

eqLogger

Version 2.3.2

Reference Manual

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Part of eqSuite seismic data collection and analysis software suite developed by the Seismology Research Centre.

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Overview

eqLogger continuously displays and archives digital waveforms sent to a directory on the computer from seismographs or from SeisMonitor telemetry systems.

It displays a "digital drum" image of continuous seismic data from a single seismograph or a number of seismographs. It is not part of the automatic hypocentre determination system of **eqSuite**.

eqLogger automatically:

Monitors the specified directory for the arrival of PC-SUDS format waveform data files.

Displays the waveforms received during the previous hour.

Combines, compresses and archives the waveform data received every half hour.

- Writes state of health (SOH) information received from a seismograph to a database each half hour.

You can use **eqLogger** to view the past hour of continuous seismic data from a number of sites or 24 hours of data from a single site.

You can specify

An individual site or "ALL" sites for display

The maximum amplitude to display for each individual site

Length of the trigger alert message display and alarm

Threshold settings for the Battery Voltage and Percent Free storage on the seismograph.

Setup and Adjustments

Installation

1 Ensure that you have the correct hardware and operating system, and that Java is installed. See "Technical Notes" below for details.

2 The eqSuite Database must already be installed. Refer to the eqSuite Database Manual for instructions on how to do this.

3 Double-click on eqSuite.exe and follow the prompts to install eqLogger and other eqSuite programs.

4 Create a folder on the hard disk to receive the waveform data from the seismographs. Usually this will be a folder on a local FTP server that seismographs will connect to and write files to.

Folder name restrictions:

The folder name must end with 'in' or 'kelunji'

The default setup is to use the folder:

C:\inetpub\ftproot\eqlogger\in

Examples of acceptable folder names: D:\ftproot\kelunji,
C:\eqWatch\data\in, C:\seismograph\in.

5 Create a directory for **eqLogger** to store the combined and compressed waveform data in.

There are no restrictions on the directory name, but the default is C:\inetpub\ftproot\archive. Other suitable names are D:\archive or C:\eqlogger\out

6 Create a directory for **eqLogger** to store images of the data window in. These images are used by **eqServer** to display recently recorded data in a web browser.

There are no restrictions on the directory name, but suitable names are D:\archiveimages or the default C:\Program Files\Apache Group\Tomcat 4.1\webapps\eqserver\data\eqlogger.

Running for the first time

7To start **eqLogger** double-click the **eqLogger** icon on the desktop.

8Specify the property values as described in the following sections.

Refer to "Trouble Shooting" if you have any problems.

Setting the trigger properties

In the Properties window select the **Trigger** tab.

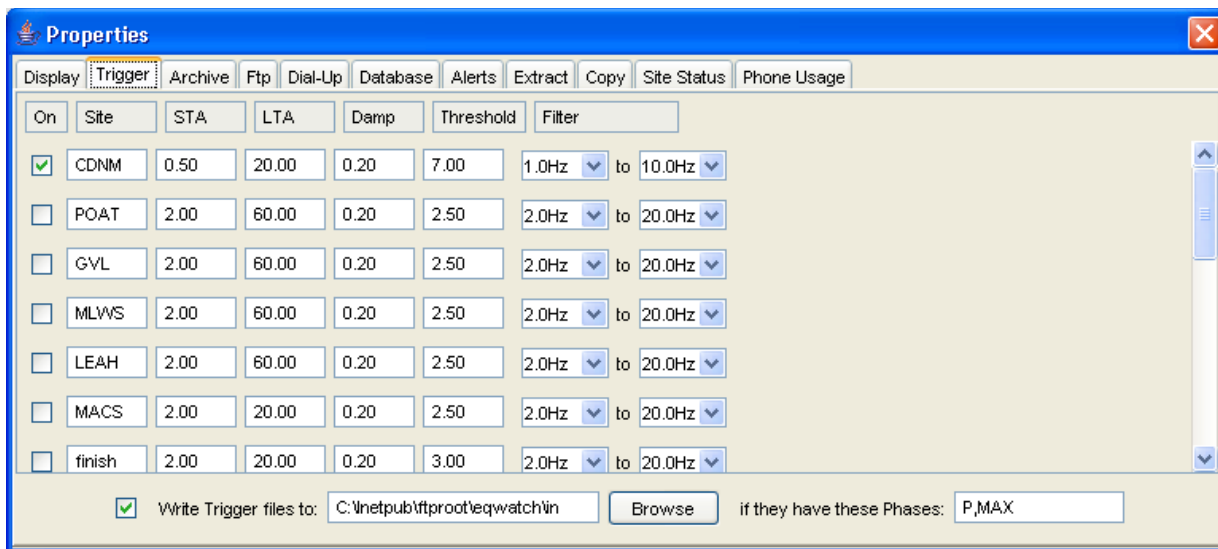
eqLogger uses an STA/LTA ratio to detect seismic events where

STA = Short Term Average amplitude
 LTA = Long Term Average amplitude

When there is minimal seismic activity, STA/LTA has a value of approximately 1.

You can adjust the trigger properties for a site that is more or less sensitive than usual.

To adjust the properties for detecting a seismic event, click the **Trigger** tab.



On

Tick the checkbox for those sites you want **eqLogger** to generate triggers from

Site

Specify the site code of the seismic recorder

STA

eqLogger will calculate the Short Term Average amplitude of the wave over the time period that you specify. A typical value for STA is 1.0 seconds.

If you specify a time period that is too short, **eqLogger** will interpret spikes as seismic events.

If you specify a time period that is too long, **eqLogger** will be insensitive.

LTA

eqLogger will calculate the Long Term Average amplitude of the wave over the time period that you specify. A typical value for LTA is 30 seconds.

Specify a value that is greater than the value you specified for STA.

If you specify a time period that is too short, **eqLogger** will be insensitive.

If you specify a time period that is too long, **eqLogger** will be slow to adjust to changes in background noise levels.

Damp

Specify the Damp value (similar to a squelch) that you think is appropriate. This value is added to the long term average to prevent continuous triggering on very quiet sites.

Typical values for Damp are between 0.2 and 1.

Threshold Ratio

Specify the STA/LTA ratio that you think would indicate a seismic event for your site.

Typical values for a STA/LTA threshold are between 2 and 10.

Filter

Filters can remove other frequencies corresponding to noise in the data, for example 50Hz noise created by power supplies.

The band pass filter removes all data outside the range specified.

You can choose to filter the selected seismograph component data. **eqLogger** will use the filtered data when it determines triggers.

eqLogger does not apply any filters to the data it archives.

You can select the lower and upper cutoff frequencies from the drop-down lists. **eqLogger** adjusts the frequency options available in these drop-down lists according to the sample rate of the data.

A typical filter range is from 2Hz to 12Hz.

If the sample rate of the data changes, **eqLogger** calculates new lower and upper cutoff frequency options.

To remove the filter, set the lower cutoff frequency to the lowest value (0Hz) and the upper cutoff frequency to half the sample rate (the largest value in the pull-down list).

Write Trigger files

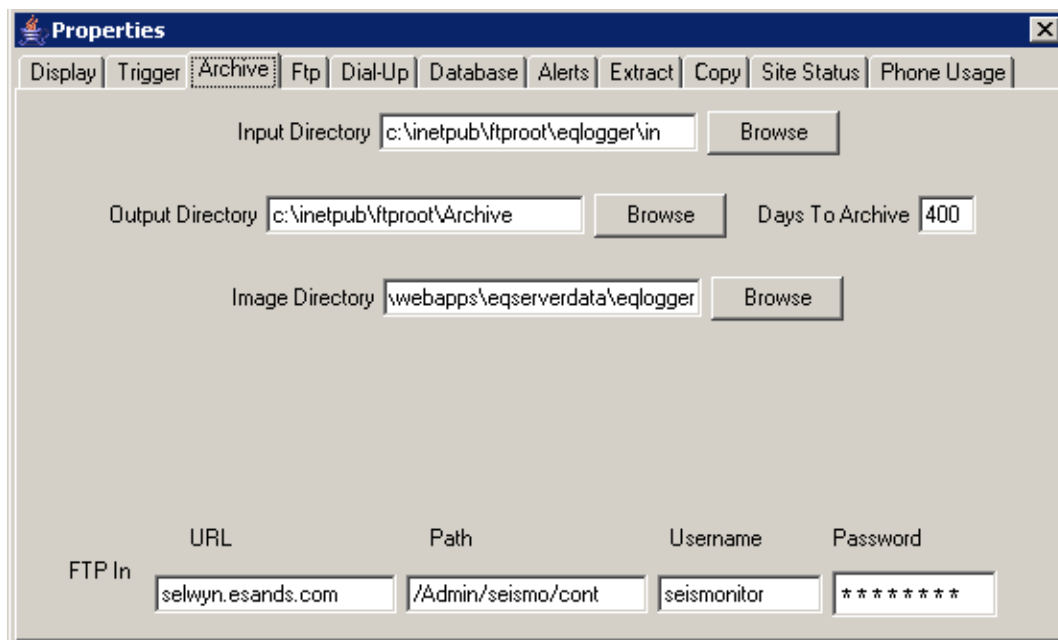
If your **eqLogger** program is part of an automatic earthquake location system using **eqWatch** or some other program you should specify the input directory of that program here and tick the checkbox.

If co-operating with **eqWatch**, this folder should be by default C:\inetpub\ftproot\eqwatch\in.

Input and Output directories

You can specify the directories to receive waveform data from the seismographs, and for outputting the archive data.

To specify the input, output and image directories, click the Archive tab.



Specify the full path for the input, output and image directories you created in the "Installation" section of "Setup and Adjustments".

The default directories are C:\in and C:\out.

Input Directory

The location of the waveform data that arrives from the seismographs.

The waveform data files arrive in intervals of between 30 seconds and 5 minutes according to seismograph settings. As **eqLogger** displays and archives the waveforms, it deletes the files in this directory.

Output Directory

The location for **eqLogger** to archive the waveform files.

Each file contains 5 minute segments and is given a name based on the start time in the format `yyyymmdd_hhmm.sud`

For example, the file `19990314_0310.sud`

is the file containing waveforms recorded on 14th March 1999, starting at 3:10 am UTC.

eqLogger stores these files in sub-directories that it creates within the output directory.

Days to Archive

Specify a value that suits the amount of storage you have available on your hard disk.

Specify a low number of days to start with - between 1 and 30. When **eqLogger** has processed at least one hour's data, you can

verify the storage required. Open the output directory you specified and note the size of each half hour .gz file that **eqLogger** has created.

See "Files" in "Technical Notes" for an explanation of the .gz files.

When **eqLogger** has archived the number of days specified, it will continue to archive data, but will discard the earliest data, one day at a time.

Image Directory

The location for **eqLogger** to archive the image files. They are low resolution pictures of the data window, available for display via web browser using **eqServer**.

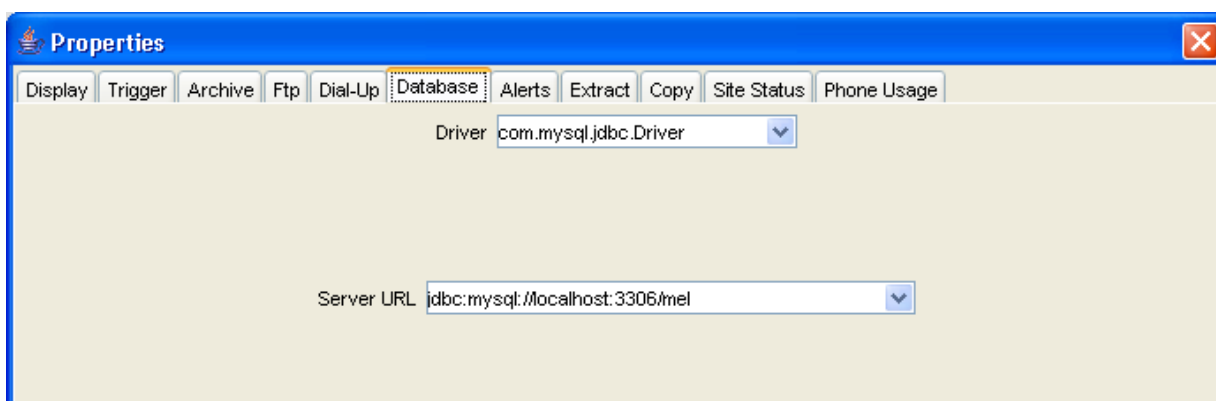
FTP in

If you wish your **eqLogger** program to gather files from a remote computer specify the URL, path, username and password here.

Database

eqLogger can write state of health (SOH) information to a database from each site sending data to the input directory. The SOH data can then be accessed by the **eqServer** package.

To specify the database parameters, click the **Database** tab.



Driver

Specify the driver this computer should use to communicate with the database.

Server URL

Specify the URL of the database being used.

User

Username.

Pass

Password.

Test

Tests the settings to see if they connect to a database.


Operation

Starting and Stopping

Starting

Double click on the **eqLogger** icon on the desktop.

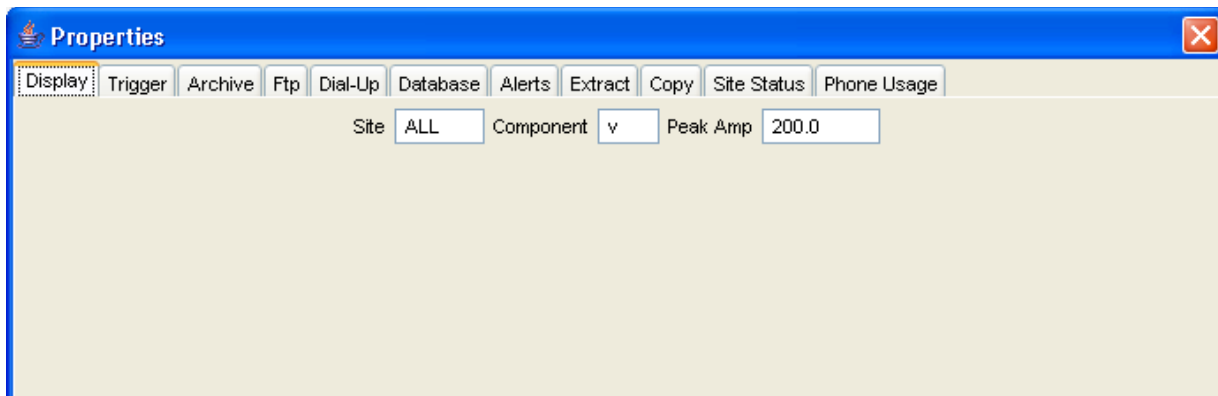
Stopping

To Stop, select Exit from the File menu. If the MSDOS command window remains open, click its Close box .

The selected waveform component

You can specify one of the seismograph components for display.

To specify the seismograph and component for display, click the Display tab, or alternatively use the pull down list from the sites menu in the data display window.



Note:

These property values do not apply to the existing waveform display. **eqLogger** uses the new property values you specify when it processes the next file. It does not redraw existing waveforms using the new values.

eqLogger saves the new property values when you Exit.

Enter values for the following properties:

Site

The site code is an abbreviation of the site name.

If you do not specify a site, or if you specify an invalid site name abbreviation, then **eqLogger** displays the first seismograph site in the file by default.

Component

A single character to specify the component for display. This character may be

v	vertical or up
n	north-south component
e	east-west component.

or any character that corresponds with a component name as configured in the seismograph (refer to the Kelunji Echo Seismic Recorder Handbook for instructions).

Enter 'v' if **eqLogger** is receiving data from SeisMonitor.

If no component is specified, or if an invalid component is specified, then **eqLogger** selects the first component of the site specified by default.

Peak Amp

The peak amplitude displayed in counts.

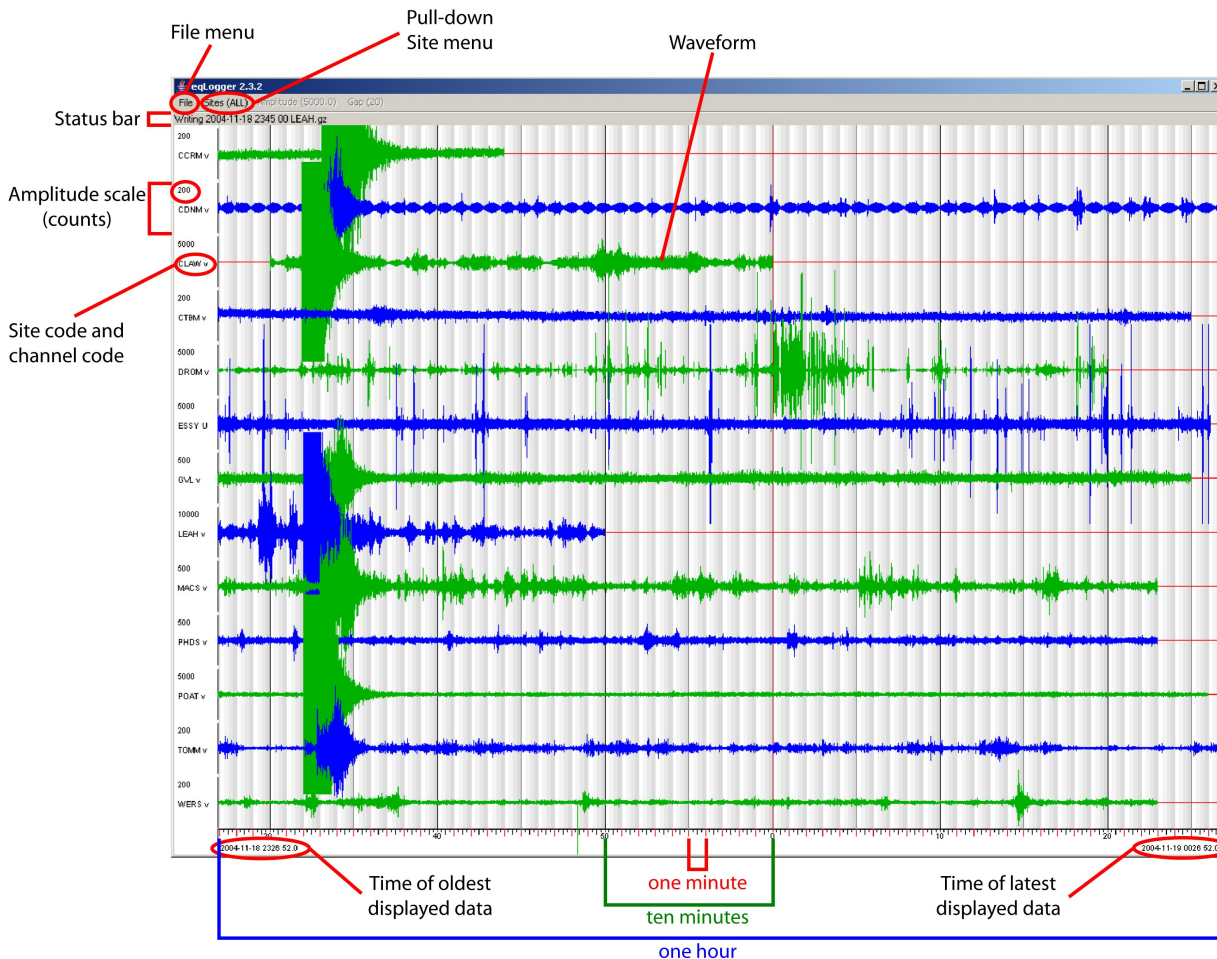
Typical values for peak amplitude are between 100 and 1000 counts.

The default value is 200.

If your site is particularly noisy, you may need to specify a higher peak amplitude.

Viewing the waveforms

eqLogger may display the past hours' data from all seismographs sending data in, or one days' data from a single site only.



The waveform display includes the following features:

A status bar displaying the name of the file **eqLogger** is currently processing

One hours' data on each axis, displayed in green and blue traces from alternating sites. Alternatively you may display one days' data from a single site by selecting a single site name rather than "All" in the drop down 'Site' menu.

The beginning time and date of the data displayed

The peak amplitude displayed for each channel in counts. This value may be changed by clicking on the value next to the channel you wish to change and selecting a new value from the drop down menu.

Grey tick marks on the horizontal axis indicate 15 second intervals

Red tick marks on the horizontal axis indicate 10 minute intervals

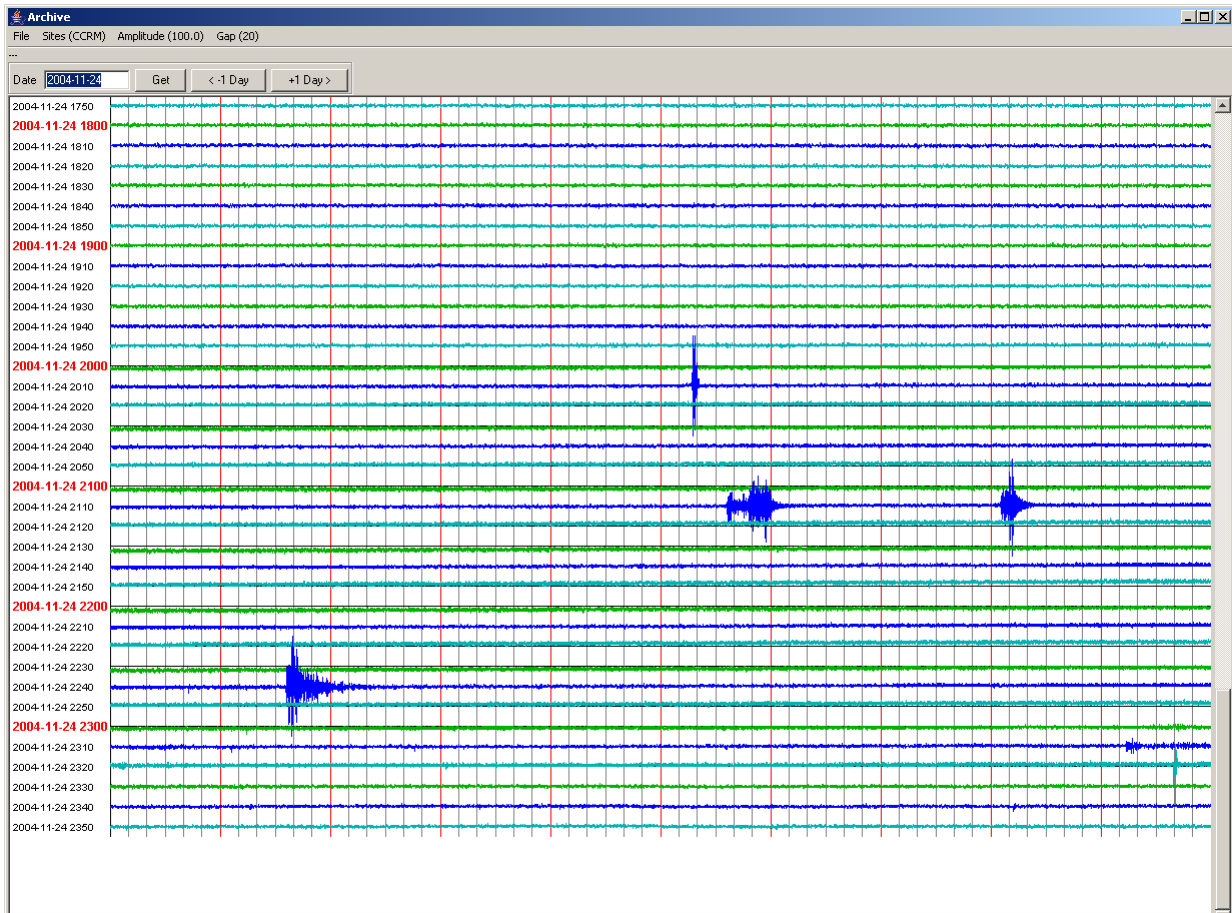
The zero axis of the waveform

A scale across the bottom indicating minutes

1 hour of continuous data from left to right. The most recent waveform is displayed on the right of the scrolling frame.

Gaps in the data appear as blank space

By selecting the View Archive option in the File menu, **eqLogger** can also display one hours' data from a single site for any selected time.



Troubleshooting

No waveform will display

Check that:

You have specified the correct input directory

The seismograph is operating correctly

The seismograph is sending files to the correct input directory

There are files in the input directory

The hard disk is not full (if so, reduce the number of days stored in the archive).

If you are connected to the seismograph by FTP, check that

FTP server is installed on your computer

The seismograph has permission to upload files onto the FTP Server

The alarm is silent

Check that the file **alarm.au** is in the same directory as **eqLogger**.

Triggers are too infrequent

Lower the STA/LTA threshold

Widen the band width filter

Triggers are too frequent

Check the data for spikes

Raise the STA/LTA threshold

Set the filter to remove upper or lower frequencies that may cause unwanted triggers

Spikes occur

Spikes are data with high amplitude over a very short time period. Spikes can generate false triggers.

To remove triggers on spikes:

Increase the Short Term Average time constant used in STA/LTA

Check the quality of the communication connection between the seismograph and the computer

Check that the seismograph and computer have the same setting for any serial line connections

No Data from Seismograph Alert occurs

eqLogger has not detected any new data files in the input directory.

eqLogger remembers the time span of the data files that have arrived. If files do not arrive for 2 minutes beyond this time span, **eqLogger** displays this inactivity alert.

For example, if the files are 1 minute long, **eqLogger** displays an alert after 3 minutes, if the files are 5 minutes long, **eqLogger** displays an alert after 7 minutes.

Check that the seismograph is operating correctly and that the connection between the seismograph and the computer is intact.

Technical notes

Equipment required

You can use **eqLogger** on a computer with the following:

Operating system

eqWatch is a Java program and will run on any operating system that has Java 1.4 or later installed.

ES&S currently supplies an installer for Windows Operating Systems, from Windows 95 onwards.

FTP Server

Normally access to an FTP server is needed for remote Seismographs to connect to and send their files.

Java

eqLogger requires Java 1.4 or later.

The latest version of Java can be found at:

<http://java.sun.com/j2se/>

How to Check what version of Java is running

Open a **Command Prompt** or MS-DOS window.

On Windows XP – this is found on the Start Menu at:

Start->Programs->Accessories->Command Prompt.

On the command line type:

```
java -version and then press Enter.
```

If java is installed you will see a reply similar to:

```
java version "1.4.2_02"
```

Directory structure

Path name restrictions:

The path must consist of existing directories. **eqLogger** does not recognise Windows 95 shortcuts.

Input Directory

The location of the waveform data sent from the seismograph, default c:\inetpub\ftproot\eqlogger\in. It must correspond to the directory where the seismograph is placing files. The seismograph will place these files in intervals usually between 30 seconds and 5 minutes according to seismograph settings. As **eqLogger** displays and archives each data file, it deletes the file from the input directory.

Output Directory

The location for **eqLogger** to archive the waveform files, default c:\inetpub\ftproot\archive. Each 5 minutes, **eqLogger** combines

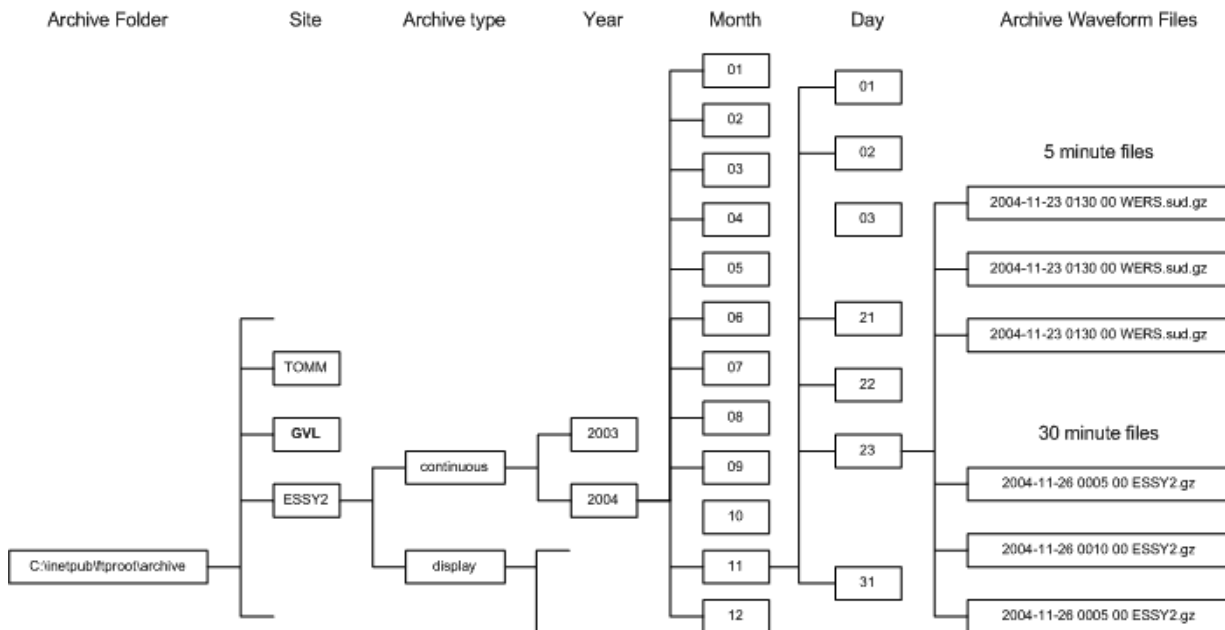
the waveform data into a 5-minute segment. It gives the file a name that indicates the starting time - in the format yyyy-mm-dd_hhmm ss SITE.gz.

For example, the file

2004-11-24 0409 20 WER.gz

is a file containing waveforms recorded on 24th November 2004, starting at 4:09am from the WER site.

eqLogger stores these files in sub-directories that it creates within the specified output directory.



Each half hour, **eqLogger** retrieves the previous 6 segments, combines and compresses them using standard gzip compression, and stores the compressed data in a file with the name of the first segment. It deletes the original uncompressed segments.

For example, the file 19990314_0310.sud would be compressed with files from 3:00am to 3:25am, and named 1999-03-14 0130 00.WER.sud.gz

You can view the waveform data stored in this directory using eqWave software.

You can calculate the storage required using the following algorithm:

$$D = \text{samplesPerSecond} \times \text{bytesPerSample} \times 3600 \times \text{numberComponents}$$

bytes of uncompressed data per hour.

where D = the amount of storage required for one hour's data

When **eqLogger** combines and compresses the data, it requires only 25% to 50% of this storage.

Band Pass Filter Options

eqLogger uses the sample rate to calculate the frequency options available in the drop-down lists. It multiplies the sample rate by the ratios listed below:

Lower cutoff frequencies:

Ratio (Proportion of sps)	100 sps example (Hz)	50 sps example (Hz)
0.2	20	10
0.15	15	7.5
0.12	12	6
0.1	10	5
0.075	7.5	3.75
0.05	5	2.5
0.04	4	2
0.035	3.5	1.75
0.03	3	1.5
0.025	2.5	1.25
0.02	2	1
0.015	1.5	0.75
0.012	1.2	0.6
0.01	1	0.5
0.0	0	0

Upper cutoff frequencies:

Ratio (Proportion of sps)	100 sps example (Hz)	50 sps example (Hz)
0	0	0
0.05	5.0	2.5
0.07	7.5	3.75
5		
0.12	12.0	6.0
0.15	15.0	7.5
0.2	20.0	10.0
0.25	25.0	12.5
0.3	30.0	15.0
0.4	40.0	20.0
0.5	50.0	25.0

Until **eqLogger** receives the first data file, it calculates the frequency options based on an estimated sample rate of 100 sps, and displays these options in the drop-down lists.

If **eqLogger** processes a data file with a sample rate that is different from the estimated or current sample rate, **eqLogger** calculates new frequency options to suit the new sample rate. **eqLogger** uses the previously specified cutoff frequency ratios to determine the new cutoff frequencies for filtering.

For example, if the sample rate changes from 100 sps to 50 sps, an upper cutoff frequency of 10 (ratio = .1) will change to 5.