Newtons4th Ltd

PSM1700 - *PsimetriQ*
PSM1735 - *NumetriQ*

Communications Manual

PSM1700 firmware v1.65
PSM1735 firmware v1/60

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:

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

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

ABOUT THIS MANUAL

This manual gives details of the communication commands recognized by the PSM17xx series of instruments over RS232, 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 1.65 (PsimetriQ) 1.60 (NumetriQ)

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CONTENTS

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	carriage return (line feed ignored)	carriage return and line feed
LAN	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 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 MONITOR 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	FDV	SDV	RDV

bit 0 RDV (result data available)
set when results are available to be read as enabled by DAVER

bit 1 SDV (sweep data available)
set when sweep results are available to be read as enabled by DAVER

bit 2 FDV (fast data available (streaming))
set when data streaming 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

1.4 Data streaming

The phase angle voltmeter and power meter modes have the option of high speed data streaming. In this operation, the window width for the measurement may be specified from 660us to 100ms and the data for each measurement window is transmitted over the communications in a continuous stream. The window is adjusted to synchronise to the measured frequency.

The instrument buffers the data and transmits at the fastest rate that is possible. The buffer depth is over 8000 data values so more than 5 seconds of data can be captured at the fastest rate of 1500 readings per second even if the data is not read at all. If the window size is such that the data can be read out in real time then data streaming can continue indefinitely.

Once the data streaming window has been setup but before the streaming has been started, the display periodically shows the measured value. Once streaming has been started, the display is blanked to minimise processing overheads. Streaming can be stopped either immediately (ABORT) or may be stopped but remaining data continues to be transmitted until the buffer is empty (STOP).

STREAM,ENABLE,0.01
START
read data
STOP
continue to read stored data

2 Communication commands

*CLS *CLS

Function: Clear status

Description: Clears the *standard event status register.*

Format: *CLS

Arguments: none

Reply: none

Example:
```
*CLS
*ESR?
0
```

Notes:

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

Function:	Set standard event status enable register.
Description:	Enable which bits of the *standard event status register* set the ESB bit in the serial poll status byte..
Format:	*ESE, value
Arguments:	decimal equivalent of bits in standard event status enable register
Reply:	can be read by *ESE?
Example:	*ESE, 60
Notes:	The following bits in the standard event status enable register have been implemented: bit 0 OPC (operation complete) bit 2 QYE (unterminated query error) bit 3 DDE (device dependent error) bit 4 EXE (execution error) bit 5 CME (command interpretation error) bit 7 PON (power on event) For example, *ESE, 60 enables all the error bits so that the ESB bit in the serial poll status byte is set in the event of any error.

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

Function:	Standard event status register query
Description:	Returns the contents of the *standard event status register* and clears it.
Format:	*ESR?
Arguments:	none
Reply:	decimal equivalent of bits in standard event status register
Example:	*ESR? 33
Notes:	The following bits in the standard event status register have been implemented: bit 0 OPC (operation complete) bit 2 QYE (unterminated query error) bit 3 DDE (device dependent error) bit 4 EXE (execution error) bit 5 CME (command interpretation error) bit 7 PON (power on event) For example, if a command is sent incorrectly and is not recognised, the CME bit will be set and the value of 33 will be returned.

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

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

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

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

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

Function:	Reset
Description:	Resets the instrument to the default state and clears the *standard event status register*.
Format:	*RST
Arguments:	none
Reply:	none
Example:	*RST
Notes:	The *RST command loads the default configuration. This is the same as loading the default configuration via the PROGRAM menu. Any preceding setup commands will be overwritten. *RST should be followed by an end of line not a message separator. It may be helpful to follow it with a short pause to allow the new configuration to become active before sending further commands.

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

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

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

Function:	Read service request enable register.
Description:	Read back the present setting of the service request enable register.
Format:	*SRE?
Arguments:	
Reply:	decimal equivalent of bits in status byte register that would generate a service request.
Example:	*SRE? 1
Notes:	

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

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

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

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

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

Function:	Self test query
Description:	Returns the results of self test
Format:	*TST?
Arguments:	none
Reply:	single integer bit 0 – set if uncalibrated bit 1 – set if error with analogue zero > 15 – major system error
Example:	*TST? 0
Notes:	

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

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

ABORT **ABORT**

Function:	Abort sweep
Description:	Abort an active sweep, or data streaming.
Format:	ABORT
Arguments:	none
Reply:	none
Example:	MODE,PHASE,STREAM,0.01 START *read data values as required* ABORT
Notes:	Any remaining values held in the buffer will be discarded.

ACTRIM **ACTRIM**

Function: Set ac control parameters

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

Format: ACTRIM,*channel,level,tolerance*

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

Reply: none

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

Notes: The level should be set in dBm if dBm mode is selected (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,*type,data,high,low*

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

Reply: none

Example: ALARM1,HIGH,1,2,0

Notes: 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,*type,data,high,low*

Arguments: type:
DISABLED
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: 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

ANALOG **ANALOG**

Function:	Set up analogue output
Description:	Sets the scaling of the analogue output or a constant value.
Format:	ANALOG,MONITOR,*zero,scale* ANALOG,MANUAL,*value*
Arguments:	zero level for monitored value full scale for monitored value value between 0 and 1 for manual
Reply:	none
Example:	ANALOG,MONITOR,
Notes:	Analog output given by: fraction = (value – zero) / full scale

BANDWI **BANDWI**

PSM1735 NumetriQ only

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 1MHz.
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,threshold*
Arguments:	value: ON OFF threshold: threshold in appropriate units
Reply:	none
Example:	BLANKI,OFF BLANKI,ON,-35
Notes:	It is not necessary to send the threshold. Not all functions have a threshold option, it will only be used if in an appropriate mode.

CONFIG **CONFIG**

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

CONFIG? **CONFIG?**

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

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
bit4	streaming data available
bit5	more streaming data to come
bit6	integration data available
bit7	datalog data available

Example:

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

Notes: DAV? does not modify the status bits.

DAVER **DAVER**

Function: Set data available enable register

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

Format: DAVER,value

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

Reply: none

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

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

DAVER? **DAVER?**

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

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
Reply:	none
Example:	DELAY,1
Notes:	

FILTER **FILTER**

Function: Select the filtering

Description: Sets the filter time constant and dynamic response.

Format: FILTER,*type,dynamics*

Arguments: type:
NONE
NORMAL
SLOW
dynamics:
AUTO
FIXED

Reply: none

Example: FILTER,NORMAL,FIXED
FILTER,NONE

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

FRA **FRA**

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

FRA? **FRA?**

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

FREQUE **FREQUE**

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

FSWEEP **FSWEEP**

Function: Set the frequency sweep parameters

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

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

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

Reply: none

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

Notes: It is not necessary to send all the arguments, but if they must be in the specified order.
The 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. Sets gain/phase analyser mode if not already set. Waits for next unread data if necessary . Clears new data available bit read by DAV?
Format: or: or:	GAINPH? GAINPH?SWEEP GAINPH,SWEEP?
Arguments:	none, or SWEEP
Reply:	6 data values separated by commas freq,mag1,mag2,db,phase,delay one line per result for sweep data
Example:	OUTPUT,ON GAINPH FSWEEP,20,10,20E3 START DAV? 3 DAV? 15 GAINPH?SWEEP data returned
Notes:	GAINPH? waits for next unread data. GAINPH?SWEEP does not wait for new data – data can be read multiple times.

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 2-50 for display
max:
harmonic series 2-50 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:	

INPUT **INPUT**

Function: Set input mode

Description: Selects the input type of the instrument

Format: INPUT,*channel*,*type*

Arguments: channel:
CH1
CH2
type:
DISABLE
VOLTAGE
SHUNT

Reply: none

Example: INPUT,CH1,SHUNT

Notes:

INTYPE **INTYPE**

PSM1735 NumetriQ only

Function: Set input connection

Description: Selects the input type for each channel to be non-inverting, inverting, or differential.

Format: INPUT,*channel*,*type*

Arguments: channel:
- CH1
- CH2

type:
- MAIN
- SECOND
- DIFFER

Reply: none

Example: INPUT,CH1,DIFFERENTIAL

Notes:

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
- 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: or: or:	LCR? LCR?SWEEP LCR,SWEEP?
Arguments:	none, or SWEEP
Reply:	14 data values separated by commas: freq, mag1, mag2, impedance, phase, series R, series L, series C, //R, //L, //C, tanδ, Q, reactance
or	11 data values separated by commas: freq, mag1, mag2, impedance, phase, resistance, reactance, admittance, phase, conductance, susceptance
sweep reply:	8 data values per line per sweep result: freq,Q,tanδ,impedance,phase,L,C,R
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:

SIGGEN	(signal generator only)
VRMS	(rms voltmeter)
GAINPH	(gain/phase analyser)
VECTOR	(vector voltmeter)
POWER	(power meter)
LCR	(LCR meter)
HARMON	(harmonic analyser)
TXA	(transformer analyser)

Reply: none

Example: MODE,GAINPH

Notes: MODE sets the measurement mode of the instrument

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
- VOLT
- DBM
- DCONLY (PsimetriQ only)
- PHRESE (PsimetriQ only)

sweep:
- OFF
- ON
- DCONLY
- PHRESE (PsimetriQ only)

phase:
- phase to switch off (PsimetriQ only)

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?SWEEP PAV,SWEEP?
Arguments:	none, or SWEEP
Reply:	7 data values separated by commas: freq,mag1,mag2,parameter,phase,a,b 1 line per result for sweep data
Example:	FREQ,3300 OUTPUT,ON PAV?LVDT_D,0.1 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.

PHASE **PHASE**

Function: Set phase meter mode.

Description: Select phase meter mode.

Format: PHASE,*mode*,*window size*

Arguments: mode:
NORMAL
STREAM
window size
streaming window size in seconds

Reply: none

Example: PHASE

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

PHASE? **PHASE?**

Function:	Phase meter query
Description:	Reads phase meter results. Sets phase meter mode if not already set. Waits for next unread data if available. Clears new data available bit read by DAV?
Format:	PHASE?
Arguments:	none
Reply:	2 data values separated by commas freq,phase
Example:	PHASE? 1.8396E2,5.0342E-2,
Notes:	The phase convention can be set to 0° to -360°, 0° to +360°, or +180° to -180° in the SYSTEM menu or using CONFIG,6,0-2 (see appendix) .

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:

PPORT **PPORT**

Function:	Set the parallel port
Description:	Force the logic level on the parallel port data lines
Format:	PPORT,*value*
Arguments:	decimal value to be written to the port
Reply:	None
Example:	PPORT,64 {set data bit 6, clear others}
Notes:	The parallel port may be used as an 8 bit logic level output port and a 4 bit logic level input port.

PPORT? **PPORT?**

Function:	Read the parallel port
Description:	Read the logic level on the parallel port control input lines
Format:	PPORT?
Arguments:	None
Reply:	Single integer data value
Example:	PPORT? 12
Notes:	The parallel port may be used as a 4 bit logic level input port and an 8 bit logic level output port.

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
0-100

Reply: none

Example: PROGRA,RECALL,13

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

PROGRA? **PROGRA?**

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

RANGE **RANGE**

Function: Set channel ranging.

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

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

Arguments: channel:
- CH1
- CH2

ranging:
- AUTO
- UPAUTO
- MANUAL

range:
- nominal range value

Reply: none

Example: RANGE,CH2,MANUAL,3V

Notes:

RESOLU **RESOLU**

Function: Set the data resolution

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

Format: RESOLU,*format*

Arguments: format:

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

Reply: none

Example: RESOLU,HIGH

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

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:	

RUN? **RUN?**

Function:	Returns status of various internal processes
Description:	Returns status of various internal processes
Format:	RUN?
Arguments:	none
Reply:	Bit 0 : Sweep running Bit 1 : Fast sweep running Bit 2 : Integrator running Bit 3 : Datalog running Bit 4 : Fast datalog running Bit 5 : Fast analog output running Bit 6 : Not used Bit 7 : Generator active
Example:	RUN? 9
Notes:	

SCALE **SCALE**

Function: Set channel scale factor.

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

Format: SCALE,*channel*,*factor*

Arguments: channel:
CH1
CH2
factor:
multiplying scale factor

Reply: none

Example: SCALE,CH2,10

Notes:

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
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.

SINGLE **SINGLE**

Function: Set single measurement mode

Description: Selects the measurement mode to be single measurements instead of normal continuous measurements.

Format: SINGLE,*value*

Arguments: value:
ON
OFF

Reply: none

Example:
```
SINGLE,ON
SPEED,WINDOW,0.8
OUTPUT,ON,OFF
*TRG; FRA?
data returned
*TRG; FRA?
data returned
```

Notes: Single measurement mode allows the output to be turned on for only one measurement then turned off again.

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:

SSWEEP **SSWEEP**

Function: Access non volatile sweep results stores.

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

Format: SSWEEP,*function,number*

Arguments: function:
RECALL
STORE
DELETE
number
1-30

Reply: none

Example: SSWEEP,RECALL,13

Notes: The sweep data can be read back using the sweep query command for each mode eg. FRA,SWEEP? for an FRA sweep.

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

Arguments: channel:
- CH1
- CH2

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

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

Notes:

STOP **STOP**

Function:	Stop sweep
Description:	Stop an active sweep, 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:	

STREAM **STREAM**

Function: Set data streaming mode

Description: Set instrument ready for data streaming with specified window

Format: STREAM,*control,window*

Arguments: control
ENABLE
DISABL
window size
streaming window size in seconds

Reply: none

Example:
```
PAV,TANPHI
STREAM,ENABLE,0.01
START
read data values as required
STOP
read remaining data values
```

Notes: Data streaming is valid for phase meter and phase angle voltmeter (vector voltmeter) modes.

STREAM? **STREAM?**

Function:	Start to read streaming data
Description:	Start to read streaming data
Format:	STREAM? STREAM,max? STREAM?max
Arguments:	max maximum number of values none return all data
Reply:	data stream separated by commas
Example:	PAV,TANPHI STREAM,ENABLE,0.01 START STREAM? data,data,data,data, ……
Notes:	This command is only used with IEEE488 (GPIB) - streaming starts immediately with RS232.

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:	

TFA **TFA**

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

TFA? **TFA?**

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

TXA **TXA**

Function: Set transformer analyser mode.

Description: Set transformer analyser mode, test, fixture, and resistances

Format: TXA,*test,fixture,source,load*

Arguments: test:
- TXTR
- TXL
- TXLL
- TXACR
- TXDCR
- TXIWC
- TXMAGI
- TXRLOS
- TXILOS
- TXHARM
- TXTHD
- TXLBAL

fixture:
- NONE
- TAF01
- TAF02

source resistance
load resistance

Reply: none

Example: TXA,TXILOS,TAF01,135,25.4

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

TXA? **TXA?**

Function:	Transformer analyser query
Description:	Read transformer analyser results. Sets transformer analyser mode if not already set. Waits for next unread data if necessary . Clears new data available bit read by DAV?
Format: or: or:	TXA? TXA?SWEEP TXA,SWEEP?
Arguments:	none, or SWEEP
Reply: txdcr txmagi	3 or 4 data values separated by commas: freq,mag1,mag2,parameter dc1,dc2,resistance freq,rms1,rms2,watts
sweep reply:	Data as above, one line per sweep result.
Example:	TXA? data returned
Notes:	TXA? waits for next unread data. TXA?SWEEP does not wait for new data – data can be read multiple times.

TXTEST **TXTEST**

Function: Set transformer analyser test.

Description: Set transformer analyser test and winding(s).

Format: TXTEST,*test,winding1,winding2*

Arguments:

test:
as TXA command

winding1:
W1
W2
W3
W4 (TAF02 only)
W2+3 (TAF01 only)

winding2: (turns ratio test only)
W1:W2
W2:W1
W1:W3
W3:W1
W2:W3
W3:W2
W1:W4 (TAF02 only)
W4:W1 (TAF02 only)
W1:2+3 (TAF01 only)
W2+3:1 (TAF01 only)

Reply: none

Example: TXTEST,TXTR,W1,W2:W3

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

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
PsimetriQ #4

Notes:

VECTOR **VECTOR**

Function: Set vector voltmeter mode.

Description: Set vector voltmeter mode and parameter.

Format: VECTOR,*parameter,lvdt scale*

Arguments: parameter:
- NONE
- INPHAS
- QUADR
- TANPHI
- POLAR
- A2/A1
- RMS2/1
- LVDT-D
- LVDT-R

lvdt scale:
- scale factor in m for lvdt applications

Reply: none

Example: VECTOR,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.

VECTOR? **VECTOR?**

Function:	Vector voltmeter query
Description:	Read vector voltmeter results. Sets vector voltmeter mode if not already set. Waits for next unread data if necessary. Clears new data available bit read by DAV?
Format: or: or:	VECTOR? VECTOR?SWEEP VECTOR,SWEEP?
Arguments:	none, or SWEEP
Reply:	7 data values separated by commas: freq,mag1,mag2,parameter,phase,a,b 1 line per result for sweep data
Example:	FREQ,3300 OUTPUT,ON VECTOR?LVDT_D,0.1 data returned
Notes:	VECTOR? waits for next unread data. VECTOR?SWEEP does not wait for new data – data can be read multiple times. 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? PQ3504,1,1.21,1.21,1.21,1.02
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*?
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:

SINEWA	(sine wave)
TRIANG	(triangle wave)
SQUARE	(square wave)
LEADIN	(leading sawtooth)
TRAILI	(trailing sawtooth)

Reply: None

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

Notes: PSM1735 NumetriQ only has SINEWA or SQUARE option

ZERO **ZERO**

Function:	Apply or remove the zero
Description:	Applies or removes a zero function depending on the measurement mode (same as pressing ZERO key). Performs lead compensation in LCR mode.
Format:	ZERO ZERO,DELETE ZERO,DB,*offset* ZERO,PHASE,*offset*
LCR compensation	ZERO,SINGLE ZERO,SWEEP,*steps,start,finish* ZERO,OPEN ZERO,SHORT ZERO,STORE ZERO,RECALL
Arguments:	offset: offset value steps: LCR sweep compensation steps start: LCR compensation start frequency stop: LCR compensation stop frequency
Reply:	none
Example:	ZERO,SWEEP,100,1e3,1e6 ZERO,OPEN *performs open circuit compensation*
Notes:	

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 – normal
1 – 2 line display (zoom level 1)
2 – single line display (zoom level 2)
data1:
first data (zoom level 1)
or data for single line (zoom level 2)
data2-4:
other data (zoom level 1)

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

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:
0 – normal
1 – 2-4 value display (zoom level 1)
2 – single line display (zoom level 2)
data1-4:
zoom data

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

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

Notes:

Appendices

COMMAND SUMMARY

CONFIGURABLE PARAMETERS

command format	reply format
*CLS	
*ESE,value	
*ESE?	single integer data value
*ESR?	single integer data value
*IDN?	company,product,serial no,version
*OPC?	0 or 1
*RST	
*SRE,value	single integer data value
*SRE?	
*STB?	single integer data value
*TRG	
*TST?	single integer data value
*WAI	
ABORT	
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	
ANALOG,type,value1,value2	
BANDWI,type	
BEEP	
BLANKI,on/off,threshold	
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	
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	
INPUT,channel,type	
INPUT,channel?	single integer data value
INTYPE,channel,type	
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	
OFFSET,offset	
OUTPUT,type,sweep,phase	
PAV,parameter,scaling	
PAV?	freq,mag1,mag2,parameter,phase,a,b
PAV,SWEEP?	n lines of VECTOR? data
PHASE	
PHASE?	freq,phase
PHASE,STREAM,window	phase,phase,phase,phase,phase,…….
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
PPORT,value	
PPORT?	single integer data value

PROGRAM,function,number	
PROGRAM?	CR terminated text string
RANGE,ch,ranging,range	
RESOLU.format	
REZERO	
SCALE,channel,factor	
SCALE,channel?	single real data value
SHUNT,channel,resistance	
SHUNT,channel?	single real data value
SINGLE,on/off	
SPEED,speed	
SSWEEP,function,number	
START	
STATUS,channel?	range number,range text,over/low/ok
STOP	
STREAM,enable,window	
STREAM,disable	
STREAM?	data, data, data, data, data, …..
SUSPEND,on/off	
TFA	
TFA?	freq,mag1,mag2,dB,phase,delay
TFA,SWEEP?	n lines of TFA? data
TXA,test,fixture,load,source	
TXA?	freq,mag1,mag2,parameter
TXA,SWEEP?	n lines of TXA? data
TXTEST,test,wind1,wind2	
USER?	3 CR terminated text strings
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	
ZERO	
ZERO,DELETE	
ZOOM,level,d1,d2,d3,d4	
ZOOM?	level,d1,d2,d3,d4

calibration commands

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

Appendix B – Configurable parameters

All parameters can be accessed using the CONFIG command:

CONFIG,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 4= Vector Voltmeter 5=Harmonic Analyser 6=Transformer Analyser
3	Bandwidth, (Acquisition Control) (Numetriq series only)	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°
7	Generator output, (Output Options)	1=On 0=Off
8	Graph, (System Options)	0=Dots 1=Lines

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

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=Window

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

15 Filter dynamics, (Acquisition Control, "Filter normal/slow")
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

23 Shunt, (System Options)
0=Default
1=Manual

Input parameters

24 Input 1 (CH1), (CH1-Input 1)
0=Voltage input
2=External shunt

25 Input 2 (CH2), (CH2-Input 2)
0=Voltage input
2=External shunt

26 Minimum range (CH1), (CH1-Input 1)
0=1mv
1=3mv
2=10mv
3=30mv
4=100mv
5=300mv
6=1v
7=3v
8=10v

27 Minimum range (CH2), (CH2-Input 2)
0=1mv
1=3mv
2=10mv
3=30mv
4=100mv
5=300mv
6=1v
7=3v
8=10v

28 Autoranging (CH1), (CH1-Input 1)
0=Full Autorange
1=Autorange up
2=Manual

29 Autoranging (CH2), (CH2-Input 2)
0=Full Autorange
1=Autorange up
2=Manual

30 Coupling (CH1), (CH1-Input 1)
0=ac+dc
1=ac

31 Coupling (CH2), (CH2-Input 2)
0=ac+dc
1=ac

32 Scale (CH1), (CH1-Input, Enter figures)

33 Scale (CH2), (CH2-Input, Enter figures)

34 External shunt (CH1), (CH1-Input, Enter figures)

35 External shunt (CH2), (CH2-Input, Enter figures)

36 Connection (CH1), (CH1-Input, (Numetriq series only)
0=Main right
1=secondary left
2=Differential (both)

37 Connection (CH2), (CH2-Input, (Numetriq series only)
0=Main right
1=secondary left
2=Differential (both)

General parameters

38 Resolution, Comms-Remote Options)
0=Normal
1=High
2=Binary

39 Phase reference, (Acuisition Control)
0=ch1
1=ch2

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=Leading sawtooth
5=Trailing sawtooth

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

59 Interval, (Acuisition 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 Parallel port, (Alarm-monitor options)
0=Disabled
1=Enabled

Power meter parameters

83 Integration type, (Power meter)
0=Signed
1=Magnitude

Streaming parameters

95 Data streaming, (Acquisiton control-Mode)
0=Normal
1=Streaming

96 Window, (Acquisition control-Mode-streaming-Enter figures)

Harmonic analyser parameters

99 Scan, (Harmonic analyser)
0=Single
1=Difference thd
2=Series thd

100 Harmonic, (Harmonic analyser)
0, 1 & 2=2
3=3
4=4
5=5
etc up to 64

101 Harmonics (Max), (Harmonic analyser-scan-series thd)
0, 1 & 2=2
3=3
4=4
5=5
etc up to 64

102 Parameter, (Harmonic analyser)
0=%
1=dB

103 Bargraph Scale, (Harmonic analyser-scan-series thd-Enter figure)

LCR sweep zero parameters

106 Frequency, (LCR Mode-Zero)
0=Single
1=Sweep

107 Sweep start (frequency), (LCR Mode-Zero-Enter figures)

108 Sweep end (frequency), (LCR Mode-Zero-Enter figures)

109 Steps, (LCR Mode-Zero-Enter figures)

System parameters

116 Control, (System options)
0=Volts
1=dBm

117 Step message, (System options)
0=Enabled
1=Disabled

118 Display sequence, (Graph display- After sweep alters screen display)
0=Primary Parameter
1=Secondary Parameter
2=Both Parameters

119 Length units, (System options)
0=Metres
1=Inch

Transformer analyser parameters

121 Parameter, (Mode-Transformer analyser)
0=Turns ratio
1=Inductance
2=Leakage inductance
3=AC resistance
4=DC resistance
5=Interwinding capacitance
6=Magnetising current
7=Return loss
8=Insertion loss
9=Single harmonic
10=thd
11=Longitudinal balance

122 Fixture, (Mode-Transformer analyser-Auxiliary control)
0=None
1=LCR active head
2=TAF01
3=TAF02
4=Impedance analyser interface
6=High Z interface

123 Winding, (Mode-Transformer analyser-Aux control-TAF01/2)

TAF01	TAF02
0=W1	0=W1
1=W2+3	1=W2
2=W2	2=W3

3=W3 3=W4

124 Turns Ratio, (Mode-Transformer analyser-Aux control-TAF01/2)

TAF01	TAF02
0=W1:W2+3	0=W1:W2
1=W2+3:W1	1=W2:W1
2=W1:W2	2=W1:W3
3=W2:W1	3=W2:W3
4=W1:W3	4=W1:W4
5=W3:W1	5=W2:W4
6=W2:W3	
7=W3:W2	

125 Source (Various parameter options), (Mode-Transformer analyser-Auxiliary control-Enter figures)

126 Load, (Insertion loss), (Mode-Transformer analyser-Auxiliary control-Enter figures)

127 Nominal (Turns ratio), (Mode-Transformer analyser-Auxiliary control-Enter figures)

TAF control parameters (TAF01)

130 Source, (Auxiliary control)

0=W1
1=W2+3
2=W2
3=W3

131 Load, (Auxiliary control)

0=W1
1=W2+3
2=W2
3=W3

132 Input 1, (Auxiliary control)

0=W1
1=W2+3
2=W2
3=W3

133 Input 2, (Auxiliary control)
0=W1
1=W2+3
2=W2
3=W3

LCR meter parameters

137 Parameter, (LCR Meter)
0=Auto
1=Capacitance
2=Inductance
3=Impedance
4=Admittance

138 Sweep, (LCR Meter)
0=Series
1=Parallel

139 Graph, (LCR Meter)
0=Single
1=Tanδ/QF
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 Phase reference, (Mode-LCR-Zero-LCR Compensation-Enter figures)

143 Reference (Value), (Mode-LCR-Zero-LCR Compensation-Enter figures)

144 Reference, (Mode-LCR-Zero-LCR Compensation)
0=Capacitance
1=Resistance

2=Inductance

145 Connection, (LCR Meter)
0=Shunt
1=Divider Zx low
2=Divider Zx high

Gain/Phase analyser parameters

147 Graph (time selection), (FRA)
0=Phase
1=Delay

148 dB offset, (FRA-Enter figures)

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

150 Ratio, (FRA)
0=ch2/ch1
1=ch1/ch2

System parameters

151 Minimum cycles, (Acquisition control-Enter figures)

152 Delay time, (Acquisition control-Enter figures)

153 IEEE address, (Comms-Remote options-interface-GPIB-Enter figures)

154 Interface, (Comms-Remote options)
0=RS232
1=LAN
2=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-Enter figures)

159 low threshold (Alarm type), (Alarm-monitor options-Enter figures)

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

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

162 Analogue output, Alarm-monitor options)
0=Disabled
1=monitor
2=Manual

164 Analogue zero (Analog output), (Alarm-Monitor options-Enter figures)

165 Analogue scale (Analog output), (Alarm-Monitor options-Enter figures)

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-Enter figures)

170 Low threshold, (Alarm type), (Alarm-monitor options-Enter figures)

Graph functions

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

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

175 Lower limit (Graph 2 scaling), (Sweep control-Enter figures)

Phase angle voltmeter parameters

177 Parameter, (Vector voltmeter)
0=In-phase
1=Quadrature
2=Tanδ
3=Magnitude
4=Phase
5=In-phase ratio
6=rms
7=rms2/rms1
8=LVDT diff
9=LVDT ratio
10=User interface

178 Scale factor (LVDT), (Vector voltmeter-Enter figures)

179 Null meter, (Vector voltmeter)
0=Off
1=Auto
2=Manual

180 Upper limit (Null meter), (Vector voltmeter-Enter figures)

181 Offset (Parameter), (Vector voltmeter-Enter figures)

Trim parameters

186 ac trim data, (Trim control)
0=Disabled
1=CH1
2=CH2

188 ac level (Trim data), (Vector voltmeter-Enter figures)

190 Trim tolerance (Trim data), (Vector voltmeter-Enter figures)

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)

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