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1. INTRODUCTION

VLog plug in voltage recorders provide a fast and easy solution to recording voltage trends and dropouts in accordance with the European power quality standard EN50160. The products are extremely easy to use and plug directly into mains power sockets. Once the logging parameters have been set VLog will start to automatically store values dates and times which can be downloaded to a PC for further analysis with VLog software. The advanced design of VLog ensures accurate recording of all parameters with no data gaps.

VLog R – measures and records RMS voltage values and dips down to one half cycle.

VLog Q – records additional power quality parameters including transients and harmonics up to the 32nd.

Key features include:

- Continuous recording of all values with no gaps
- Clear graphical and spreadsheet summary of data with quick overview of key power quality parameters
- Min, Max, Average RMS values (1/4 cycle) with time stamps
- Actual transient display (>100 μ S) with time stamp (Q Version)
- Individual harmonic and THD values with trends (Q Version)
- Statistical analysis of data according to EN50160
- Remote access capability via an external modem

PQLog is the PC resident software for the VLog series of Power Quality Monitors¹. This software package comprises of two separate applications,

PQLog Setup – Simple set up of internal clock, logging periods and intervals with default values for quick results

PQLog View – Data presentation showing RMS voltage and harmonic trends, actual transients, summary information and statistics in accordance with EN50160

	VLog R	VLog Q
Operating Voltage	100 – 250V	100 – 250V
Avg. RMS value Resolution	Yes 0.125 V	Yes 0.125 V
Max. RMS value Resolution	Yes 0.5 V	Yes 0.125 V
Min. RMS value Resolution	Yes 0.5 V	Yes 0.125 V
Number of events	32,000	175,000
Dips / Interruptions	Yes	Yes
Time resolution	5 ms	5 ms
Voltage resolution	1V	0.125 V
Over-Voltages	No	Yes
Time Resolution	-	5 ms
Voltage resolution	-	0.125 V
Frequency	No	Yes
Harmonics Measurement EN 601000-4-7	No	Yes (up to 32 nd)
N ^o of recording channels	1 Phase to Neutral	1 Phase to Neutral 2 Phase/Neutral to Ground
Transients	No	Yes
Remote operation via modem	Yes	Yes

¹ Note: For the remainder of this document, VLog refers to either product in the VLog series of Power Quality Monitors: VLog R or VLog Q



1.1 System Requirements

The minimum PC configuration to run PQLogView is as follows:

- Available serial port
- 64 MB RAM
- Min. 10 MB Hard Disk Drive space.
- Microsoft Windows 95, 98, NT 4.0, or 2000

2. INSTALLATION

2.1 Installing the software

Before starting the installation program, ensure that all applications are closed.

- Insert Disk 1 into the disk drive
- Double-click on the "set-up" icon
- Follow the on screen instructions until promoted to enter Disk 2
- Insert Disk 2 into the disk drive
- Follow the on screen instructions until installation is complete

A VLog Power Quality Monitor folder will be created, containing two programs: PQLogView and PQLog Setup.

2.2 Instrument connection

The PQLog Setup application will enable you to check your VLog unit. First, connect the RS232 cable into the VLog serial port. Connect the other end to a free serial port on your PC, and make sure VLog is powered. When powered the VLog LED will flash every second.

2.3 Starting PQLog Setup

1. Click the Start button
2. From the start menu, point to programs, point to PQLog, then click on PQLog Setup.

Your screen will display:



Fig. 1: PQLog Setup initial screen

2.4 Selecting the serial port

On the upper left corner there is a dialogue box marked **COM Port**. Select the serial port to be used for communicating with VLog.

Once the correct serial port has been selected, establish the communication by means of the **Start** button. The screen will change accordingly (depending on the Instrument connected).

3. INTERNAL PARAMETERS

3.1 VLog R

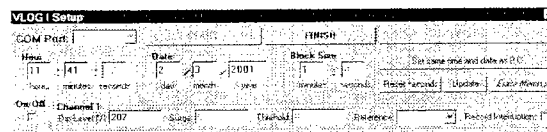


Fig. 2: VLog R internal parameters

VLog R displays:

- Internal clock
- Block size for the measurement process
- DIP limit

By default, the block size is 10 minutes. This means that every 10 minutes, VLog will record the minimum and maximum values reached, and the average for the 10 minute period. The length in minutes of this period is user definable from 1 to 30 minutes.

The DIP level is the value below which the voltage must pass for a DIP to be recorded. By default, this value is 207V, (which is 90% of 230V, the standard European domestic voltage), but it is also user definable. Users not requiring DIP recording measurement can set to 0 (zero).

When the set-up process is complete, click the Finish button. VLog R will then commence measuring (this is indicated by the LED, adjacent to the serial port, flashing).

3.2 VLog Q

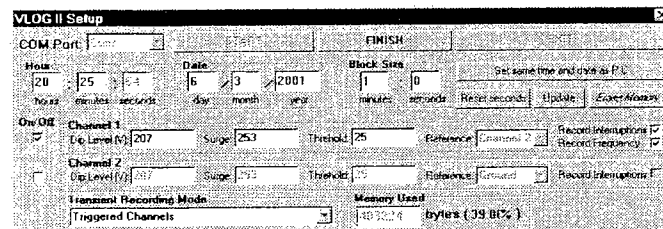


Fig. 3: VLog Q internal parameters

VLog Q displays:

- Internal clock
- Block size for the measurement process.
- Recording Channel
- DIP Limit
- Surge Level
- Threshold parameter
- Transient Recording mode

3.2.1 Block Size

By default, the block size is 10 minutes. This means that every 10 minutes, VLog Q will record the fixed-time events: minimum and maximum RMS values reached,

the average of the RMS values for the 10 minute period, harmonics amplitudes and frequency values (max, min and average). The length in minutes of this period is user definable from 3 seconds to 240 minutes.

3.2.2 Recording Channels

VLog Q has two internal recording channels. The first channel always measures phase-to-neutral voltage². Harmonics and frequency calculations are always performed in Channel 1, which cannot be switched off. In contrast, the frequency measurement function can be switched off, if it is not required, or the user prefers to save memory in order to record for longer periods. Interruption recording can also be switched on or off. The second recording channel can be set to measure either Phase-to-Ground or Neutral-to-Ground. Interruption recording can also be switched on or off.

3.2.3 DIP Limit

The Dip level is the value below which the RMS voltage must pass for a DIP to be recorded. By default, this value is 207V, (which is 90% of 230V, the standard European domestic voltage), but it is also user definable. Users not requiring DIP recording measurement can set it to 0 (zero).

3.2.4. Surge Level

Similarly, the Surge level is the value over which the RMS voltage must pass for a surge to be recorded. By default it is set to 253V. (230 + 10%)

3.2.5 Threshold Parameter

The Threshold parameter defines the voltage difference between the instantaneous voltages of two consecutive periods that triggers a transient recording. By default it is set to 25V, which typically triggers a small number of transients per week in normal network conditions. Users only interested in recording large transients should set it to a higher value.

3.2.6 Transient Recording

The Transient Recording mode parameter enables the user to adjust which voltage channels are recorded when a transient is detected. By default, it will record only the channels that triggered the transient. But it is also possible to change this to record all active channels, independent of which channel triggered the recording.

When the set-up process is complete, click the Finish button. VLog Q will then continue measuring (this is indicated by the LED, adjacent to the serial port, flashing).

² In Norway and other countries Channel 1 measures Phase-to-Phase voltage since electricity distribution is without a neutral connection

4. SAFETY

This product conforms to the latest directives concerning safety and electromagnetic compatibility.


- European Low Voltage Directives 73/23/EEC and 93/68/EEC
- European EMC Directives 89/336/EEC and 93/68/EEC

Safety Standards

IEC / EN 61010-1: 2001/ 2. Edition: Safety requirements for electrical equipment for measurement, control and laboratory use: Part 1: General requirements

EMC Standards

IEC / EN 61326 Amendment 1/1998 for residential and industrial areas.

Emissions : Class B 

Safety instructions :

During operation of this appliance, certain parts inside the enclosure carry hazardous voltages. Infringement of warnings may therefore result in major bodily harm or material damage.

This product is designed to be safe under the following conditions:

- indoor use
- altitude up to 2000m
- temperature 0°C to +50°C
- maximum relative humidity 80% for temperatures up to 31°C decreasing linearly to 40% relative humidity at 50°C.

This meter complies with the requirements of the above safety standard for 300V Cat II Pollution degree 2

Safety in its use is the responsibility of the operator who must be a suitably qualified or authorised person.

Reliable and safe operation of this unit therefore presupposes appropriate transport, storage, positioning and mounting, as well as careful operation and maintenance.

Operating and safety instructions must be followed.

This equipment is a direct-plug in unit and must be plugged only in applicable and standardised sockets. Distribution circuits must be fused.

If there is reason to believe that safe operation is no longer possible, the instrument should be disconnected and secured from unintentional reconnection.

This instrument must be opened by trained service staff

only!

Safe operation should be considered to be no longer possible if the instrument

- shows visible damage
- has been exposed to a period of climatic conditions outside the permissible limits
- has been exposed to major mechanical stresses

If properly handled and treated this equipment requires no maintenance. For cleaning the equipment must be disconnected from mains! Only a moist rag with some domestic detergent should be used.

Do not use abrasive cleaners or solvents. Do not immerse the instrument in liquids.

5. PQLOG VIEW

PQLog View is a powerful application designed to help the user get the most from the VLog Power Quality Monitor.

5.1 Starting PQLog View

1. Click the Start button
2. From the start menu, point to programs, point to PQLog, then click on PQLog View.

Your screen will look like this:

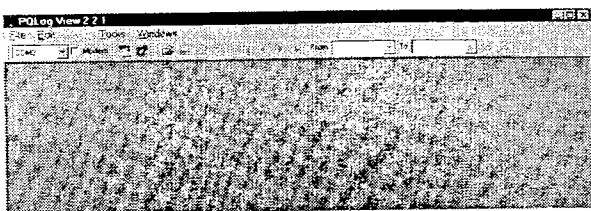


Fig. 4: PQLog View Screen

PQLog View incorporates several toolbars which provide quick access to commonly used functions. These functions are also accessible from the Menu Bar. All toolbars can be re-arranged by dragging them, or make them 'float' over the application. It is also possible to hide them by clicking the 'x' button when 'floating'.

The "Comms toolbar" comprises of 4 items:

- A serial port selector. To choose which port is used for communication with VLog.
- A checkbox to indicate whether a modem will be used or not³.

³ IMPORTANT: Before using a Modem, make sure both local and remote modems are properly configured, (see section 6 'Remote Operation of VLog').

- The Download data button. A connection will be established with VLog, and all VLog recordings will be downloaded.
- Erase Memory. This button will erase the VLog internal memory. The user is prompted for confirmation of this command before data is erased.

The "Main Toolbar" also comprises of 4 items, but only 1 is active at start-up:

- Open data from File: To retrieve previously saved data files from the PC hard drive.

The other 3 buttons are active when PQLog View has data stored in memory:

- Save data to File.
- Print Current Screen.
- Print report. This produces a printed report of the information on screen. It is possible to adjust the report parameters.

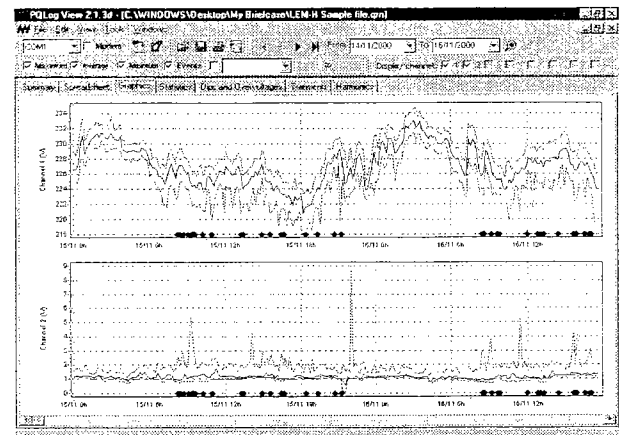


Fig. 5: VLog Q Displaying 2 channels Neutral-to-Ground voltage graphical data

In PQLog View, every file has its own window inside the main one. This allows files to be open simultaneously for comparison. Each of these windows has eight tab markers, which are used to select different viewing modes of the recorded data.

When a data window has been created, The 'Graphics tab' is selected and the graphs corresponding to full measurement period are displayed. New Toolbars appear, and can change according to the viewing mode selected. Their function will be explained in the corresponding viewing mode.

5.2 Summary

The summary presents general information regarding the monitoring process. There are 3 fields the user can edit:

- Recording Location
- Client Name
- Notes. In this field it is possible to enter up to 32kb of text.

Additional information is also displayed including time of first and last recording, recording interval, number of recordings, number of recorded events.

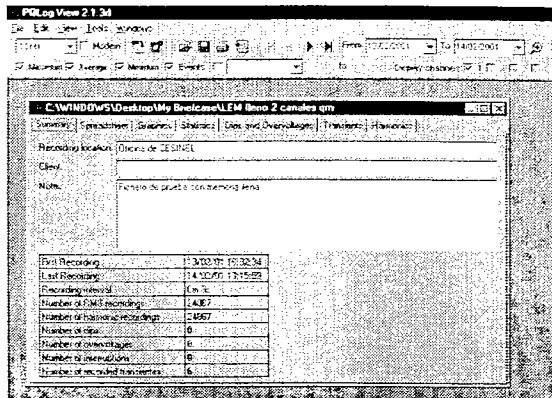


Fig.6 Summary Mode

5.3 Spreadsheet

This mode displays all the recorded data in tabular mode. For every event or measurement, the recording date is displayed in the left column. The second column indicates the type of event or if it is just a timed measurement. If the event is a dip, over-voltage or interruption, the duration is shown in the third column. After this, the maximum, minimum and average values are displayed for every recorded channel. When a dip is recorded, the minimum voltage reached is displayed in the 'Min' column of the corresponding channel.

If an over-voltage is recorded, the maximum measured voltage is recorded on the corresponding 'Max' column.

When an interruption is detected, 0 is noted for maximum, minimum and average measurements. A transient is simply marked 'Transient' in the affected channels.

Frequency Measurements are also displayed in the Max, Average and Min columns of the corresponding channel.

Date	Type	Duration	Channel 1	Channel 2	Channel 3	Channel 4	Channel 5	Channel 6	Channel 7	Channel 8	Channel 9	Channel 10
14/03/00 11:50:05	Measurement		227.75	228.125	228.975	229.825	230.675	231.525	232.375	233.225	234.075	234.925
14/03/00 12:55:31	Measurement		227.75	227.875	228.5	229.125	229.75	230.375	231.000	231.625	232.250	232.875
14/03/00 13:58:37	Measurement		228.375	227.75	228.5	229.125	229.75	230.375	231.000	231.625	232.250	232.875
14/03/00 13:59:43	Measurement		228.4	227.75	228.375	229.000	229.625	230.250	230.875	231.500	232.125	232.750
14/03/00 14:58:48	Measurement		228.25	227.375	228.25	229.125	230.000	230.875	231.750	232.625	233.500	234.375
14/03/00 15:58:55	Measurement		228.375	227.5	228.375	229.250	230.125	231.000	231.875	232.750	233.625	234.500
14/03/00 16:59:01	Measurement		228.575	227.375	228.375	229.250	230.125	231.000	231.875	232.750	233.625	234.500
14/03/00 17:59:07	Measurement		228.75	227.50	228	228.75	229.50	230.25	231.00	231.75	232.50	233.25
14/03/00 18:59:13	Measurement		228.625	227.125	228.125	229.125	230.125	231.125	232.125	233.125	234.125	235.125
14/03/00 19:59:19	Measurement		228.625	227	227.75	228.5	229.25	230.00	230.75	231.50	232.25	233.00
14/03/00 20:59:25	Measurement		228.25	226.75	227.625	228.500	229.375	230.250	231.125	232.000	232.875	233.750
14/03/00 21:59:31	Measurement		228.25	227	227.75	228.500	229.250	230.000	230.750	231.500	232.250	233.000
14/03/00 22:59:37	Measurement		228	226.75	227.625	228.500	229.375	230.250	231.125	232.000	232.875	233.750
14/03/00 23:59:43	Measurement		228	226.75	227.625	228.500	229.375	230.250	231.125	232.000	232.875	233.750
14/03/00 00:59:49	Measurement		228.625	226.5	227.375	228.250	229.125	230.000	230.875	231.750	232.625	233.500
14/03/00 01:59:55	Measurement		228.5	226.5	227.5	228.5	229.5	230.5	231.5	232.5	233.5	234.5
14/03/00 02:59:01	Measurement		228.5	227.25	228.375	229.500	230.625	231.750	232.875	234.000	235.125	236.250
14/03/00 03:59:07	Measurement		228.75	227.375	228.125	229.000	229.875	230.750	231.625	232.500	233.375	234.250
14/03/00 04:59:13	Measurement		228.125	227.25	228.375	229.500	230.625	231.750	232.875	234.000	235.125	236.250
14/03/00 05:59:19	Measurement		228.5	227.375	228.375	229.375	230.375	231.375	232.375	233.375	234.375	235.375
14/03/00 06:59:25	Measurement		228.625	227.25	228.25	229.25	230.25	231.25	232.25	233.25	234.25	235.25
14/03/00 07:59:31	Measurement		228.75	227.5	228.5	229.5	230.5	231.5	232.5	233.5	234.5	235.5
14/03/00 08:59:37	Measurement		228.625	227.375	228	229	230	231	232	233	234	235

Fig.7 Spreadsheet Mode

5.4 RMS Voltage

In this case, the recorded information is displayed in graphic mode. Since a graph is displayed for each channel, the display can become over cluttered if multiple channels are recorded, especially with small screens. To avoid this, each channel can be switched on or off with the 'channels' toolbar.

The RMS measurements are marked with red for maximum, black for average and green for minimum. In the 'preferences' dialogue box (Edit menu) it is possible to specify the way the measurement points are linked to form a line.

The recorded events are also shown using several symbols. A green triangle pointing down represents a dip. The minimum value reached is shown in a small sign. A red triangle pointing up represents over-voltages. A blue diamond represents recorded transients and grey rectangles mark the beginning and end of the interruptions.

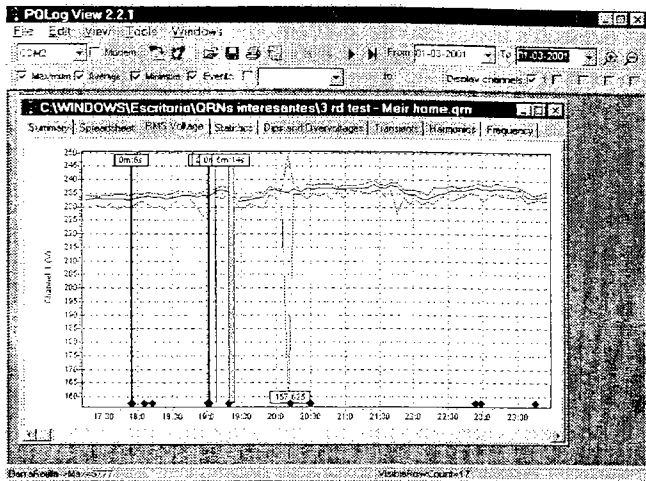


Fig. 8 RMS Voltage

The individual traces for maximum, average and minimum can be switched on or off with the appropriate checkbox in the graphic control toolbar. The same applies to the marks of the events.

In this mode, the 'Events' toolbar can be used to jump to the next or previous event and also to go to the first or last recorded event. When this is done, the data in the spreadsheet mode will change accordingly.

The magnifying glass with a '+' sign is useful for viewing data with more detail; the displayed interval is thus reduced. The magnifying glass with a '-' has the opposite effect.

5.5 Statistics

This panel displays a statistical analysis of the recorded data. On the right side of the panel a histogram of the data is shown. The height of a bar represents the number of measurements that are in the voltage range for that bar. For instance, the fourth bar in the histogram above indicates that there have been 65 voltage measurements between 222.5 and 223.0V.

On the left of the panel several statistical measurements are displayed. From top to bottom:

- Mean value, which is given by the formula:

$$\mu = \frac{\sum_{i=1}^N x[i]}{N}$$

where $x[i]$ represents a particular measurement and N the total number of measurements

- Standard Deviation, given by:

$$\sigma = \sqrt{\frac{\sum_{i=1}^N (x[i] - \mu)^2}{N - 1}}$$

where μ represent the mean as defined before

- 5% percentile: the lowest value that is higher than 5% of the measurements
- 95% percentile: the lowest value that is higher than 95 % of the measurements
- The % of values that are between nominal-15% and nominal+10%
- The % of values that are between nominal - 10% and nominal + 10%
- Minimum recorded value
- Maximum recorded value

Unlike the graphic panel previously explained, only one channel can be selected at any given time. To reflect this, the Statistics toolbar has radio buttons instead of checkboxes. It is also possible to select which one of the three traces (maximum, average or minimum) will be analysed.

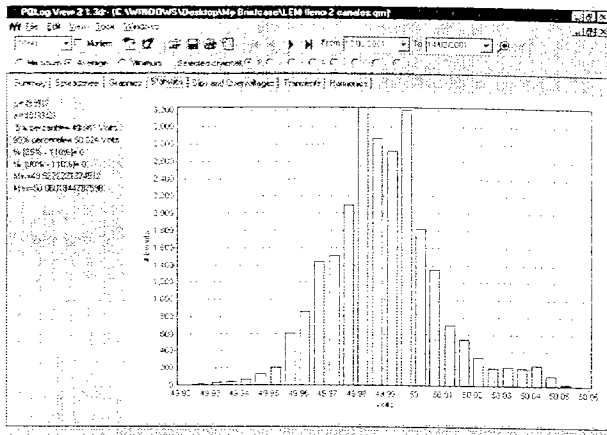


Fig. 9 Statistics

5.6 Dips and Over-voltages

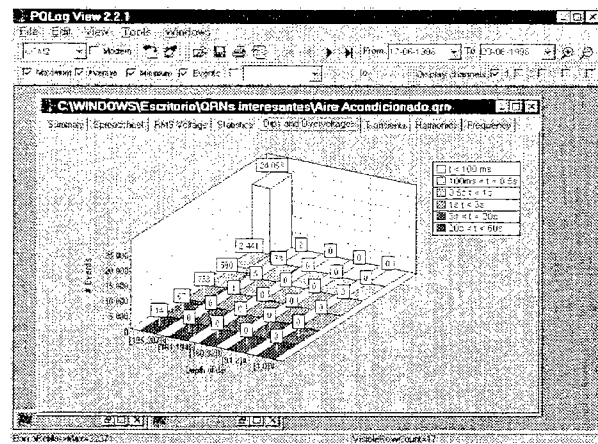


Fig. 10 Dips and Over-voltages

In this panel a two dimensional histogram displays the recorded dips and over-voltages. The bottom axis represents dip depth and duration in different axis. The height of a bar represents the number of events recorded with that particular duration and voltage level. For example, the highest bar on the graph above indicates that 24053 dips were recorded with duration shorter than 100 ms and voltage level between 195 and 207 volts.

The histogram can be copied using the 'Copy' function in the 'Edit' menu.

5.7 Transients

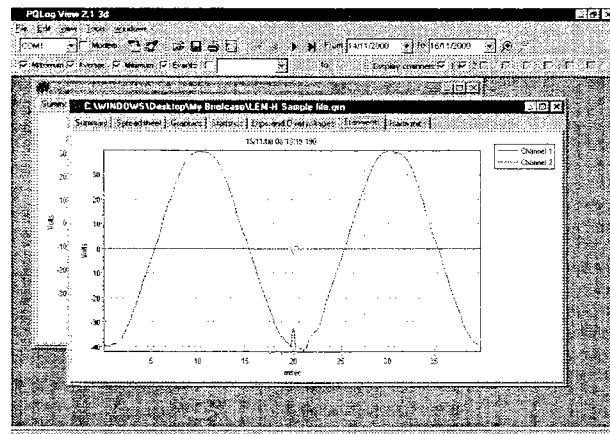


Fig. 11 Transients

The recorded waveforms are displayed for every transient detected. It is possible to browse the different transients with the 'Events' toolbar. It is also possible to switch on or off every one of the channels that have

been recorded, by clicking in the appropriate checkbox.

When the transient panel is active, the 'Export data' item in the 'File' menu lets you save the transient data for processing in other application. It is also possible to use 'Copy' in the 'Edit' menu in order to later paste the graph in a word processor or other application

5.8 Harmonics

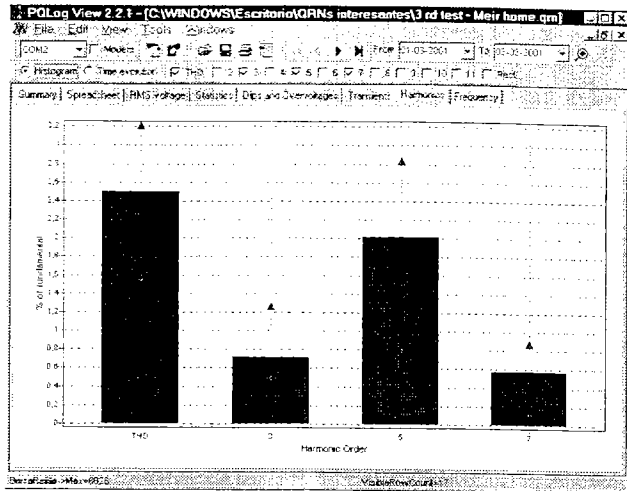


Fig.12 Harmonics

There are two ways to visualise the recorded harmonic amplitudes

- Histogram for the different harmonic orders. In this mode, the average (blue bar) maximum (red triangle) and minimum (green triangle) of all the harmonics amplitudes are displayed. Also the Total Harmonic Distortion (THD) is shown. Any of these individual harmonics or the THD can be switched on or off. Note that the time interval analysed is as shown in the RMS Voltage tab, which is defined by the "From" and "To" day selectors.
- Time-evolution curves, in a similar way to the RMS values. Note that odd harmonics (which are normally larger than even) are plotted using thicker lines. Individual harmonics, as well as the THD, can be switched on or off. In this mode the interruptions are drawn over the recorded data to mark the fact that in those periods there is no available data

5.9 Frequency

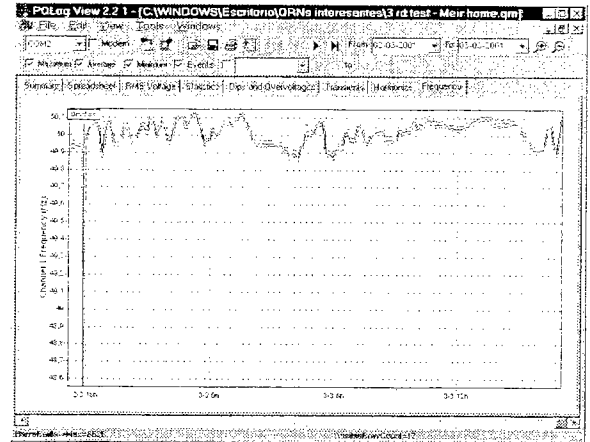


Fig. 13 Frequency

The recorded frequency values are displayed as time-evolution curves, in a similar way to the RMS voltage (or current) values. The Colour convention used to display the values of the frequency are; for maximum a red trace, average a black trace and minimum a green trace. As with all graphs in PQLog View, it is possible to copy the figure in order to paste it into a word processing document or other application.

6. REMOTE OPERATION OF VLOG INSTRUMENTS

As mentioned previously, it is possible to establish a remote connection with VLog using two modems, one connected to VLog and one connected to the PC. These two modems must be configured properly in order for the connection to be established correctly. The configuration should make the modem use V42 and V42bis protocols for data compression and error correction. Most modern modems support these standards.

Remote Modem: Configure the modem connected directly to VLog as follows. It should be configured to answer the phone when a call is received, and to set the serial port speed to 57600 BPS.

There are basically two types of modems on the market; those who follow the U.S. Robotics set of commands, and those who follow the Rockwell set of commands. If you are not sure which set of commands your modem uses, check in your modem's operator's manual to obtain the command to force the use of data compression:

- ◆ **&K2:** Your modem is U.S. Robotics or compatible
- ◆ **%C2:** Your modem is Rockwell or compatible

Once you have identified your modem, it is necessary to initialise it. In order to do this, connect it to your P.C., and open a communications program such as Windows HyperTerminal. Make a new connection with 57600 BPS, 8 data bits, no parity bit and 1 stop bit. Type:

AT ↵

Expected response:

OK

The below table gives the expected responses for each modem type:

	U.S Robotics and compatible	Rockwell and compatible
You type:	AT&F0↵	AT&F0↵
Modem answers:	OK	OK
You type:	AT&S0=1↵	AT&S0=1↵
Modem answers:	OK	OK
You type:	ATM0&B1&K2 ↵	ATM0%C2↵
Modem answers:	OK	OK
You type:	ATY0↵	ATY0↵
Modem answers:	OK	OK
You type:	ATQ1↵	ATQ1↵
Modem answers:	(nothing)	(nothing)
You type:	AT&W0↵	AT&W0↵
Modem answers:	(nothing)	(nothing)

After completing this, the modem should be correctly configured. Switch it off and on, and make sure it picks up the line when called. When this is successfully completed, connect it to VLog.

Local Modem: Configure the modem connected to the PC where PQLog View is installed as follows. It does not need any special previous set-up, since PQLog View sends an initialisation string whenever a call is made.

The initialisation string is defined in the following table:

U.S Robotics and compatible	Rockwell and compatible
AT&F0Q0&B1&K2	AT&F0Q0%C2

7. WARRANTY

The software is provided on an "as is" basis. The user is responsible for the choice, installation use and results of use. LEM does not warrant that the functions contained in the software will meet the user's requirements or that the operation of the programme will be uninterrupted or error free. LEM does not recommend use of the software for life critical functions or for any application where a software error may cause financial loss, damage or expense. LEM makes no representation, gives no warranty and accepts no condition of any kind whatsoever either expressed or implied, except as herein expressly stated.

LEM gives a limited warranty that the disks on which the programme is supplied, to be free from material and workmanship defects under normal use for a period of 90 days from the date of receipt by or delivery to the licensee. In the event that the disks are found to be so defective within the said period, as evidenced by a proof of purchase receipt, LEM will replace them free of charge if they are returned postage pre-paid.

Under no circumstances will LEM, be liable for any consequential, incidental, indirect, special or exemplary damages or other economic or physical loss, even if LEM has been advised of the possibility of such damages and loss. Under no circumstances will liability exceed the purchase price of the software.

It is prohibited to copy the documentation and other printed material. Disassembly, reverse engineering and reverse compilation of the software is prohibited. The software supplied by LEM is copyright.

The user undertakes to take all necessary precautions to protect the software from unauthorised copying, distribution or use.

The Interface hardware is guaranteed for one year from the date of purchase against defective material or workmanship.

If the hardware fails during the warranty period, at the discretion of LEM, it will be repaired or replaced with a new or reconditioned unit provided LEM is satisfied that the failure is due to defective material or workmanship.

Goods alleged by the buyer to be defective shall not form the subject of any claim for injury, loss, damage, or any expense howsoever incurred whether arising directly or indirectly from such alleged defects other than death or personal injury resulting from the seller's negligence. No condition is made or to be implied nor is any warranty given or to be implied as to the life or wear of goods supplied or that they will be suitable for any particular purpose or for use under specific conditions, notwithstanding that such purpose or conditions may be known to the seller.