Personal Vehicle Monitoring Devices

Imagine you're travelling comfortably down the highway with about 50 passengers on your coach. It has been an uneventful run, except for an occasional erratic driver, and you get a call on your mobile bluetooth. It's your boss, and he's asking what's going on. Puzzled, you enquire what he's talking about. "I've just had a phone call from a bloke in a car saying you cut him off, tailgating and doing 120!" Does this (or something like it) sound familiar?

The modern bus and coach driver has enough to contend with regarding safety and legislation. Directed road-rage and false accusations don't enhance our reputations, and can damage the reputation of the companies we serve.

Thankfully, modern technology has a simple solution, with multiple advantages, to this and other similar problems.

Camera systems are not new in the passenger transport industry. There is now a wide range of relatively cheap but advanced "black-box" vehicle monitoring devices available to protect the performance of the individual driver and vehicle. There have been many references on current affair television programmes recently promoting these devices.

The benefits of using a **VMD** for professional coach drivers and operators are:

1. Monitoring of driver performance.
    - legal
    - safe
    - economic / efficient
2. Monitoring of driver's legal performance (in accordance with Operator Accreditation)
    - passenger announcements
    - safety instructions
    - driver behaviour
3. Legal evidence
    - transport department investigations of compliance (safety spiels, driving hours, etc.)
    - police investigation of incidents
    - insurance investigation of incidents
4. Driver self-improvement
    - examination of data to professionally enhance driver skills.
    - evidence for training and attaining accreditations.

Mounted on the windscreen, most basic modern VMDs have high definition cameras recording the traffic ahead. They have accompanying firmware for GPS tracking, and speed monitoring. Advanced devices often have an accelerometer to measure forces in all three axes (front-back, left to right, up and down) as well.

The data is recorded onto SD cards, and can be transferred to computer for analysis or hard-drive for storage. There is accompanying software to analyse the various performance parameters.

Figure 1: A sample VMD unit

How They Work

They are powered by the same sockets as Sat Nav GPS devices. The VMDs are mounted on the windscreen similarly to Sat Navs, however they can be less obtrusive, as they don't need to be monitored while driving.

Typically, the camera records a 120^{O} view of the road ahead. A microphone can record audio inside the vehicle (including loud external noises such as horns and impacts).

When the VMD is activated (powered from the socket), they boot up with system and memory card checks, acquire GPS signals, and set date, time, and position.

All data is concurrently recorded, as operational time progresses, on the SD card. The larger the SD card capacity, the more data can be stored. (For instance, a 16Gb card can hold about 16 hours of data, depending on sensitivity of the settings).

The video should be recorded in an advanced tamper resistant format. The data is date and time stamped with the GPS co-ordinates, speed, and records acceleration of the X,Y, and Z axes.

[The accelerometer measures g-forces in the three directions to determine impacts, and if the vehicle experiences excessive braking/accelerating or swerving, or vibrations from road conditions, etc.]

Most data features can be configured to adjust sensitivity to measurements using the software.

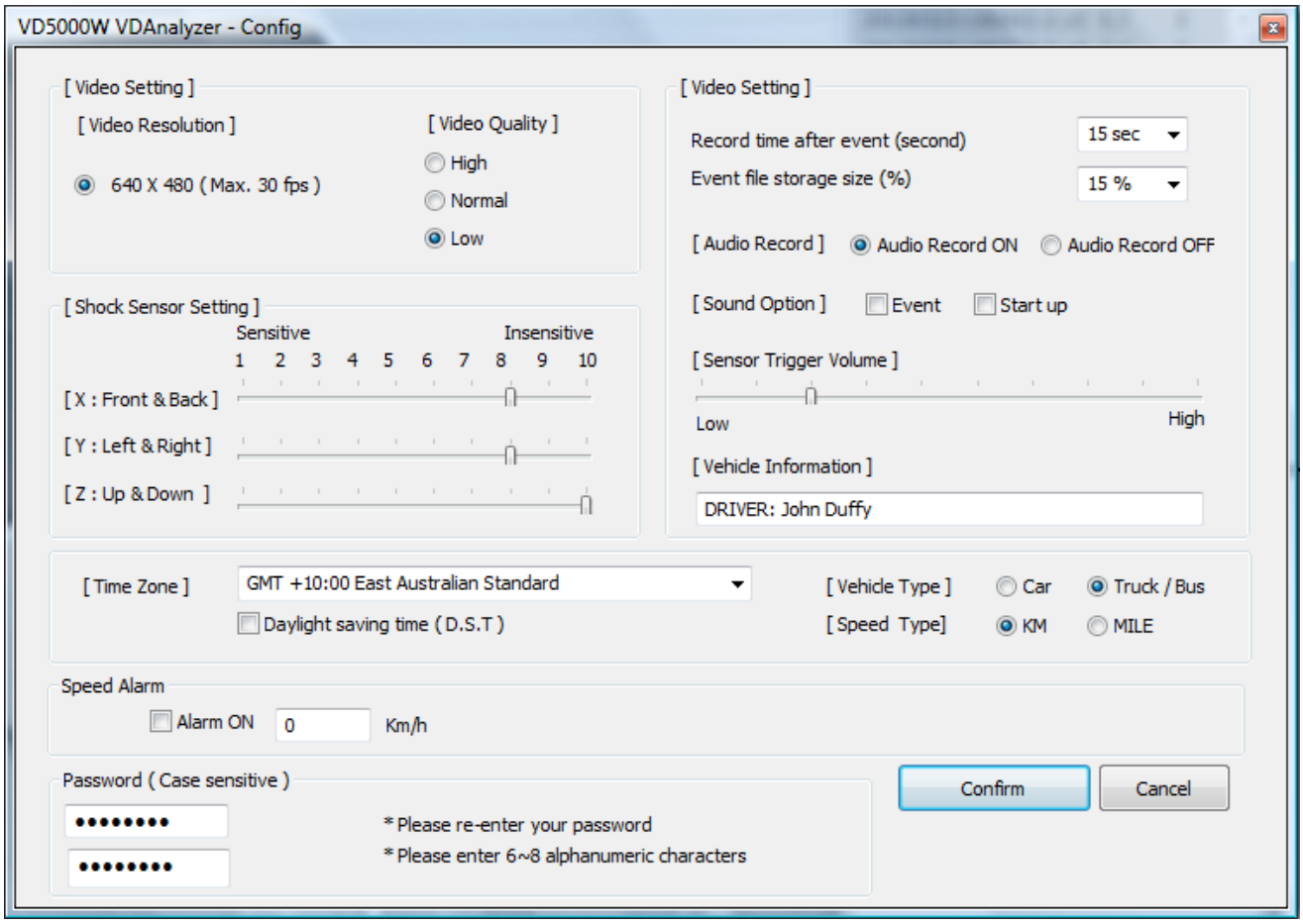

Figure 2: A sample of the software configuration

Examining figure 2, the adjustable ***Video*** features include resolution, recording interval after an event (eg impact), and audio, sound alerts if parameters are exceeded.

The ***Shock Sensor*** adjusts the sensitivity to forces in the 3 directions of the vehicle. The shock settings determine whether an event (such as impacts or hard driving) has occurred. The video and data is recorded in a special "event" folder if the sensitivity is exceeded (separating data from the normal driving conditions, making it easier to determine and find problems later).

The ***time zone, vehicle type***, and ***distance measures*** can also be configured. The unit for figure 2 has an audible ***Speed Alarm*** which sounds when the vehicle exceeds a preset speed.

Once the device has recorded the journey, at the completion, the data can be saved to a storage device (hard drive) or analysed.

Most devices have a similar interface as that displayed in Figure 3.

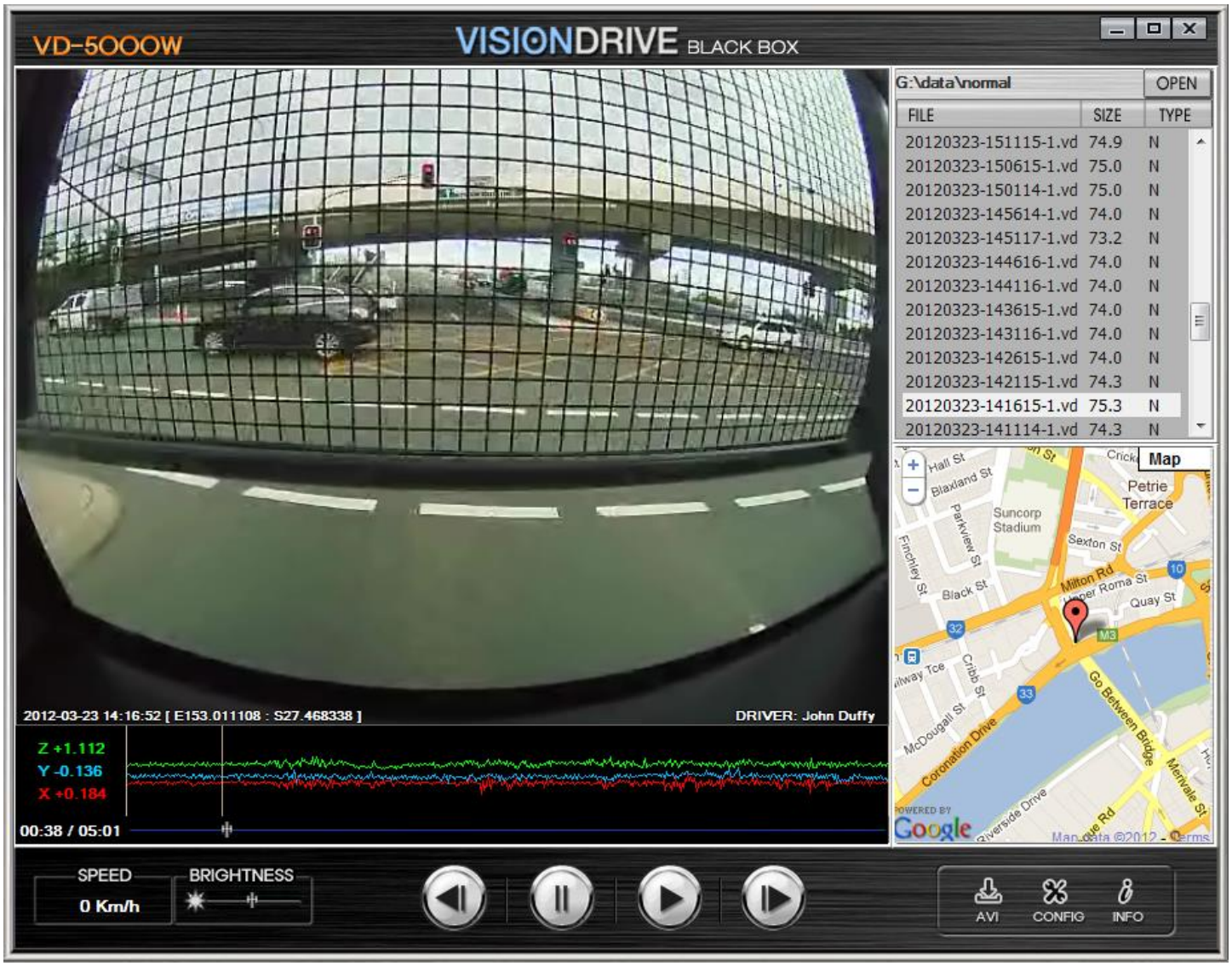

Figure 3: Sample interface for the VMD device for analysing data.

The most obvious feature is the ***video recorded*** (incorporating the date, time, GPS co-ordinates on the left; alterable vehicle information on the right).

The top right is the access to the directory of the ***recorded files***, below which is the position of the vehicle on ***Google Maps***.

This sample device has an ***accelerometer graph*** outlining the g-forces the vehicle experiences and is displayed beneath the video. The top line (Z-axis, which is coloured green) displays forces forward and backward. This is useful to determine if the driver accelerates or brakes excessively. The middle line (Y-axis, which is coloured blue) shows the sideway forces. In a heavy vehicle, this is useful to determine vehicle side impacts. The bottom line (X-axis, coloured red) presents the vertical forces encountered. This parameter is excellent for showing adverse road conditions (pot-holes and corrugations). On good roads, this can help monitor vibrations in the drive train or particularly the steer axle (eg. alignment or tyre balance issues).

Along the bottom, from the left outlines ***speed***, ***brightness*** of the video, and ***viewing controls***. The right hand side contains the software menu to extract the video & data to ***AVI*** (video) files, and the ***configuration*** menu (figure 2).

Some brands of VMDs have a specialised analytical programme where an entire journey can be examined collectively.

The user selects the ***Tracking Period*** to examine. There is provision to set an ***Overspeed*** Filter, which marks any position a set speed is exceeded. (In figure 4, the setting is 102kph.)

The ***Google map*** displays set positions along the route. Placing the mouse over the points, highlights the details of the journey at that position (as displayed in the balloon). Such details include the ***date, time, speed***, and a link to the ***video*** at that point.

To the right of the map, is a section outlining the ***total distance*** travelled and ***total operational time***.

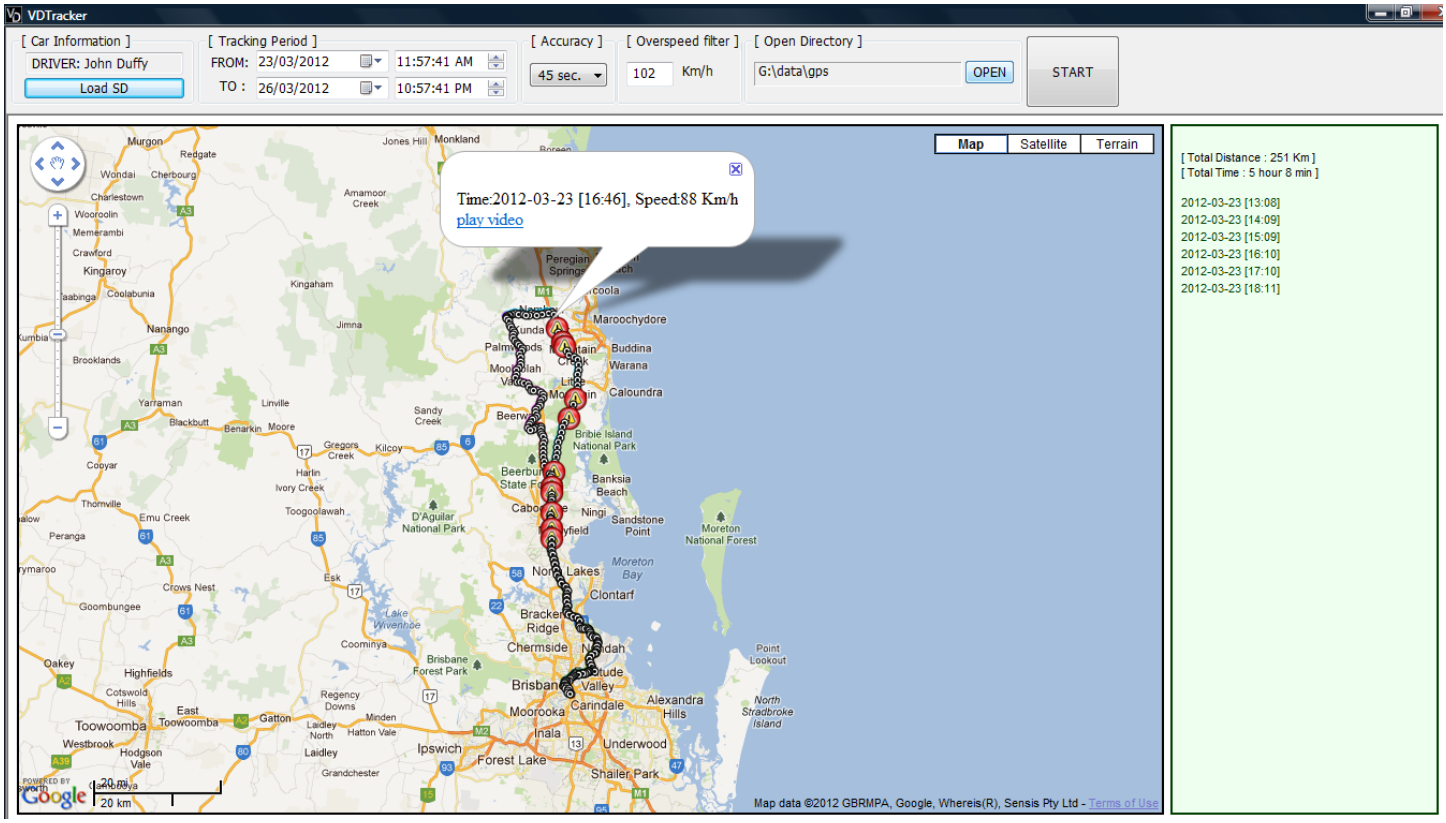

Figure 4: Specialised tracking software

Points to Consider

When designing or purchasing a VMD system, there are a number of features and requirements that need considering.

They include:

- purpose of VMD system
  - legal evidence of compliance (ie. the driver's legal performance are correct).
  - legal evidence of incidence (ie. to show police & other involved parties recorded incidences).
  - analysis of performance (ie. to improve driver efficiency)
- legislation (which must be examined regularly due to the dynamics of laws)
  - Commonwealth
    - Privacy Act 1988
  - Queensland
    - Transport Operations (Passenger Transport) Regulation 2005
- unit capabilities
  - video angles / quality
  - data storage capacity
    - SD / micro SD card sizes v. recording time
  - adjustable settings
    - configure various parameters
    - fine tuning the firmware
    - adjustable /aligning camera angles
  - power supply
    - 12V or 24V
    - polarity (not usually an issue)
  - software
    - compatibility with your computer
    - reliable (ie. no glitches/bugs, self-check systems)
    - easily upgradable
    - tamper resistant or tamper evident (to prevent editing)
  - technical support from the supplier

Summary

These units cost fairly little, yet they provide savings in many ways. For the driver, they can provide insurance and protection. They can save losing demerit points and a fine (by proving your innocence). Additionally, knowing one's actions are recorded is a great motivator to exercise defensive and excellent driving behaviour.

For the operator, they provide assurances your drivers are performing professionally and edifying your corporate image.

So back to the boss' phone call - You can reply that you have your entire driving performance on detailed record and that you will happily present it to him to verify the irate driver is "talking through his hat".

The example unit mentioned in this article is a VD5000W from VISIONDRIVE. It represents a mid-range device from a reliable brand. < visiondrive.net.au > 0419 225 722 **Discounts available for QOCS members.**

About the Author

John Duffy is a free-lance coach captain based on the Sunshine Coast, Queensland and trades as *Tour Coach Services*.

He is a fully certified and accredited Trainer, holding Certificate III in Driving Operations (Bus) and Certificate IV Heavy Vehicle Instructor and Assessment, and various other transport qualifications.

He has a passion for the heavy passenger transport industry and road safety, mentoring novice drivers into coach captains.

John is a member of the *Australasian College of Road Safety*, *The Australian Driver Trainers Association* and the *Queensland Omnibus and Coach Society*.

He is currently publishing the "Australian Bus and Coach Driver's Guide", to be used as a national training device for drivers, trainers, and operators.

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