is used.

ALARM2

ALARM2

Function: Set parameters for alarm2.

Description: Set alarm2 type and thresholds.

Format: ALARM2,DISABLED
ALARM2,*type,data,high,low*

Arguments: type:
 HIGH
 LOW
 INSIDE
 OUTSIDE
 data
 1-4 for zoom data
 high:
 high threshold
 low:
 low threshold

Reply: None

Example: ALARM2,LOW,3,0,0.5

Notes: DISABLED does not have any further arguments otherwise both thresholds must be sent even if only one is used. There is no LINEAR option for alarm 2.

ALARME

ALARME

Function: Set alarm status enable register

Description: Sets bits in the alarm status enable register to control which alarm bit if any set the alarm active bits in the status byte.

Format: *ALARME,value*

Arguments: decimal equivalent of alarm bits
bit2 set bit 3 of status byte when alarm 1 is active
bit3 set bit 3 of status byte when alarm 2 is active

Reply: none

Example: *ALARME, 12*
**SRE,8*
set bit 3 in status byte when either alarm 1 or alarm 2 is active and generate a service request

Notes: default value is 0

ALARME?

ALARME?

Function: Read alarm status enable register

Description: Read back present bits in the alarm status enable register which controls the alarm active bit in the status byte.

Format: ALARME?

Arguments: none

Reply: decimal equivalent of alarm bits

Example: ALARME?
12

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: dBm mode is selected by *OUTPUT,DBM*

AUXILI

AUXILI

Function: Controls the auxiliary device

Description: Controls the auxiliary device connected to the extension port.

Format: *AUXILI,device,value*

Arguments: device:
 NONE
 IAI
Value (optional):
 LOW
 NORMAL
 HIGH
 VHIGH

Reply: None

Example: AUXILI,IAI,HIGH

Notes: Arguments will be extended to include other auxiliary devices as they become available

BANDWI

BANDWI

Function: Select bandwidth or selective (heterodyning) measurements.

Description: Selective measurement automatically starts at around 10kHz for those functions that support it. It can be disabled by forcing the bandwidth to "wide". For low noise measurements at low frequency the bandwidth can be restricted to "low".

Format: BANDWI,*type*

Arguments: type:
 AUTO
 WIDE
 LOW

Reply: none

Example: BANDWI,WIDE

Notes: In wide bandwidth mode the frequency range is limited to 5MHz.
In low bandwidth mode, the frequency is restricted to 30kHz

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*
Arguments: value:
 ON
 OFF
Reply: none
Example: BLANKI,OFF
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: CONFIG,*index*?
or: 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.

COUPLI

COUPLI

Function: Set ac or dc coupling.

Description: Selects the input coupling for a given input channel.

Format: *COUPLI,channel,coupling*

Arguments: channel:
 CH1
 CH2
 coupling:
 AC+DC
 ACONLY

Reply: none

Example: COUPLI,CH2,AC+DC

Notes:

CYCLES

CYCLES

Function: Set the minimum number of cycles for a measurement.

Description: The measurement window is normally set according to a time value but subject to a whole cycle of the frequency. Setting a minimum number of cycles to a value greater than 1 extends the measurement window at frequencies where the periodic time is longer than the set window time.

Format: *CYCLES,cycles*

Arguments: minimum number of cycles

Reply: none

Example: *CYCLES,4*

Notes:

DATALO

DATALO

Function: Set up datalog

Description: Sets datalog parameters or accesses datalog non-volatile store.

Format: *DATALO,function,interval*

Arguments: function:
 DISABLE
 RAM
 NONVOL
 RECALL
 DELETE
 interval:
 datalog interval in seconds

Reply: none

Example: DATALOG,NONVOL,10

Notes:

DATALO?

DATALO?

Function: Read back datalog results

Description: Return datalog values, one record per line

Format: *DATALO,start,records*

Arguments: start:
 first record to return
 records:
 number of records to return

Reply: 3 to 6 data values depending on settings:
 index 1-n
 elapsed time in hours
 data1
 data2 (if stored)
 data3 (if stored)
 data4 (if stored)
 one record per line

Example: DATALOG,NONVOL,36
 START
 wait for datalog
 STOP
 DATALOG,20,4?
 20,1.9000E-1,1.2345E0
 21,2.0000E-1,1.2345E0
 22,2.1000E-1,5.6789E3
 23,2.2000E-1,1.2345E0

Notes: if no arguments are sent then DATALOG?
 returns all data in the same format

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
bit5 harmonic data available
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

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:

DELAY

DELAY

Function: Set a delay time between frequency points

Description: Applies a settling time when changing frequency for systems which need some settling time after the frequency changes before a measurement should be made.

Format: *DELAY,time*

Arguments: delay time in seconds from 1 to 60

Reply: none

Example: *DELAY,1*

Notes: Whole seconds only

FAST

FAST

Function: Set fast communications mode.

Description: Disables the screen drawing for high speed operation.

Format: FAST,*value*

Arguments: value:
 ON
 OFF

Reply: none

Example: FAST,ON

Notes: FAST mode does not suppress the data acquisition which continues in the background. See SUSPEND to disable all non-communication functions.

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: FRA?
or: FRA,SWEEP?

Arguments: none, or SWEEP

Reply: 6 data values separated by commas
freq,mag1,mag2,db,phase,delay
+ 4 values if 3 channels in use
mag3,db3,phase3,delay3
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.
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 action at the end of the sweep is specified in the OUTPUT command.

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.
Format: GAINPH?
or: GAINPH,SWEEP?
Arguments: none, or SWEEP
Reply: See FRA?
Example: OUTPUT,ON
GAINPH
FSWEEP,20,10,20E3
START
DAV?
3
DAV?
15
GAINPH?SWEEP
data returned
Notes: GAINPH? is the same as FRA?

HARMON

HARMON

Function: Set harmonic analyser mode.

Description: Set harmonic analyser mode and parameters.

Format: *HARMON,scan,parameter,harmonic,max*

Arguments: scan:
 SINGLE
 THDD
 THDS
 parameter:
 PERCEN
 DB
 harmonic:
 single harmonic 2-100 for display
 max:
 harmonic series 2-100 for series thd

Reply: none

Example: *HARMON,SINGLE,PERCEN,3*

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

HARMON?

HARMON?

Function: Harmonic analyser query

Description: Read harmonic results.
Sets harmonic analyser mode if not already set.
Waits for next unread data if necessary.
Clears new data available bit read by DAV?

Format: HARMON?
or: HARMON,SWEEP?
or: HARMON,SERIES?

Arguments: none, or SWEEP, or SERIES

Reply: 7 data values separated by commas:
single: freq,mag1,mag2,h1,h2,harm1,harm2
thd: freq,mag1,mag2,thd1,thd2,harm1,harm2
1 line per result for sweep data
series: 6 data values separated by commas:
mag1,%1,phase1,mag2,%2,phase2

Example: HARMON?
data returned

Notes: HARMON? waits for next unread data.
HARMON?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,channel,type*

Arguments: channel:
 CH1
 CH2
 CH3
 type:
 VOLTAGE
 CURRENT

Reply: None

Example: INPUT,CH1,CURRENT
 SHUNT,CH1,0.1

Notes: Current input needs an external shunt

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 conditions.

Format: *LCR,conditions,parameter,head*

Arguments: conditions:
 AUTO (same as AUTOSH)
 AUTOSH
 AUTOFR
 MANUAL
parameter:
 AUTO
 CAPACITANCE
 INDUCTANCE
 IMPEDANCE
 ADMITTANCE
head:
 NONE
 LOW (only valid for IAI)
 NORMAL
 HIGH
 VHIGH

Reply: none

Example: LCR,AUTO,IMPEDA,NORMAL

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

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: LCR?
or: LCR?SWEEP
or: LCR,SWEEP?

Arguments: none, or SWEEP

Reply: 14 data values separated by commas:
freq, mag1, mag2, impedance, phase,
series R, series L, series C, //R, //L,
//C, $\tan\delta$, Q, reactance

or 11 data values separated by commas:
freq, mag1, mag2, impedance, phase,
resistance, reactance, admittance,
phase, conductance, susceptance

sweep reply: 13 data values per line per sweep result:
freq, Q factor, $\tan\delta$, Z mag, Z phase,
series L, series C, series R, Y mag,
Y phase, //L, //C, //R

or 5 data values per line per sweep result:
freq, real, quadrature, magnitude,
phase

Example: OUTPUT,ON
LCR?
data returned

Notes: LCR? waits for next unread data.
LCR?SWEEP does not wait for new data –
data can be read multiple times.

LOWFRE

LOWFRE

Function: Set low frequency mode

Description: Sets the low frequency option for external frequency measurement.

Format: LOWFRE,*value*

Arguments: value:
 ON
 OFF

Reply: none

Example: LOWFRE,ON

Notes: LOWFRE is mainly used for measuring low frequencies when not using the instrument generator for the frequency reference. However, as it applies digital filtering, it may also be useful when analysing any signals below a few hundred Hertz.

MARKER

MARKER

Function: Set frequency marker

Description: Enable or disable frequency marker.

Format: *MARKER,value,frequency*

Arguments: value:
 ON
 OFF
 frequency:
 marker frequency in Hz

Reply: none

Example: *MARKER,OFF*
MARKER,ON,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:
 VRMS (rms voltmeter)
 GAINPH (gain/phase analyser)
 VECTOR (vector voltmeter)
 POWER (power meter)
 LCR (LCR meter)
 HARMON (harmonic analyser)
 SCOPE (oscilloscope)

Reply: none

Example: *MODE,GAINPH*

Notes: MODE sets the measurement mode of the instrument

MULTIL

MULTIL

Function: Selects data for multi string reply

Description: Selects data values across phases and functions that can be read in a single string.

Format: *MULTILOG,index,channel,function*

Arguments: index:
 0 clear all
 1-30 select data 1-30
channel:
 1-3 channels 1-3
function:
 1-99 see appendix

Reply: none

Example: MULTIL,0
 MULTIL,1,1,2 (phase 1 Watts)
 MULTIL,2,2,2 (phase 2 watts)
 MULTIL?
 2 data values returned

Notes:

MULTIL?

MULTIL?

Function: Reads multi string reply

Description: Waits for data to be available then returns selected results.

Format: MULTILOG?
or: MULTILOG,*lines?*

Arguments: Lines:
Integer

Reply: Up to 60 data values as selected by the MULTILOG command in a single reply string
OR
Up to 60 data values as selected by the MULTILOG command in a single reply string, replying "*lines*" times.

Example: MULTIL,0
MULTIL,1,1,2 (phase 1 Watts)
MULTIL,2,2,2 (phase 2 Watts)
MULTIL?
2 data values returned
MUTLIL,5?
Replies 5 times, each containing 2 data values

Notes: The MULTILOG,*lines?* command will reply each time a new data point is available.

NEWLOC

NEWLOC

Function: Waits for new data then holds so that multiple commands can be used on the same data set.

Description: Reads multiple sets of data

Format: NEWLOC

Arguments: None

Reply: none

Example: NEWLOC;HARMON?SERIES;HPOWER?
Harmonic series and Power data returned

Notes: After the command the data will still be held so to release the lock send SUSPEND,OFF

NOOVER

NOOVER

Function: Disable overranging

Description: Prevents an overrange error from blanking out results in manual ranging.

Format: NOOVER,*value*

Arguments: value:
 ON
 OFF

Reply: none

Example: NOOVER,ON

Notes: This can be useful when testing devices in a noisy environment. The range can be set to the correct range for the signal to be measured even if sporadic noise spikes would push it up on to the next range.

PFCONV

PFCONV

Function: Set power factor sign convention.

Description: Fundamental power factor is given a sign depending convention either:
negative if lagging current
negative if leading current

Format: PFCONV,*type*

Arguments: type:
NEGLAG
NEGLEA

Reply: none

Example: PFCONV,NEGLAG

Notes: An inductive load would have a lagging current, a capacitive load would have a leading current.
The sign given to VAR can be independently set: see VARCON

OFFSET

OFFSET

Function: Set the output offset
Description: Sets the output generator offset in Volts.
Format: *OFFSET,offset*
Arguments: offset in Volts
Reply: none
Example: *OFFSET,5e-3* (set offset to 5mV)
Notes:

OUTPUT

OUTPUT

Function: Set output

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

Format: `OUTPUT,command,sweep,phase`

Arguments: command:
OFF
ON
DCONLY
VOLT
DBM
sweep:
OFF
ON
DCONLY

Reply: none

Example: `OUTPUT,ON`

Notes: For safety, the output defaults to off and must be turned on explicitly. It is not necessary to send all the arguments, but if they are sent they must be in the specified order

PAV

PAV

Function: Set phase angle voltmeter mode.

Description: Set phase angle voltmeter mode and parameter.

Format: *PAV,parameter,lvdt scale*

Arguments: parameter:
INPHAS
QUADR
TANPHI
MAGNIT
POLAR
A2/1
RMS2
RMS2/1
LVDT-D
LVDT-R
lvdt scale:
scale factor in m for lvdt applications

Reply: none

Example: PAV,LVDT-D,0.1

Notes: It is not necessary to send any arguments, but those that are sent must be in the specified order.
PAV and VECTOR are aliases for the same command.

PAV?

PAV?

Function: Phase angle voltmeter query

Description: Read phase angle voltmeter results.
Sets phase angle voltmeter mode if not already set.
Waits for next unread data if necessary.
Clears new data available bit read by DAV?

Format: PAV?
or: PAV,RMS?
or: PAV,SWEEP?

Arguments: none, or SWEEP

Reply: 7 data values separated by commas:
freq,mag1,mag2,ratio,phase,a,b
+5 data values if CH3 enabled
mag3,ratio3,phase3,a3,b3
+ rms values if PAV,RMS?
1 line per result for sweep data

Example: `FREQ,3300`
`OUTPUT,ON`
`PAV?`
data returned

Notes: PAV? waits for next unread data.
PAV?SWEEP does not wait for new data – data can be read multiple times.
PAV and VECTOR are aliases for the same command.

PHASEM

PHASEM

Function: Set phase meter mode.
Description: Select phase meter mode.
Format: PHASEM
Arguments: as FRA
Reply: none
Example: PHASEM
Notes: PHASEM is an alias for FRA to support early instruments

PHASEM?

PHASEM?

Function: Phase meter query
Description: Reads phase meter results
Format: PHASE?
Arguments: none
Reply: as FRA?
Example: PHASE?
Data returned
Notes: PHASEM is an alias for FRA to support early instruments.

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:

PHREF

PHREF

Function: Set phase reference

Description: Select measurement of phase as CH2 relative to CH1 or as CH1 relative to CH2

Format: PHREF,*channel*

Arguments: channel:
CH1: phase = ch2 wrt ch1
CH2: phase = ch1 wrt ch2

Reply: none

Example: PHREF, CH2

Notes: This parameter influences the phase meter mode and the phase angle voltmeter mode

POWER

POWER

Function: Set up power meter mode.

Description: Configure power meter with integration type

Format: *POWER, integration type*

Arguments: integration type:
MAGNITUDE
SIGNED

Reply: none

Examples: POWER,SIGNED
POWER

Notes: It is not necessary to send the integration type argument.

POWER?

POWER?

Function: Read power meter results

Description: Reads back latest power meter results.
Sets power meter mode if not already set.
Waits for next unread data if necessary.
Clears new data available bit read by DAV?

Format: POWER?
or: POWER?*results*
or: POWER,*results?*

Arguments: results:
 WATTS
 RMS
 INTEGR

Reply: WATTS:
 9 data values separated by commas
 W,W.f,VA,VA.f,pf,pf.f,Wdc,W.h,freq
RMS:
 8 data values separated by commas
 rms1,2,dc1,2,f1,2,phase1,2
INTEGR:
 9 data values separated by commas
 Wh,Wh.f,VAh,VAh.f,avpf,avpf.f,
 Ah,Ah.f,time
no argument:
 26 data values separated by commas
 WATTS, RMS, INTEGR

Example: POWER?WATTS

Notes:

PROGRA

PROGRA

Function: Access non volatile program stores.

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

Format: *PROGRA,function,number*

Arguments: function:
 RECALL
 STORE
 DELETE
 number
 0-999

Reply: none

Example: *PROGRA,RECALL,13*

Notes: Number 0 represents factory default, which can only be recalled.

PROGRA?

PROGRA?

Function: Identify program.

Description: Reads the name of the last program to be loaded or recalled or a program is memory.

Format: PROGRA,NAME?
PROGRA,NAME,*number*?
PROGRA,FILES?

Arguments: number
0-999

Reply: NAME: text string
FILES: 1 text string per stored program:
number,name,date

Example: PROGRA,NAME?
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 result stores.
Description: Recall, store or delete non-volatile result.
Format: *RESULT,function,number*
Arguments: function:
 RECALL
 STORE
 DELETE
 number
 0-999
Reply: none
Example: RESULT,RECALL,13
Notes:

RESULT?

RESULT?

Function: Identify available results.

Description: Reads the name of the stored results.

Format: RESULT,NAME,*number*?
RESULT,FILES?

Arguments: number
0-999

Reply: NAME: text string
FILES: 1 text string per stored result:
number,name,date

Example: RESULT,NAME,13?
PSU stability sweep #3

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
 CH3
 factor:
 multiplying scale factor

Reply: none

Example: SCALE,CH2,10

Notes:

SCOPE?

SCOPE?

Function: Set the scope channel.
Fetch raw scope data.

Description: Set the channel to be displayed on the instrument. Read back raw oscilloscope data.

Format: SCOPE,*channel*
SCOPE,*channel?*

Arguments: channel:
CH1
CH2
CH3
CH1?
CH2?
CH3?

Reply: 252 signed integers:
range
trigger
250 x data

Example: SCOPE,CH1
display channel 1 on the instrument
HOLD,ON
SCOPE,CH1?
read data
read back channel 1 raw oscilloscope data
SCOPE,CH2?
read data
SCOPE,CH3?
read data
HOLD,OFF

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

SETUP

SETUP

Function: Upload instrument set up

Description: All the settings within the instrument may be read by SETUP? The same settings may then be stored by ending the same data back to the instrument. As it sends all settings in a compressed format it is quicker than setting individual parameters.

Format: SETUP,index,data

Arguments: index:
 0-15
 data:
 ASCII hex as returned by SETUP?

Reply: none

Example: SETUP?
 Read 16 lines of data
 SETUP,00,data00
 SETUP,01,data01
 .
 .
 SETUP,15,data15

Notes: The settings are only updated when the 16th line has been received and the checksum has been verified.

SETUP?

SETUP?

Function: Read instrument set up

Description: All the settings within the instrument may be read by SETUP?. The same settings may then be stored by ending the same data back to the instrument. As it sends all settings in a compressed format it is quicker than setting individual parameters.

Format: SETUP?

Arguments: none

Reply: 16 lines of ASCII data

Example: SETUP?
Read 16 lines of data

Notes:

SHUNT

SHUNT

Function: Set channel shunt value

Description: Set the resistance factor of a current shunt to be divided into the measured voltage for a given input channel.

Format: SHUNT,*channel,resistance*

Arguments: channel:
 CH1
 CH2
 CH3
 resistance:
 shunt resistance in Ohms

Reply: none

Example: SHUNT,CH1,10

Notes: The SHUNT command is still accepted if the channel has not been configured for current. The value stored will be used when the channel is configured for current.

SMOOTH

SMOOTH

Function: Select the smoothing

Description: Sets the filter time constant and dynamic response.

Format: *SMOOTH,type,dynamics*

Arguments: type:
 NONE
 NORMAL
 SLOW
 dynamics:
 AUTO
 FIXED

Reply: none

Example: SMOOTH,NORMAL,FIXED
 SMOOTH,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.
 FILTER is an alias for SMOOTH

SPEED

SPEED

Function: Sets the measurement speed

Description: Sets the minimum window size for the measurement.

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

Arguments: value:
FAST
MEDIUM
SLOW
VSLOW
WINDOW

Reply: none

Example: *SPEED,SLOW*
SPEED,WINDOW,0.1

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: MODE,GAINPH (set gain phase analyser)
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?
or: STATUS,*channel?*

Arguments: channel:
CH1
CH2
CH3

Reply: If no channel specified:
OVER if any channel overflow
LOW if any channel underflow
OK if all channels in range
Else, range number,range text,status
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, or data streaming.
Format: STOP
Arguments: none
Reply: none
Example: MODE,PHASE,STREAM,0.01
START
read data values as required
STOP
read remaining data values

Notes:

SUSPEND

SUSPEND

Function: Suspend data acquisition

Description: Suspends the background data acquisition to maximise the communications speed.

Format: *SUSPEND,command*

Arguments: command
OFF
ON

Reply: none

Example: DATALOG, NONVOL, 36
START
wait for datalog
STOP
SUSPEND, ON
DATALOG?
data, data, data, data,
SUSPEND, OFF

Notes:

TAGREP

TAGREP

Function: Set up a reply tag

Description: Select a reply tag to identify the instrument in a multi-instrument environment

Format: TAGREP,*on/off*

Arguments: on/off:
ON
OFF

Reply: none

Example: TAGREP,ON
*ESR?
PPA5530:00635:1

Notes: When "tag reply" is turned on every reply string has a prefix of an identification string comprising the model and serial number

TEMPER

TEMPER

Function: Set up temperature measurement

Description: Set scaling and offset for a temperature sensor connected to the torque input (power transformer application mode)

Format: TEMPER,type,scalefactor,offset

Arguments: type:
DISABLED
CENTIG
FARHEN
Scale:
Multiplying factor in degrees/Volt
Offset:
Additive zero in Volts

Reply: none

Example: TEMPER,CENTIG,5,-2
Sensor scaling = 5°C/V, 0V = 10°C

Notes:

TEMPER?

TEMPER?

Function: Read the temperature

Description: Returns the measured temperature from a sensor connected to the torque input

Format: TEMPER?

Arguments: none

Reply: Single data value

Example: TEMPER?
Data returned

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.

Format: TFA?
or: TFA,SWEEP?

Arguments: none, or SWEEP

Reply: As for FRA?

Example: OUTPUT,ON
TFA
FSWEEP,20,10,20E3
START
DAV?
3
DAV?
15
TFA?SWEEP
data returned

Notes: 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
 PSM3750 #4

Notes:

VARCON

VARCON

Function: Set VAr sign convention.

Description: Fundamental VAr measurement is given a sign depending convention either:
negative if lagging current
negative if leading current

Format: VARCON,*type*

Arguments: type:
NEGLAG
NEGLEA

Reply: none

Example: VARCON,NEGLAG

Notes: An inductive load would have a lagging current, a capacitive load would have a leading current.
The sign given to power factor can be independently set: see PFCONV

VECTOR

VECTOR

Function: Set vector voltmeter mode.
Description: Set vector voltmeter mode and parameter.
Format: VECTOR,*parameter*,*lvdt scale*
Arguments: As PAV
Reply: none
Example: VECTOR,LVDT-D,0.1
Notes: PAV and VECTOR are aliases for the same command.

VECTOR?

VECTOR?

Function: Vector voltmeter query

Description: Read vector voltmeter results.

Format: VECTOR?
or: VECTOR,SWEEP?

Arguments: none, or SWEEP

Reply: As PAV

Example: `FREQ,3300`
`OUTPUT,ON`
`VECTOR?`
data returned

Notes: PAV and VECTOR are aliases for the same command.

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?
PQ3504,1,1.12,1.12,1.01,2.01

Notes: This data can be displayed on the screen by pressing SYSTEM then BACK

VRMS

VRMS

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

VRMS?

VRMS?

Function: Read true rms voltmeter results

Description: Reads back latest voltmeter results.
Sets voltmeter mode if not already set.
Waits for next unread data if necessary.
Clears new data available bit read by DAV?

Format: VRMS?
or: VRMS,*results?*

Arguments: results:
RMS
SURGE

Reply: RMS:
8 data values separated by commas
rms1,2,dc1,2,ac1,2,dbm1,2
SURGE:
6 data values separated by commas
pk1,2,cf1,2,surge1,2
no argument:
14 data values separated by commas
RMS results then SURGE

Example: VRMS?RMS

Notes: As VRMS? 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 VRMS? command.

WAVEFO

WAVEFO

Function: Set the output waveform

Description: Selects the output waveform for the signal generator.

Format: WAVEFO,*type*

Arguments: type:
SINEWAVE
SQUARE
TRIANGLE
SAWTOOTH
PULSE
WHITENOISE

Reply: None

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

Notes:

WIRING

WIRING

Function: Set the wiring configuration

Description: Selects 2 channel or 3 channel operation.

Format: WIRING,*type*

Arguments: type:
 CH2
 CH3

Reply: None

Example: WIRING,CH3

Notes:

ZERO

ZERO

Function: Apply or remove the zero. Performs lead compensation in LCR mode.

Description: Applies or removes a zero function depending on the measurement mode (same as pressing ZERO key). Applies lead compensation in LCR mode along with setting the parameters prior to applying the compensation.

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

LCR compensation ZERO,OPEN
 ZERO,SHORT
 ZERO,SINGLE
 ZERO,SWEEP,*steps,start,finish*
 ZERO,ZREF,*type,component*

Arguments: offset:
 offset value
 steps:
 LCR sweep compensation steps
 start:
 LCR compensation start frequency
 stop:
 LCR compensation stop frequency
 type:
 Zref type, enter CAPACI,RESIST or
 INDUCTI
 Component:
 Sweep Compensation value

Reply: none

Example: ZERO,SWEEP,100,1e3,1e6
ZERO,OPEN
performs open circuit compensation
ZERO,ZREF,CAPACI,0.00001
Sets zref to a capacitance value of 10 μ F
ZERO,ZREF,INDUCTI,0.001
Sets zref to a inductance value of 1mH
ZERO,ZREF,RESIST,100,45
*Sets zref to a resistance value of 100 Ω
with a phase of 45 degrees*

Notes: The compensation is stored with the program. Use "PROGRAM,STORE,n" and "PROGRAM,RECALL,n" to store or recall the program to/from memory location "n"

ZREF: Enter the value of capacitance in **F**. The value of inductance in **H**, the value of Resistance in **ohms** and the value of phase in **Degrees**.

ZOOM

ZOOM

Function: Sets the display zoom parameters.

Description: Sets the zoom level and data.

Format: *ZOOM,level,data1,data2,data3,data4*

Arguments: level:
0 – no zoom
1 – normal
2 – 4 line display
3 – 3 line display
data1-4:
function data for zoom

data consists of line number for channel 1
or line number + 64 for channel 2
or line number + 128 for channel 3

Reply: None

Example: VRMS
ZOOM,1,1,12 (level 1, ch1 rms, ch2 rms)

Notes: It is not necessary to send all the parameters, but whatever parameters are sent must be in the correct order.

ZOOM?

ZOOM?

Function: Read the display zoom parameters.

Description: Reads the zoom level and data.

Format: ZOOM?

Arguments:

Reply: 5 integers separated by commas:
Level,data1,data2,data3,data4

Data consists of line number for channel 1
or line number + 64 for channel 2 or line
number + 128 for channel 3

Example: ZOOM?
1,1,129,0,0 (level 1, ch1 rms, ch2 rms)

Notes:

Appendices

COMMAND SUMMARY

CONFIGURABLE PARAMETERS

COMMAND SUMMARY

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	
ACTRIM,channel,level,tol	
ALARM,latch,sounder	
ALARM?	single integer data value
ALARME,value	
ALARME?	single integer data value
ALARM1,type,data,high,low	
ALARM2,type,data,high,low	
AMPLIT,amplitude	
AUXILI,device,value	
BANDWI,type	
BEEP	
BLANKI,on/off	
CONFIG,parameter,data	
CONFIG,parameter?	single integer or real data value
COUPLI,channel,coupling	
COUPLI,channel?	single integer data value
CYCLES,cycles	
DATALO,function,interval	
DATALO,start,records?	index,time,data... one record per line
DAV?	single integer data value
DAVER,value	
DAVER?	single integer data value
DELAY,time	
FAST,on/off	

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FILTER,type,dynamics	
FRA	
FRA?	freq,mag1,mag2,dB,phase,delay
FRA,SWEEP?	n lines of FRA? data
FREQUE,frequency	
FSWEEP,steps,start,end,log	
GAINPH	
GAINPH?	freq,mag1,mag2,dB,phase,delay
GAINPH,SWEEP?	n lines of GAINPH? data
HARMON,scan,para,h,hmax	
HARMON?	freq,mag1,mag2,hmag1,hmag2,h1,h2
or	freq,mag1,mag2,thd1,thd2,h1,h2
HARMON,SERIES?	mag1,%1, ϕ 1,mag2,%2, ϕ 2
HARMON,SWEEP?	n lines of HARMON? data
HOLD,on/off	
INPUT,channel,type	
INPUT,channel?	single integer data value
KEYBOA,value	
LCR,conditions,param,head	
LCR?	freq, mag1, mag2, impedance, phase, R, L, C (series), R, L, C (parallel), tan δ , Q, reactance
or	freq, mag1, mag2, impedance, phase, resistance, reactance, admittance, phase, conductance, susceptance
LCR,SWEEP?	n lines of data: freq,QF,tan δ ,impedance,phase,L,C,R freq,QF,tan δ ,admittance,phase,L,C,R
or	
LOWFRE,on/off	
MARKER,on/off,frequency	
MODE,type	
MULTIL,index,ch,func	
MULTIL?	up to 60 floating point values
NEWLOC	
NOOVER,on/off	
OFFSET,offset	
OUTPUT,type,sweep,phase	
PAV,parameter,scaling	
PAV?	freq,mag1,mag2,parameter,phase,a,b
PAV,SWEEP?	n lines of VECTOR? data
PFCONV,type	
PHASEM	
PHASEM?	same as FRA
PHCONV,convention	

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PHREF,channel	
POWER,integration type	
POWER,WATTS?	W,W.f,VA,VA.f,pf,pf.f,Wdc,W.h,freq
POWER,RMS?	rms1,rms2,dc1,dc2,fnd1,fnd2, ϕ 1, ϕ 2
POWER,INTEGR?	Wh,Wh.f,VAh,VAh.f,pf,pf.f,Ah,Ah.f,t
PROGRAM,function,number	
PROGRAM?	CR terminated text string
RANGE,ch,ranging,range	
RESOLU.format	
RESULT,function,number	
RESULT?	CR terminated text string
REZERO	
SCALE,channel,factor	
SCALE,channel?	single real data value
SCOPE,channel?	252 signed integers
SCREEN?	240 lines of 40 bytes
SETUP,index,data	
SETUP?	16 lines of ASCII data
SHUNT,channel,resistance	
SHUNT,channel?	single real data value
SMOOTH,type,dynamics	
SPEED,speed	
START	
STATUS,channel?	range number,range text,over/low/ok
STOP	
SUSPEND,on/off	
TAGREP,on/off	
TEMPER,type,scalefactor, offset	
TEMPER?	Single real data value
TFA	
TFA?	freq,mag1,mag2,dB,phase,delay
TFA,SWEEP?	n lines of TFA? data
USER?	3 CR terminated text strings
VARCON,type	
VECTOR,parameter,scaling	
VECTOR?	freq,mag1,mag2,parameter,phase,a,b
VECTOR,SWEEP?	n lines of VECTOR? data
VERSION?	datecode,type,cpu,dsp,fpga,boot
VRMS	
VRMS?	RMS? data followed by SURGE?
VRMS,RMS?	rms1,rms2,dc1,dc2,ac1,ac2,db1,db2
VRMS,SURGE?	pk1,pk2,cf1,cf2,surge1,surge2
WAVEFO,type	

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WIRING,type

ZERO

ZERO,DELETE

ZERO,OPEN

ZERO,SHORT

ZERO,SWEEP,steps,start,finish

ZERO,ZREF,type,component

ZOOM,level,d1,d2,d3,d4

ZOOM?

level,d1,d2,d3,d4

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calibration commands

CALAPP	
CAL AUX,string	
CAL COM,freq	
CAL DCO,value	
CAL FIL,index,value	
CAL FIL?	six real data values
CAL FRQ,index,freq	
CAL FRQ?	seven real data values
CAL IAI,freq,res, reac	
CAL I BR,index,value	
CAL I BR?	single integer data value
CAL IDS,string	
CAL IDS?	string
CAL OUT,index,value	
CAL PHA,index	
CAL RES	
CAL SAV,password	
CAL SNO,serial number	
CAL STR,string	
CAL STR?	string

Appendix B – Configurable parameters

All parameters can be accessed using the CONFIG command:

CONFIG,number,parameter?

CONFIG,parameter,data

<i>Number</i>	<i>Function</i>	<i>Parameter</i>
System parameters		
1	Operating mode, (Sets main mode)	0=RMS Voltmeter 1=Frequency Response analyser 2=Power Meter 3=LCR Meter 5=Harmonic Analyser 6= Vector Voltmeter 7=Oscilloscope
2	Language, (System Options if installed)	0=English 1=Other (if installed)
3	Bandwidth, (Acquisition Control)	0=Auto 1=Wide
4	Autozero, (System Options)	0=Auto 1=Manual
5	Low blanking, (System Options & RMS Voltmeter)	0=Off 1=On
6	Phase convention, (System Options)	0=-180° to +180° 1=0° to -360° 2=0° to +360°

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- 7 Generator output, (Output Options)
 - 0=Off
 - 1=On
 - 2=dc only

- 8 Graph, (System Options)
 - 0=Dots
 - 1=Lines

- 9 Keyboard beep, (System Options)
 - 0=On
 - 1=Off

- 11 Low frequency mode, (Acquisition Control)
 - 0=Off
 - 1=On

- 12 Speed "window size", (Acquisition Control, Enter figures)

- 13 Speed, (Acquisition Control)
 - 0=Very slow
 - 1=Slow
 - 2=Medium
 - 3=Fast
 - 4=Very fast
 - 5=Window

- 14 Smoothing, (Acquisition control)
 - 0=Normal
 - 1=Slow
 - 2=None

- 15 Smoothing response, (Acquisition Control)
 - 0=Auto reset
 - 1=Fixed time

- 16 Baud rate, (Comms-Remote Options, RS232)
 - 0=19200
 - 1=9600
 - 2=4800
 - 3=2400
 - 4=1200

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- 18 Sweep steps, (Sweep Control-Enter step number figures)
- 19 Sweep start frequency, (Sweep Control-Enter figures)
- 20 Sweep end frequency, (Sweep Control-Enter figures)
- 21 Sweep-type, (Sweep Control)
 - 0=Single
 - 1=Repeat
- 22 Conditions, (LCR Meter)
 - 0=Auto frequency
 - 1=Manual
 - 2=Auto shunt
- 23 Shunt, (System Options)
 - 0=Default
 - 1=Manual
- Input parameters**
- 24 Input 1 (CH1), (CH1-Input 1)
 - 0=Disabled
 - 1=Direct
 - 2=External shunt
 - 3=External attenuator
- 25 Input 2 (CH2), (CH2-Input 2)
 - As Ch1
- 26 Input 3 (CH3), (CH3-Input 3)
 - As Ch1
- 27 Minimum range (CH1), (CH1-Input 1)
 - 1=3mV
 - 2=10mV
 - 3=30mV
 - 4=100mV
 - 5=300mV
 - 6=1V
 - 7=3V
 - 8=10V
 - 9=30V
 - 10=100V
 - 11=300V

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12=1kV
13=300mV*
14=1V*
15=3V*
16=10V*

- 28 Minimum range (CH2), (CH2-Input 2)
 As CH1
- 29 Minimum range (CH3), (CH3-Input 3)
 As CH1
- 30 Autoranging (CH1), (CH1-Input 1)
 0=Full Autorange
 1=Autorange up
 2=Manual
- 31 Autoranging (CH2), (CH2-Input 2)
 As Ch1
- 32 Autoranging (CH3), (CH3-Input 3)
 As Ch1
- 33 Coupling (CH1), (CH1-Input 1)
 0=ac+dc
 1=ac
- 34 Coupling (CH2), (CH2-Input 2)
 As Ch1
- 35 Coupling (CH3), (CH23-Input 3)
 As Ch1
- 36 Scale (CH1), (CH1-Input, Enter figures)
- 37 Scale (CH2), (CH2-Input, Enter figures)
- 38 Scale (CH3), (CH3-Input, Enter figures)
- 39 External shunt (CH1), (CH1-Input, Enter figures)
- 40 External shunt (CH2), (CH2-Input, Enter figures)

41 External shunt (CH3), (CH3-Input, Enter figures)

Display parameters

42 Zoom level, (Main Display)

0=Zoom -

1=Zoom +

2=Second zoom +

43 Display zoom characters on line 1

44 Display zoom characters on line 2

45 Display zoom characters on line 3

46 Display zoom characters on line 4

47 Display type, (Main display-datalog or sweep display mode)

0=Real Time

1=Table

2=Graph

Signal generator parameters

48 Generator frequency, (Output Options-Enter figures)

49 Generator amplitude, (Output Options-Enter figures)

50 Generator offset, (Output Options-Enter figures)

51 Generator waveform, (Output Options)

0=Sinewave

1=Triangle

3=Square wave

4=sawtooth

5=pulse

6=white noise

52 Frequency step, (Output options-Enter figures)

53 Amplitude step, (Output options-Enter figures)

54 Amplitude dBm (Output options-[116 system control]-Enter figures)

55 Generator after sweep, (Sweep Control)

0=Off

1=On

Datalog parameters

- 58 Datalog, (Acquisition Control-memory type)
0=Disabled
1=RAM
2=Non volatile
- 59 Interval, (Acquisition Control-RAM/Non volatile-Enter time figures)

General parameters

- 64 Frequency marker, (Sweep Control)
0=Off
1=On
- 65 Marker frequency, (Enter frequency-Graph display-After sweep, alters marker position)
- 66 Program 1-6 direct load, (System Options)
0=Disabled
1=Enabled
- 67 DFT type, (System Options)
0=Cosine
1=Sine
- 69 Ignore Overload, (System Options)
0=Disabled
1=Enabled
- 72 Frequency reference, (Acqu Options)
0=CH1
1=CH2
2=CH3
- 73 DFT selectivity, (Advanced acqu Options)
0=normal
1=narrow
- 75 Frequency lock, (Advanced acqu Options)
0=Normal
1=Constant

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78 High speed mode, (Advanced acqu Options)
0=Disabled
1=Enabled

84 Input, (Acquisition)
0=2 channel
1=3 channel

Power meter parameters

86 Difference THD, (Power meter)
0=Disabled
1=Including dc
2=Excluding dc

87 PF sign, (Power meter)
0=Negative lagging
1=Negative leading

88 VAr sign, (Power meter)
0=Negative lagging
1=Negative leading

RMS meter parameters

92 Rectified mean, (RMS meter)
0=Absolute
1=Normalised

93 Ratio 2, (FRA)
0=ch2/ch1
1=ch1/ch2
2=ch3/ch1
3=ch1/ch3
4=ch3/ch2
5=ch2/ch3
6=ch3 freq

Harmonic analyser parameters

99 Computation, (Harmonic analyser)
0=Difference thd
1=Harmonic series
2=TIF
3=THF
4=TRD
5=TDD
6=Harmonic series phase

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- 100 Selected harmonic, (Harmonic analyser)
2 to 100
- 101 Max harmonic, (Harmonic analyser - series)
2 to 100
- 103 Bargraph scale, (Harmonic analyser – series)
value in Volts
- 104 Bargraph scale, (Harmonic analyser – series)
value in Amps

LCR sweep zero parameters

- 106 Compensation, (LCR meter)
0=Single frequency
1=Sweep
- 107 Sweep zero start frequency, (LCR meter)
value in Hz
- 108 Sweep zero end frequency, (LCR meter)
value in Hz
- 109 Sweep zero steps, (LCR meter)
2 to 250

System parameters

- 111 Current rating, (Harmonic analyser, TRD)
value in A
- 113 Marker, (Harmonic analyser)
0=Off
1=On
- 114 Marker position, (Harmonic analyser)
value in %
- 116 Control, (System options)
0=Volts
1=dBm

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- 117 Step message, (System options)
0=Enabled
1=Disabled
- 118 Display sequence, (Graph display after sweep)
0=Primary Parameter
1=Secondary Parameter
2=Both Parameters
- 119 Length units, (System options)
0=m
1=inch
- 122 Auxiliary device, (Aux)
0=None
4=IAI
- 131 Show scaled external range, (System options)
0=Disabled
1=Enabled
- 132 Zoom 2 high resolution, (System options)
0=Disabled
1=Enabled
- LCR meter parameters**
- 135 Invert Y-Axis, (Nyquist LCR Meter)
0=normal (off)
1=Invert (on)
- 136 Display origin axis, (Nyquist LCR Meter)
0=Hide (off)
1=Displayt (on)
- 137 Parameter, (LCR Meter)
0=Auto
1=Capacitance
2=Inductance
3=Impedance
4=Admittance
- 138 Sweep, (LCR Meter)
0=Series
1=Parallel

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- 139 Graph, (LCR Meter)
0= Tan δ /QF
1= Single
2=Resistance
- 140 LCR head shunt, (Auxiliary control-fixture-LCR active head)
0=Low
1=Normal
2=High
3=Very high
- 141 Graph, (LCR meter-impedance)
0=Linear
1=Log
- 142 Reference phase, (LCR meter-Zero-Compensation)
-90° to +90°
- 143 Reference value, (LCR meter-Zero-Compensation)
value in Ohms/Farads/Henries
- 144 Reference type, (LCR meter-Zero-Compensation)
0=Capacitance
1=Resistance
2=Inductance
- 145 Connection, (LCR Meter)
0=Shunt
1=Divider Zx low
2=Divider Zx high
- 146 Phase offset, (LCR meter)
value in degrees
- Gain/Phase analyser parameters**
- 147 Graph phase/time selection, (FRA)
0=Phase
1=Delay
- 148 Gain dB offset, (FRA)
value in degrees

- 149 Gain/Phase margins, (FRA)
0=Disabled
1=Enabled
- 150 Ratio, (FRA)
0=ch2/ch1
1=ch1/ch2
2=ch3/ch1
3=ch1/ch3
4=ch3/ch2
5=ch2/ch3
6=ch3 freq
- System parameters**
- 151 Minimum cycles, (Acquisition control)
1-100
- 152 Delay time, (Acquisition control)
1-60s
- 153 IEEE address, (Comms-Remote options-interface-GPIB)
1-31
- 154 Interface, (Comms-Remote options)
0=RS232
1=USB
2=LAN
3=GPIB
- Alarm functions (Monitor 1)**
- 156 Monitor 1 data, (Alarm-monitor options)
0=Zoom1
1=Zoom2
2=Zoom3
3=Zoom4
- 157 Alarm type, (Alarm-monitor options)
0=Disabled
1=Linear
2=Alarm if high
3=Alarm if low
4=Outside window
5=Inside window

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- 158 High threshold (Alarm type), (Alarm-monitor options)
value in same units as zoom function
- 159 low threshold (Alarm type), (Alarm-monitor options)
value in same units as zoom function

- 160 Alarm latch (Alarm type), (Alarm-monitor options)
0=Off
1=On

- 161 Alarm sounder (Alarm type), (Alarm-monitor options)
0=Enabled
1=Disabled

Alarm functions (Monitor 2)

- 167 Monitor 2 data, (Alarm-monitor options)
0=Zoom1
1=Zoom2
2=Zoom3
3=Zoom4

- 168 Alarm 2 type, (Alarm-monitor options)
0=Disabled
1=Linear
2=Alarm if high
3=Alarm if low
4=Outside window
5=Inside window

- 169 High threshold (Alarm type), (Alarm-monitor options)
value in same units as zoom function
- 170 Low threshold, (Alarm type), (Alarm-monitor options)
value in same units as zoom function

Graph functions

- 173 Graph 2 scaling, (Sweep control)
0=Auto
1=Manual

- 174 Upper limit (Graph 2 scaling), (Sweep control)
value in same units as graph function
- 175 Lower limit (Graph 2 scaling), (Sweep control-Enter figures)
value in same units as graph function

Phase angle voltmeter parameters

- 177 Parameter, (Vector voltmeter)
0=In-phase
1=Quadrature
2=Tan ϕ
3=Magnitude
4=Phase
5=In-phase ratio
6=rms
7=rms ratio
8=LVDT diff
9=LVDT ratio
- 178 Scale factor (LVDT), (Vector voltmeter-Enter figures)
- 179 Null meter, (Vector voltmeter)
0=Auto
1=Manual
2=Off
- 180 Upper limit (Null meter), (Vector voltmeter-Enter figures)
- 181 Phase offset (Parameter), (Vector voltmeter)
value in degrees

Trim parameters

- 186 ac trim data, (Trim control)
0=Disabled
1=CH1
2=CH2
- 188 ac level (Trim data), (Vector voltmeter)
value in Volts

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190 Trim tolerance (Trim data), (Vector voltmeter)
value in %

Other parameters

192 Steps, (Sweep control)

0=Log

1=Linear

193 Graph 1 scaling, (Sweep control)

0=Auto

1=Manual

194 Upper limit (Graph 1 scaling), (Sweep control-Enter figures)

195 Upper limit (Graph 2 scaling), (Sweep control-Enter figures)

198 Resolution, Comms-Remote Options)

0=Normal

1=High

2=Binary

199 LAN IP address 3

200 LAN IP address 2

201 LAN IP address 1

202 LAN IP address 0

203 Tag comms reply with unit identifier

0=Disabled

1=Enabled

Scope parameters

208 Timebase

value in s/div

209 Trigger level

value in V or A

210 Pretrigger

0=none

1=25%

2=50%

3=75%

- 211 Trigger polarity
0=rising edge
1=falling edge
- 212 Trigger mode
0=auto
1=normal
2=single shot
- 215 Cursors
0=off
1=on
- 216 Trigger HF reject
0=off
1=on

Generator parameters

- 219 Generator ceiling
value in V
- 220 Generator phase control
0=off
1=on
- 221 Pulse width
value in s
- 222 Amplitude step if dBm control
value in dBm
- 223 Linear frequency step
value in Hz

Appendix C – MULTILog parameters

function	measurement	notes
1	frequency	
2	watts	Ch1/ch2 only
3	VA	Ch1/ch2 only
4	VAr	Ch1/ch2 only
5	power factor	Ch1/ch2 only
6	fundamental watts	Ch1/ch2 only
7	fundamental VA	Ch1/ch2 only
8	fundamental VAr	Ch1/ch2 only
9	fundamental PF	Ch1/ch2 only
10	harmonic watts	Ch1/ch2 only
11	harmonic watts %	Ch1/ch2 only
12	impedance	Imp meter mode
13	resistance	Imp meter mode
14	reactance	Imp meter mode
15	impedance phase	Imp meter mode
16	efficiency	
17	fundamental efficiency	
18	Not used	
19	integrated watts	integrator mode
20	integrated VA	integrator mode
21	integrated VAr	integrator mode
22	integrated rms current	integrator mode
23	average power factor	integrator mode
24	integrated fundamental watts	integrator mode
25	integrated fundamental VA	integrator mode
26	integrated fundamental VAr	integrator mode
27	integrated fundamental current	integrator mode
28	average fundamental power factor	integrator mode
29	average integrated watts	integrator mode
30	average integrated VA	integrator mode
31	average integrated VAr	integrator mode
32	average integrated fundamental watts	integrator mode
33	average integrated fundamental VA	integrator mode
34	average integrated fundamental VAr	integrator mode
35	average rms voltage	integrator mode
36	average fundamental voltage	integrator mode
37	Not used	
38	DC watts	

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function	measurement	notes
39	average rms current	integrator mode
40	average fundamental current	integrator mode
41	delta watts	
42	fundamental delta watts	
43	elapsed time	integrator mode
44	resistance	Imp meter mode
45	inductance	Imp meter mode
46	capacitance	Imp meter mode
47	tan delta	Imp meter mode
48	Q factor – see notes	Imp meter mode
48	k-factor – see notes	Transformer mode
49	corrected power	Transformer mode
50	rms voltage	
51	rms current	
52	fundamental voltage	
53	fundamental current	
54	voltage phase	
55	current phase	
56	harmonic voltage	
57	harmonic current	
58	dc voltage	
59	dc current	
60	ac voltage	
61	ac current	
62	peak voltage	
63	peak current	
64	voltage crest factor	
65	current crest factor	
66	rectified mean voltage	
67	rectified mean current	
68	voltage form factor	
69	current form factor	
70	voltage harmonic	harmonic mode
71	current harmonic	harmonic mode
72	voltage harmonic percentage	harmonic mode
73	current harmonic percentage	harmonic mode
74	voltage thd	harmonic mode
75	current thd	harmonic mode
76	voltage tif	harmonic mode
77	current tif	harmonic mode
78	phase to phase rms voltage	

79	phase to phase fundamental voltage	
80	phase to phase voltage phase angle	
81	phase to phase rms voltage	
82	voltage surge	
83	current surge	
84	voltage rms deviation	transformer mode
85	voltage fundamental deviation	transformer mode
86	voltage phase deviation	transformer mode
87	voltage positive peak	
88	current positive peak	
89	voltage negative peak	
90	current negative peak	
91	voltage positive peak unfiltered	
92	current positive peak unfiltered	
93	voltage negative peak unfiltered	
94	current negative peak unfiltered	
95-99	reserved for future expansion	

Notes:

These are generic functions for our range of instruments. Not all functions are available on the PSM3750.

Function 48 is used to measure Q-factor in Imp meter mode AND to measure corrected power in Transformer mode.

Functions 78 and 81 are the same.

Example script to return results for Power, RMS Voltage and AC Voltage:

```
>
>
> multil,0
> multil,1,5,2
> multil,2,5,50
> multil,3,5,60
> multil?
-1.8846E-7,-2.0984E-3,8.5765E-4
```

Appendix D - Newtons4th Ltd. Contact details

Please direct all queries or comments regarding the PSM3750 instrument or this manual to:

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