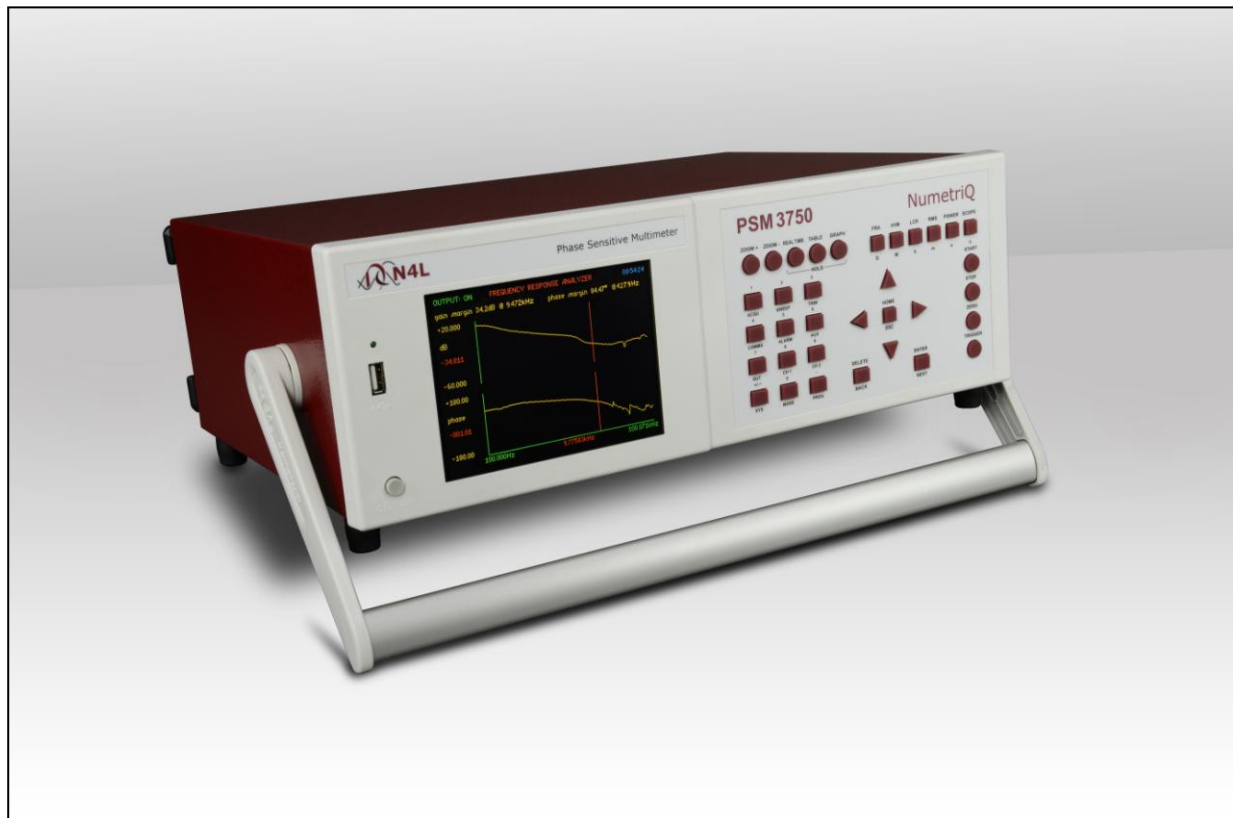# PSM3750 - *NumetriQ*

COMMUNICATIONS MANUAL

Version 1.20

23rd January 2020

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 1.20

23rd January 2020

CONTENTS

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. E.g.

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.

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?

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?

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?

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

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?

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

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

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?

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

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: or:	FRA? 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: or:	GAINPH? 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: or: or:	HARMON? HARMON,SWEEP? HARMON,SERIES?
Arguments:	none, or SWEEP, or SERIES

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

HVHOME   **HVHOME**

Function: Clear the High Voltage Protect Power Up
                 warning

Description:

Format: HVHOME

Arguments: None

Reply: None

Example: HVHOME

Notes: Clears the message from the PSM display.
                 The message will reappear when the
                 instrument is power cycled.

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?

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, tanδ, Q, reactance.

Reply: with   11 data values separated by commas:
Admittance   freq, mag1, mag2, impedance, phase,
selected in the   resistance, reactance, admittance,
LCR Parameter   phase, conductance, susceptance.
menu.

Sweep reply: 13 data values per line per sweep result:
                     freq, Q factor, tanδ, Z mag, Z phase,
                     series L, series C, series R, Y mag,
                     Y phase, //L, //C, //R.

Sweep reply: Admittance or Impedance selected.

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

Sweep reply: Admittance or Impedance selected and Temperature option selected.

6 data values per line per sweep result: freq, real, quadrature, magnitude, phase, temperature.

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?

Function:	Reads multi string reply
Description:	Waits for data to be available then returns selected results.
Format: or:	MULTILOG? 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

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: or: or:	PAV? PAV,RMS? 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

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

Format: POWER

Arguments: none

Reply: None

Examples: POWER

Notes:

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

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?

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:

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?

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?

Function:	transfer function analyser query
Description:	Read transfer function analyser results.
Format: or:	TFA? 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

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: or:	VECTOR? 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

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

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 10µF
                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 100Ω
                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

And

CONFIGURABLE PARAMETERS

Appendix A – 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	

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,ϕ1,mag2,%2,ϕ2
HARMON,SWEEP?   n lines of HARMON? data
HOLD,on/off
HVHOME
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),
                               tanδ, Q, reactance
or   freq, mag1, mag2, impedance, phase,
                               resistance, reactance, admittance,
                               phase, conductance, susceptance
LCR,SWEEP?   n lines of data:
                               freq,QF,tanδ,impedance,phase,L,C,R
or   freq,QF,tanδ,admittance,phase,L,C,R
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

Command	Response
PHCONV,convention	
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,ϕ1,ϕ2
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   A-5
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

calibration commands

CALAPP
CALAUX,string
CALCOM,freq
CALDCO,value
CALFIL,index,value
CALFIL?   six real data values
CALFRQ,index,freq
CALFRQ?   seven real data values
CALIAI,freq,res,reac
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,number,*parameter*?
      CONFIG,*parameter,data*

Number   Function   *Parameter*

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   High Voltage Protection Mode, (System Options)
                        0=On
                        1=Off

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°

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

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

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

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)
                        0=3mV
                        1=10mV
                        2=30mV
                        3=100mV
                        4=300mV
                        5=1V
                        6=3V
                        7=10V
                        8=30V
                        9=100V
                        10=300V
                        11=1kV
                        12=300mV*
                        13=1V*
                        14=3V*
                        15=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=Square wave
                   2=Triangle
                   3=Sawtooth
                   4=Pulse
                   5=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)

Datalog parameters

58   Datalog, (Acuisition Control-memory type)
         0=Disabled
         1=RAM
         2=Non volatile

59   Interval, (Acuisition Control-RAM/Non volatile-Enter time figures)

General parameters

66   Program 1-6 direct load, (System Options)
         0=Disabled
         1=Enabled

67   DFT type, (System Options)
         0=Cosine
         1=Sine

69   Ignore Overload, (Advanced ACQU Options)
         0=Disabled
         1=Enabled

72   Phase 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

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

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 %

115   High Voltage Protection Message at PowerUp
                        0=On
                         1=Off

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

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 Measurement, (LCR Meter)
                0=Series
                1=Parallel

139   Graph, (LCR Meter)
                0= Tanδ/QF
                1= Single
                2=Resistance

140   Shunt, (Auxiliary control-auxiliary device-IAI)
                0=Low
                1=Normal
                2=High
                3=Very high

141   Impedance 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

148   Gain dB offset, (FRA)
                    value in degrees

149   Gain/Phase margins, (FRA)
                    0=Disabled
                    1=Enabled

150   Computation, (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)
              1-30

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

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

System parameters

176   Ramp Off (Output Control)
                            0=Off
                            1=On

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
             3=CH3

188   ac level (Trim data), (Vector voltmeter)
             value in Volts

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   Lower limit (Graph 1 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

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	

PSM3750 communications manual

function	measurement	notes
39	average rms current	integrator mode
40	average fundamental current	integrator mode
41	delta watts	
42	temperature	Impedance mode
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:

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.