



3G/WiFi Enabled Telematics  
Camera for Commercial Vehicles

**KP1S**

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### CAUTION

RISK OF ELECTRIC SHOCK  
DO NOT OPEN

DO NOT REMOVE THE COVER

REFER SERVICING TO QUALIFIED SERVICE PERSONNEL



Install the product where it does not block the driver's view of the road. Please refer to the installation section in the user manual for a full guide on where to install product.



Damages caused by production malfunction, loss of data or other damages that may occur while using this product is not the responsibility of the manufacturer. When malfunction occurs, the product may not save all videos and the sensor may not recognise shock impacts.

### **WARNING:**

DO NOT EXPOSE PRODUCT TO RAIN OR MOISTURE

# GPS RECEPTION

- 1. Activate the product in an area with a clear view of the sky & without large buildings to improve GPS reception.**

For commercial purposes GPS has an average range error of more than 15 meters and the range error could be more than 100 meters depending on environmental conditions like buildings and roadside trees etc.

- 2. The temperature range for optimum operation of the GPS receiver in your car is -10 ~ 50°C.**

- 3. When using the product for the first time or after a long period (more than three days), it may take a little longer to recognize your current location.**

It may take between five and thirty minutes to get GPS reception.

**GPS reception may be impaired under the following circumstances:**

- 1) If there is an object at the end of the GPS antenna.
- 2) If your vehicle has metallic elements on or in the windshield.
- 3) If equipment generating electromagnetic waves that interfere with the GPS signal are installed in the vehicle e.g. other GPS devices including certain types of wireless activated alarms, MP3 and CD players and camera alarms using GPS.
- 4) If you are using a receiver connected by a cable, electrical interference can be avoided by simply changing the location of the KP1S installation.
- 5) On heavily overcast or cloudy days, if the vehicle is in a covered location such as under a bridge or raised roadway, in a tunnel, an underground roadway or parking area, inside a building or surrounded by high-rise buildings.
- 6) If GPS signal reception is poor, it may take longer to locate your current position when the vehicle is moving than when it is stationary.

# 1. OVERVIEW

The KP1S is the world's most advanced incident camera with powerful 3G/WiFi video transmission, GPS location tracking and telematics data. The KP1S also features an optional second camera to help provide a comprehensive view of any incident and keep an eye on valuable cargo.

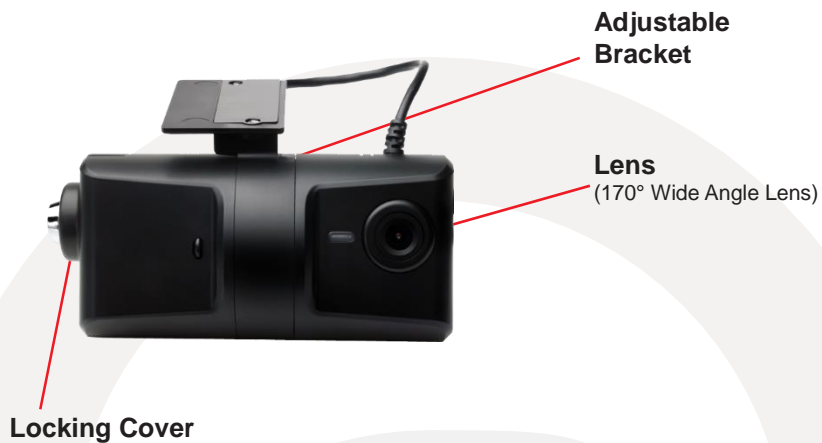
This evidence can protect a driver from many of the issues faced on the roads today:

- Cash for Crash / Pre-meditated staged accidents
- False/Exaggerated Whiplash Claims
- Conflicting Reports of Actual Events
- Lack of Witnesses
- Driving Offence Allegations (Speed Cameras, Traffic Violations, etc.)

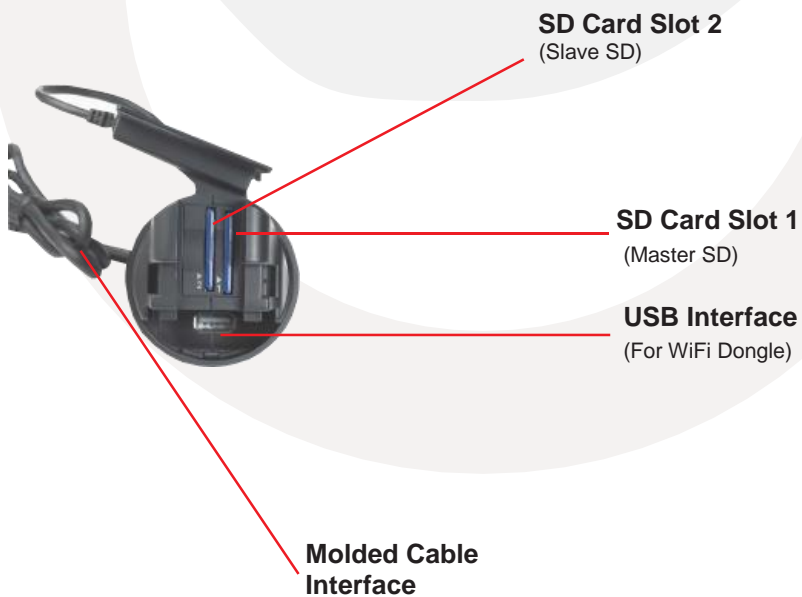
## **Features:**

- Wide Angle Lens: 170° - providing pillar-to-pillar view
- Instant remote retrieval of court admissible evidence from both cameras
- Adjustable recording rates
- Easily upgradable USB interface - 3G or WiFi data transfer
- Optional Audio Recording
- Integrates with 3rd party telematics platforms
- Server Software available
- Email Video transfer option
- Internal Microphone and Speaker
- Smart Bosch G-Force sensor, 100x per second sampling rate
- GPS + GLONASS built-in for superior location accuracy
- Password protected recordings preventing unauthorized access of recordings and data on the SD card
- Lockable tamper resistant cover protects unauthorized access to the SD card(s) and USB modem (3G or Wi-Fi). It also disables the ability to adjust the camera angle.

## Front

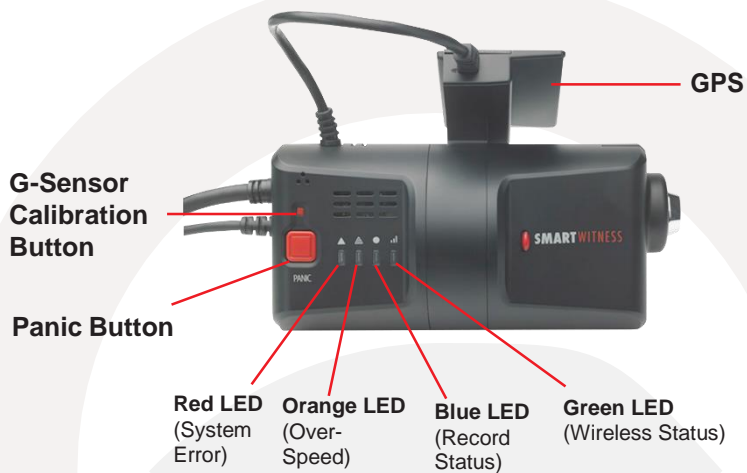


## Side





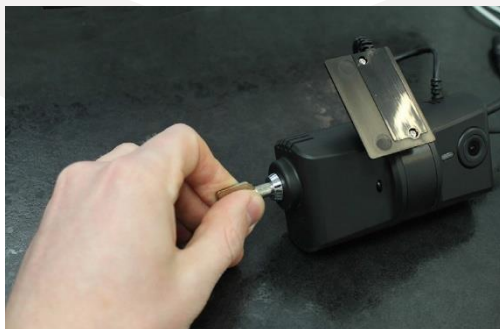
## Rear



## Bracket

KP1S features a new, easily adjustable bracket designed to give you the ideal viewing angle. To adjust the bracket, follow the steps below.

Remove the locking case using the key and turning anti-clockwise.



Then, pinch the red and black clips and then pull the case away from KP1S.

Black clip in identical position on the reverse



Adjust the angle of the bracket to the desired angle and slide in to lock in place.



When you are happy with the angle, slide the case back onto KP1S and lock.

## Cables

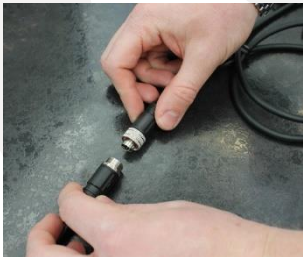
KP1S comes with 2 cables permanently connected at the side. The thicker cable connects to the power adaptor cable (KP1S-PWK, KP1S-CIG, KP1S-INT1-S, or KP1S-INT2).

The second (thinner) cable connects to the second camera. This cable allows both power and video to be carried to the secondary camera. Please note that the second cable provides power to compatible SmartWitness “-S” cameras only (SVA021-S, SVA025-S, SVA030-S, SVA032-S, SVA033-S, SVA041-S).

### KP1S Main Cable



To connect the cable to either the cigarette lighter adaptor or either junction box, attach by lining up the arrows on each cable and then push together. To secure them together, twist the silver plate as shown below.



### 2<sup>ND</sup> Camera Input



## Contents



1x KP1S



1x 3M Adhesive Pad and Adhesive Cable Ties



1x Locking Case



2x Keys for Locking Case



1x User Manual

## Hardware Installation

### KP1S Installation Guide with INT1S Power Adaptor

#### 1. KP1S Windshield Mounting



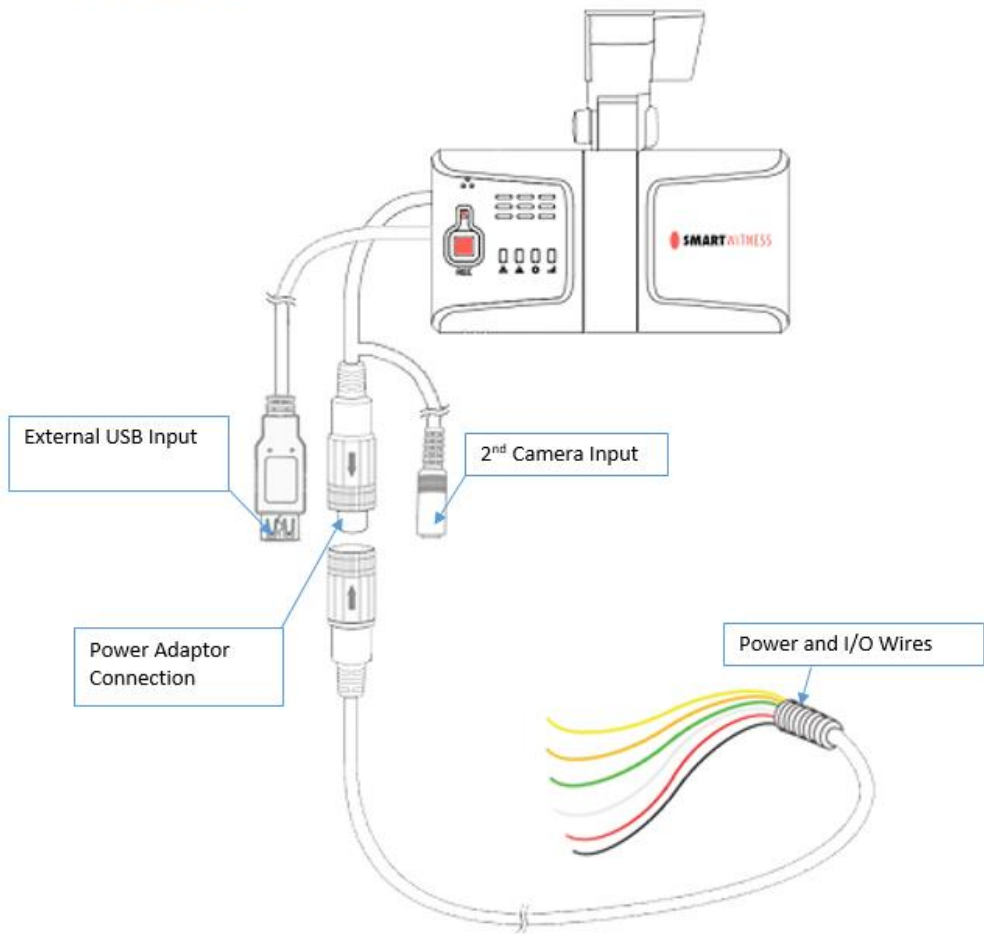
Apply provided 3M VHB adhesive pad to the mounting bracket and press firmly to adhere.



Clean the windshield with alcohol and make sure it is dry. Then remove the red 3M paper from the adhesive and press firmly and hold on the windshield for about 20 seconds.

***\*NOTE: adhesive cures best when installed in moderate temperature environment. Not recommended to install in cold weather.***

## 2. KP1S Diagram



### 3. KP1S Bracket Attachment & SD Card insertion



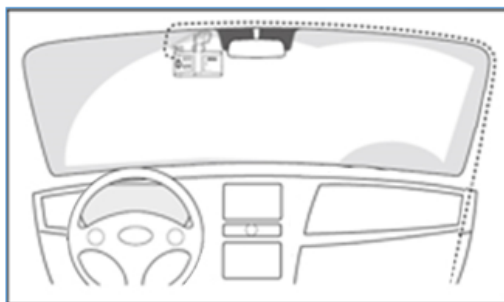
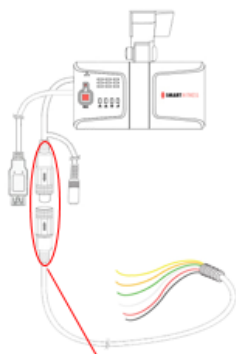
Use the provided keyset to unlock and remove the locking cover. To unlock the cover, insert the provided keyset and turn counter-clockwise 90 degrees (the key stays connected to the cover when it is in the unlocked position). Once unlocked, press firmly on the two buttons on either side of the cover and pull the door away from the camera.

Once the locking cover is removed, you can adjust the angle of the camera to comply with the angle of your windshield. When you are happy with the angle on the windshield, slide the case back onto KP1 and lock.










SD card(s) must be first initialized with KP1 Config Tool software, which is available for download on our website: <http://support.smartwitness.com> . After SD card initialization, you can customize your settings and save the settings to your SD card(s). The settings will apply to the camera at the next power up.

#### 4. KP1 Power Connection to Vehicle



To connect the cable to either the cigarette lighter adaptor or either junction box, attach by lining up the arrows on each cable and then push together. To secure them together, twist the silver plate as shown above

Once your camera is mounted on the dash, you can run the cables up and around the edge of your windshield (or up in the headliner) and down the side panel (A pillar). Make sure you go in the direction of your vehicle power/fusebox/input panel.

	<b>Black (Ground)</b>
	<b>Red (Power Battery +)</b>
	<b>White (Power ACC +)</b>
	<b>Green (Alarm In, NC/NO), (External panic button+)</b>
	<b>Black (Ground), (NC/NO Alarm-)</b>
	<b>Orange (Alarm In, Voltage on/off (3~70V))</b>
	<b>Yellow (Alarm out), Low(0V) to High (5V)</b>

**Power Specifications**  
Input: DC 10~32V, 200mA  
Output: DC5V, 2500mA

Make sure vehicle ignition is off and keys are out, then connect the RED, WHITE, and BLACK wires to the inputs as specified above. GREEN, ORANGE, and YELLOW wires are optional. Installation should only be performed by a professional.



## 5. Final Steps

After installation of the KP1 and optional accessories (2<sup>nd</sup> camera, 3G modem, LCD Monitor) into the vehicle, you can turn on vehicle ignition and the KP1 will power on (and if applicable, the LCD, rear camera, and 3G modem). There will be a sequence of LED lights cycling during boot process. **Once boot up is complete. There will be a solid blue light. This means proper operation and recording. If 3G modem is being used, the Green light should be solid as well. If Green light is blinking, then there is a server error. If a red led comes on after bootup, there is an error and you should contact your supplier. Please refer to KP1 user manual for more details on LED status indicators.**

- 1) After you've set the camera angle, locked the cover and removed the Key, press the G-Sensor calibration button once (small red button ABOVE the panic button)



- 2) Press the panic button and initiate a test recording. The blue light should blink rapidly (Note: if using Continuous Record mode, the blue light will not blink rapidly when pushing the panic button)
- 3) OPTIONAL: If using LCD monitor and Rear Camera, put the vehicle into reverse to ensure the rear camera automatically displays on the LCD monitor.
- 4) OPTIONAL: Set the LCD video input 1 to be "mirrored" (or flipped) by accessing the setup on the LCD GUI. The rear camera image should be orientated the same as a mirror, so the driver is not disoriented when looking at the LCD monitor.

Please visit <http://support.smartwitness.com> for additional information or troubleshooting help

## 2. BASIC OPERATION

### Automatic Start

Plug the car charger cable into the cigarette lighter adaptor in your vehicle and KP1S will start automatically.

However KP1S will not start recording immediately after the power has been turned on. It takes around 30-45 seconds for the built-in power backup system to be charged. After this, the internal flash memory will be ready to record.

### PLEASE NOTE

Please make sure to turn off the power of the KP1S when inserting or ejecting the SD card and the USB 3G/WiFi dongle.

### LED Operation at Start-up

Firstly, the Red LED will be ON (around 6 sec), then, Red LED (Warning) and Orange LED will be ON (around 12 sec)



Red LED, Orange LED, Blue LED, Green LED will be ON in sequence (around 40 ~ 50 sec)

Blue LED On/Off (Starting time: around 60 ~ 70 sec)



(Buzzer sound operation at start-up)



Single “Beep” after starting (If beep is set to ‘On’ in config settings).

### G-Sensor Calibration

After installing KP1S, you will need to calibrate the G-Sensor. To do this, turn on KP1S and park the vehicle on a flat surface. Then, press the [G-Sensor Calibration] button for one second.

This G-Sensor calibration is only needed the first time KP1S is used.

## Recording Modes

### Normal (Continuous)

Full-time video recording at the selected frame rate, resolution, and quality set by the KP1S configuration tool software. Recording files will be made for 10 minutes. Once a 10 minute file is made, a new file will begin and so on.

### Event (Shock, Panic, Overspeed, & Alarm inputs)

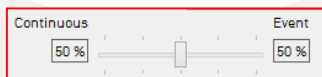
The event recording function will be automatically started by G-sensor, panic button or alarm. You can set the G-sensor parameters for the unit on your PC using KP1S config software.

Each event file will contain 20 seconds of footage before, and up to 20 seconds after an incident. The event file can also be extended by a 2<sup>nd</sup> trigger during event recordings.

When a file is extended by a second trigger, 20 seconds post recording from the event will be added to the data file with a maximum recording time of 3 minutes. Once the 3 minutes has been reached, the file will split and a new file will be created. If there is no event triggered by the camera, video will not be recording for that time.

### Dual Mode

Continuous video footage will be recorded at 1 FPS. Event will be triggered and recorded at the selected frame rate, resolution, and quality set by the KP1S configuration tool software. When using 2 SD cards, Dual Mode will record the 1 FPS continuous footage on SD 1 and events on SD 2. If only using 1 SD card, the % allocated for continuous and event files is selectable using the slider in the configuration tool software.



### SD Auto Format Feature (Optional)

When one of the SD Cards has an error and cannot record, all the cards will be formatted and all data will be erased. Configuration settings will be backed up.

## Please Note

If there are 6 'beeps' sounded from the unit, this means that there is an SD card error or the SD card is full.

## Driving File Record

The DRV (Driving) file will be recorded during driving even if there are no events or video. The DRV file consists of GPS and G-sensor data. This helps to find specific data or driving behaviors.

The DRV file overwrites the oldest data. The DRV files will be made every 10 minutes.

## Communication

The USB 3G/WiFi modem is inserted to the USB terminal inside the locking case.

For a list of compatible USB modems with KP1S, please contact your local dealer.

During communication, the GREEN LED will be on to show you can communicate. The GREEN LED will flash when communication is performed.

The dongle will need to be setup with the correct APN settings using the KP1S config software.

If there is a communication error, the unit will 'Beep' twice.

If there are modem recognition errors, the unit will 'Beep' 3 times.

## Over Speed

This function will allow the user to set a speed limit on the unit and alert the driver when the limit has been exceeded.

Excessive speeds can be set in 2 stages. The first limit is **50mph** and the second limit is **70mph**.

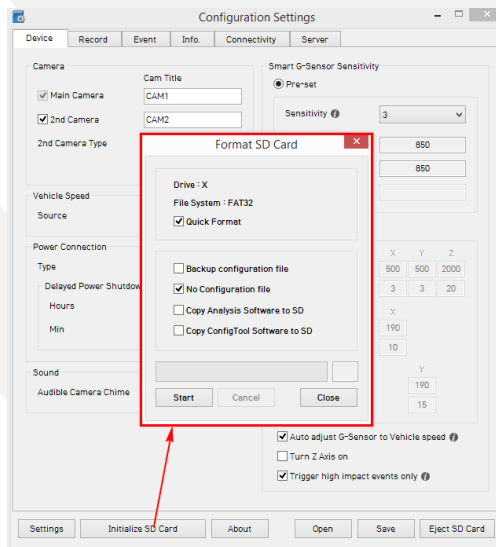
When the 50mph limit is reached, the ORANGE LED will be lit.

When the 70mph limit is reached, the ORANGE LED will be blink quickly.

The trigger on the unit will sound twice when both limits have been exceeded.

## SD Card Initialization

It's recommended to use the Configuration Tool to initialize a new SD card before using with KP1S. Configuration Tool Software can be downloaded from <http://support.smartwitness.com>



It is recommended to select “No Configuration File” at first initialization. After SD card is initialized, you can set your desired settings and then click “Save” to apply the settings to the SD card.

## Inserting SD Card(s)

To insert the SD card, turn off the power and check the BLUE LED Light is off. Once the LED light is off, you can safely insert the card.

There are 2 SD Card slots for this unit, please insert the first SD card into SD card slot 1.



## Removing the SD Card(s)

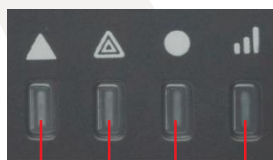
To safely remove the SD card(s), turn off the power and then check the BLUE LED, once off, you can remove the SD card(s).

## Inserting a WiFi USB Modem

Turn off the power and then check the BLUE LED light. Once the BLUE LED light is off, insert the 3G/WiFi USB modem. Check with your distributor for a list of compatible USB modems.

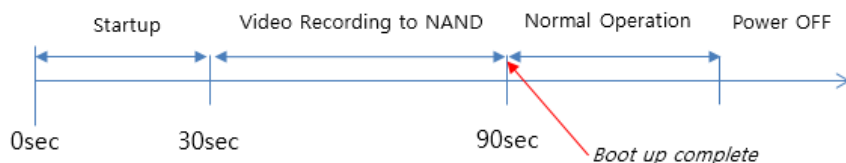


## LED/Buzzer Specification



1. Red LED (Error)
2. Orange LED (Over Speed Warning)
3. Blue LED (Record Status)
4. Green LED (Network Connection Status)

## KP1S LED Specification







### 1.1. Startup, Data Buffering to NAND (0 to 90seconds after power on)

KP1 BOOT UP SEQUENCE		LED			
		(red) 	(orange) 	(blue) 	(green) 
Start	1 <sup>st</sup> step ( 0~12sec)	ON			
	2 <sup>nd</sup> step (12 ~ 30sec) charging capacitor	ON	ON & OFF		
	3 <sup>rd</sup> step (31 ~ 60sec) begin recording video to NAND memory	ON	ON	ON & OFF	
	4 <sup>th</sup> step (61 ~ 89sec)	ON	ON	ON	ON & OFF
	5 <sup>th</sup> step (90sec + 1sec )	ON	ON	ON	ON





\*If SD card is blank (not initialized), KP1 will blink RED led slowly for about 1 minute, then automatically initialize the SD card, apply the latest NAND settings, and reboot.



## Normal Operation (after 90 second boot up sequence)

Normal Operation		LED			
		(red)	(orange)	(blue)	(green)
					
Connectivity	3G/Wi-Fi Connected				ON
	No dongle or SIM				OFF
	3G/Wi-Fi error (network dead zone, server down, etc.)				ON & OFF slowly
Recording (by record mode)	Continuous Record mode			ON	
	Event Record mode			ON	
	Dual Record Mode			ON	
	<i>Event Triggered (Event mode &amp; Dual mode only)</i>			ON & OFF quickly	
Over speed	over speed 1 exceeded		ON		
	over speed 2 exceeded		ON & OFF quickly		
	Normal		OFF		
Warning	No 2 <sup>nd</sup> camera signal	ON			
	Record error (SD error, no SD)	ON & OFF slowly		OFF	
	SD Card Full	ON & OFF quickly			
	Normal	OFF			

## Other Functions

Item		LED			
		(red) 	(orange) 	(blue) 	(green) 
<b>FW Upgrade</b>	Immediately after power on when FW file (.bin) is present	ON & OFF together, alternating with Blue/Green		ON & OFF together, alternating with Red/Orange	
<b>G-Sensor Calibration</b>	After Power up sequence and small red button on KP1S is pressed			ON and OFF Quickly + Beep (3 seconds)	
<b>SD Format</b>	1 minute after blank card is inserted into KP1 or when SD card auto format starts after SD card corruption occurs			ON & OFF slowly	ON & OFF slowly
<b>Shutdown</b>	Shutdown process	OFF	OFF	ON & OFF quickly	
	Shutdown finished	OFF	OFF	OFF	OFF

\* LED ON and OFF speed.

item	Speed
ON and OFF Quickly	250msec
ON and OFF	500msec
ON and OFF Slowly	1000msec

## Recording When Power is Cut

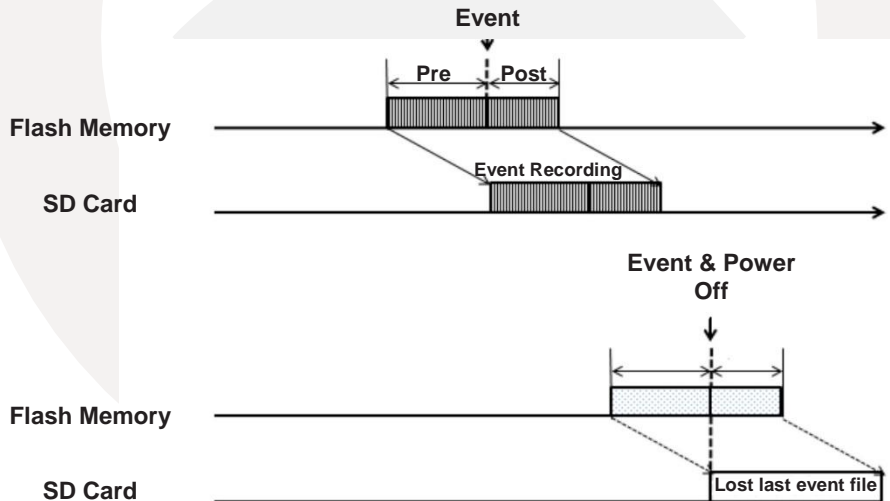
### During continuous recording

The continuous video recording will be recorded up to just before the end of the power is turned off.



### During event recording

When the power is off and simultaneously an event is triggered there unit will not be on enough time to record the event file. Therefore, there is a possibility of the last event file will be lost.



### During Dual Mode recording

The continuous video recording will be recorded up to just before the end of the power.

When the power is off and an event is triggered, there unit will not be on enough time to record the event file. Therefore, there is a possibility of the last event file will be lost.

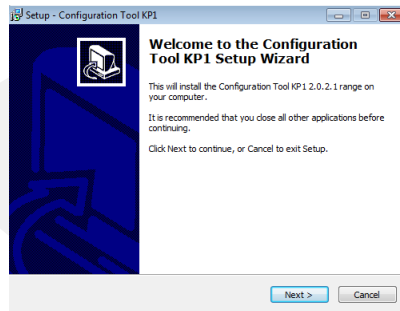
### 3. Software Installation

#### Configuration Tool

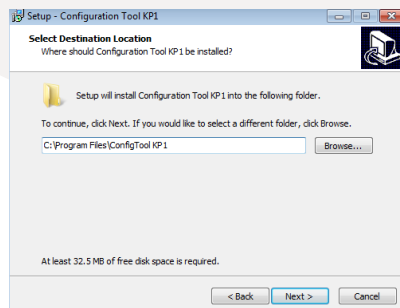
Before using KP1S, you will need to install both the configuration software and the analysis software to adjust KP1S settings. If you do not have the software you can download it from <http://support.smartwitness.com>

To install the configuration software, follow the steps below.

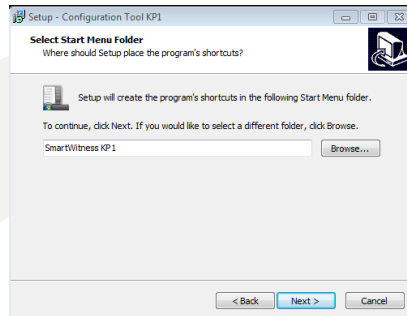
1. Insert your SD card into the SD Card reader and plug into your Windows PC.
2. Drag the software onto your desktop from the software folder.
3. Double click the software icon to run the software installation software.



4. When the above pop up comes on screen, click the 'Next' button to begin the setup.
5. Then, select the destination to save the software and click 'Next'.



6. You can choose to create a desktop icon

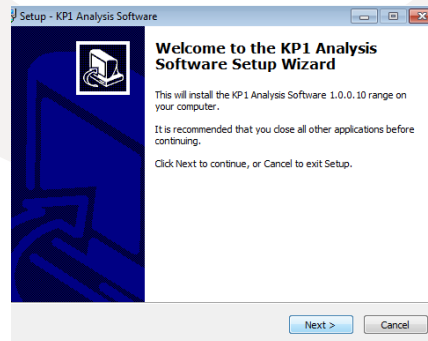


7. To finish installation, click the 'Install' button. Then, open the software by double clicking the shortcut icon or going to the folder in your documents.

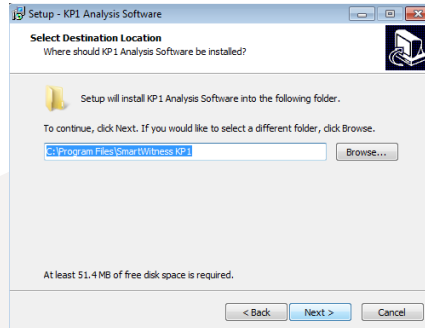
## Analysis Software

To install KP1S Analysis Software, follow the steps below. If you do not have the software you can download it from <http://support.smartwitness.com>

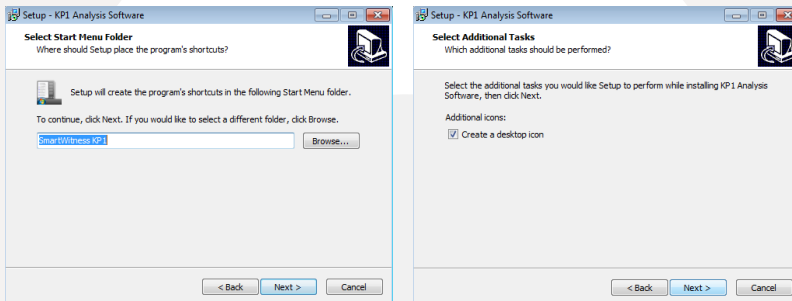
1. Insert your SD card into the SD Card reader and plug into your PC.
2. Drag the software onto your desktop from the software folder.
3. Double click the software icon to run the software installation software.



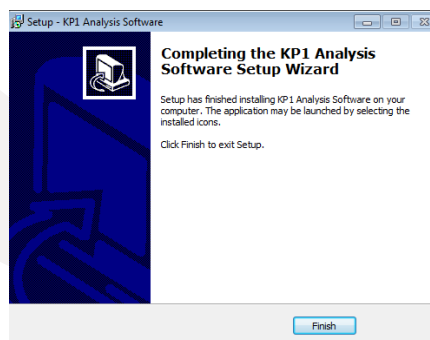
4. Click the 'Next' button to continue.



5. Select a destination to save the software to and click 'Next'.



6. You can set the software to create shortcuts in both the Start Menu and the Desktop, as shown above.



7. To complete the setup, click the 'Finish' button. When installed, double click the shortcut icon to open the software.

## 5. Configuration Software

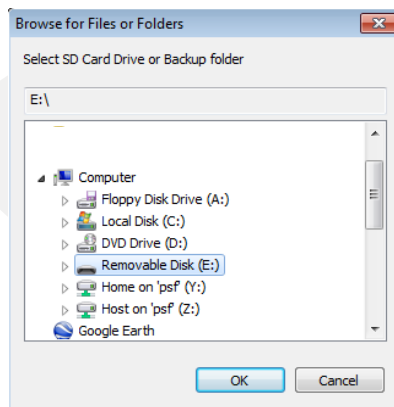
Before using KP1S, you will need to open the configuration software to initialize the SD card, configure settings on the unit such as telematics and resolution etc. Before loading the configuration software, insert your SD card into the computer using an SD card Reader.

### Initialize SD Card

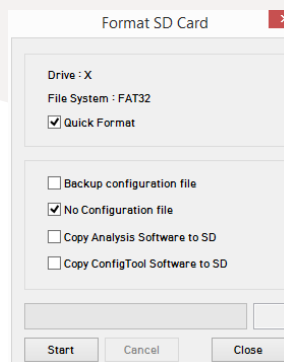
Firstly, on the configuration tool, you can initialize the SD card so it is ready for use in KP1S. To do this, click the 'Initialize SD Card' button.



To initialize the SD card, click on the above icon and you will be presented with the following screen to choose the SD card to initialize option.

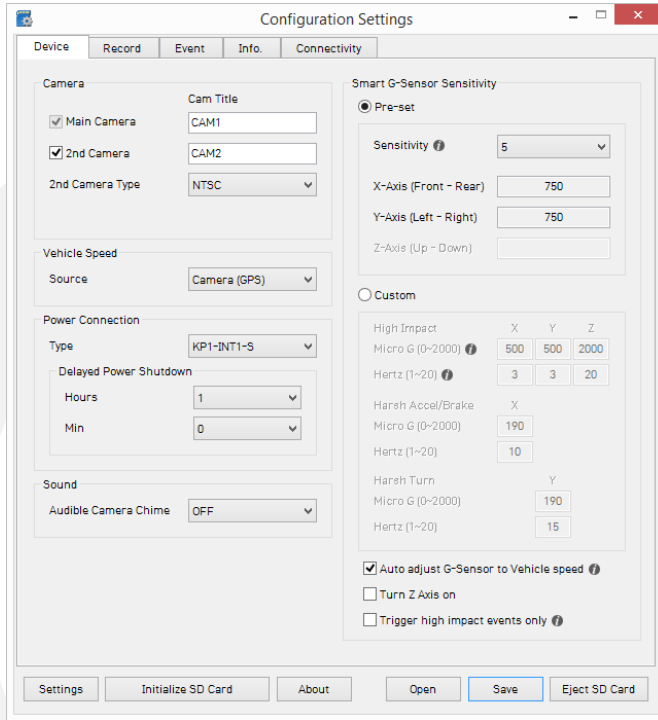


Click 'OK' when you have selected the SD card. Then, click the 'Quick Format' button and "No Configuration file" selection (As shown Below).



**Only 1 card must have a configuration file saved. The 2<sup>nd</sup> card (if used) only needs to be initialized with "No Configuration File" selected. SD cards can be inserted into either slot and will not affect operation**

## Device Settings

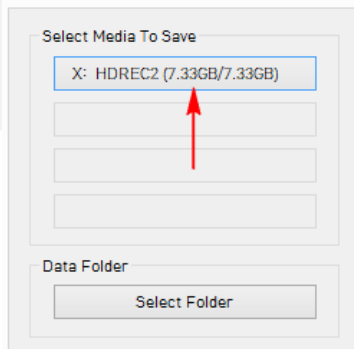


The Configuration Settings window is divided into several sections:

- Device:** Includes tabs for Device, Record, Event, Info, and Connectivity.
- Camera:** Contains checkboxes for Main Camera and 2nd Camera, input fields for Cam Title (CAM1, CAM2), and a dropdown for 2nd Camera Type (NTSC).
- Vehicle Speed:** Includes a Source dropdown set to Camera (GPS).
- Power Connection:** Includes a Type dropdown set to KP1-INT1-S, and a Delayed Power Shutdown section with Hours (1) and Min (0) dropdowns.
- Sound:** Includes an Audible Camera Chime dropdown set to OFF.
- Smart G-Sensor Sensitivity:** Includes a Preset section with a Sensitivity dropdown set to 5, and X-Axis (Front - Rear) and Y-Axis (Left - Right) input fields set to 750. It also has a Custom section with various Micro G and Hertz settings for High Impact, Harsh Accel/Brake, and Harsh Turn.
- Buttons:** Settings, Initialize SD Card, About, Open, Save, and Eject SD Card.

**PLEASE NOTE**

After you make any changes to the configuration options, you must apply the settings to the SD card by clicking “Save” and selecting the SD card



The Select Media To Save dialog box shows a list of media options. The first option, X: HDREC2 (7.33GB/7.33GB), is highlighted with a red arrow. Below the list is a Data Folder section with a Select Folder button.



## Camera

- **Built-in Camera:** This box is checked by default.
- **2<sup>ND</sup> Camera:** Check this box to use both the built-in camera and additional camera.
- **Cam Title:** Rename each camera (maximum 10 digits)
- **2<sup>ND</sup> Camera Type:** Choose the camera type from NTSC or PAL (if you are located in North America, you will choose NTSC).

## Speed

- **Source:** Select speed source from GPS or Pulse (Car speed pulse)

## Connection

- **Type:** Choose the connection source:
  1. Standard: Bare Wire (KP1S-PWK) or Cigar Power
  2. KP1S-INT1: Basic Power Adaptor (No longer available as of May 2015)
  3. KP1S-INT1-S: Basic Power Adaptor with delay power shutdown
    - When INT1-S is selected, a new option will appear to set the delay shut-off time.
  4. KP1S-INT2: Advanced power adaptor

## Smart G-Sensor Sensitivity

The user defined G-Sensor option allows the user to adjust the G-Sensor settings to suit your needs. For example, vehicles that drive slower will have lower G-Sensor threshold and therefore a custom setting would be more beneficial.

To set the G-Sensor to custom, check the “Custom” option and select the threshold levels.

- **Preset:** Tick the checkbox to set the sensitivity of the Smart Sensor from 1-9 (1 Lowest, 9 highest). Sensitivity should be set in consideration to the vehicles suspension, vehicle mass, and also the road condition.
- **Sensitivity:** Adjust the sensitivity of the G-sensor (1-9) with 9 being the most sensitive.
- **Trigger Value X:** Front/Rear impact force (acceleration/braking).
- **Trigger Value Y:** Left/Right impact force (turning)
- **Trigger Value Z:** Up/Down impact force.
- **Auto Adjust G-Sensor to Vehicle Speed:** Set the G-sensor to automatically adjust the sensitivity relative to the speed of your vehicle.
- **Turn Z Axis On:** Check this box to turn the Z axis value on.

## Custom

Adjust each individual axis of the sensor.

- **Threshold:** Sensitivity difference between the average G-sensor value per second and your set G-sensor value.
- **Hertz:** Set your threshold limit (1~20). If you chose 5, for example, then if the X, Y or Z value is exceeded 5 times within 1 second, the alarm will be triggered.
- **Auto Adjust G-Sensor:** Set the G-sensor to automatically adjust the sensitivity relative to the speed of your vehicle. Less false events will occur at higher vehicle speeds
- **Turn Z Axis On:** Check this box to turn the Z axis value on.
- **Trigger High Impact Events Only:** Hard brake, Fast Acceleration, and hard turning events will not trigger, only severe G-Sensor levels will trigger.

## Alarm

- **Beep:** Turn the audible camera alarm On or Off.

## Record Settings

The screenshot shows the 'Configuration Settings' window with the 'Record' tab selected. The window is divided into several sections: 'Main Camera', '2nd Camera', 'Recording Settings', and 'Telematics Data'. The 'Main Camera' section has dropdowns for Resolution (HD (720p)), Frame Per Second (FPS) (15), and Quality (High). The '2nd Camera' section has similar dropdowns for Resolution (D1 (720x480)), FPS (15), and Quality (High). The 'Recording Settings' section includes a 'Record Mode' dropdown set to 'Dual Mode', a slider between 'Continuous' (50%) and 'Event' (50%), a 'Data Password Protection' field, a checked 'Overwrite Recordings when SD is Full' checkbox, an unchecked 'Parking Mode (Continuous Mode Only)' checkbox, a checked 'Record Audio' checkbox, an unchecked 'Automatic Gain Control (AGC)' checkbox, and a 'MIC Volume' dropdown set to 100. The 'Telematics Data' section has a checked 'Recording Settings' checkbox, a 'Duration' dropdown set to 240 Hours, a 'G-Sensor Sampling' dropdown set to Average Value, and a checked 'Overwrite Driving Data (oldest first)' checkbox. At the bottom of the window are buttons for 'Settings', 'Initialize SD Card', 'About', 'Open', 'Save', and 'Eject SD Card'.

Configuration Settings

Device | **Record** | Event | Info | Connectivity | Server

Main Camera

Resolution: HD (720p) ▼

Frame Per Second (FPS): 15 ▼

Quality: High ▼

2nd Camera

Resolution: D1 (720x480) ▼

Frame Per Second (FPS): 15 ▼

Quality: High ▼

Recording Settings

Record Mode: Dual Mode ▼

Continuous: 50 % | Event: 50 %

Data Password Protection (1000~9999):

☒ Overwrite Recordings when SD is Full

☐ Parking Mode (Continuous Mode Only) ⓘ

☒ Record Audio

☐ Automatic Gain Control (AGC)

MIC Volume: 100 ▼

Pre-Event: 10 seconds ▼

Post-Event: 10 seconds ▼

Telematics Data

☒ Recording Settings

Duration: 240 Hours ▼

G-Sensor Sampling: Average Value ▼

☒ Overwrite Driving Data (oldest first)

Settings | Initialize SD Card | About | Open | Save | Eject SD Card

## Main Camera Resolution

HD (1280x720)    VGA (640x480)    QVGA (320x240)

## 2<sup>ND</sup> Camera Resolution

D1 (720x480)    HD1 (720x240)    CIF (352x240)

## Recording Modes

- Continuous
- Event
- Dual Mode: 1fps continuous recording + Event recording (adjust the 'FPS' from 1fps to 30fps).

**Available FPS & Max FPS per Resolution** - Single camera mode (Main camera only).

Resolution	FPS
HD (720P) 1280x720	30
	15
	10
	5
	4
	2
	1
VGA 640x480	30
	15
	10
	5
	4
	2
	1
QVGA 320x240	30
	15
	10
	5
	4
	2
	1

## Two Camera Mode (Main Camera + 2<sup>ND</sup> Camera)

Main Camera	
Resolution	FPS
HD (720P) 1280x720	15
	10
	5
	4
	2
	1
HD (720P) 1280x720	15
	10
	5
	4
	2
	1
HD (720P) 1280x720	15
	10
	5
	4
	2
	1
VGA (640x480)	30
QVGA (320x240)	30

2 <sup>ND</sup> Camera	
Resolution	FPS
D1 720x480	15
	15
	30
	30
	30
	30
HD1 720x240	15
	30
	30
	30
	30
	30
CIF 352x240	30
	30
	30
	30
	30
	30
D1 (720x480)	30
D1 (720x480)	30

## Pre-Event Recording Time, Post-Event Recording Time

Adjust the Pre/Post time from 5 seconds to 20 seconds.

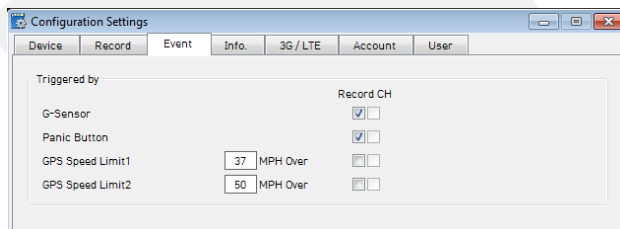
## Telematics Data

Adjust Telematics Data (driving log) record duration, from 8 hours to 480 hours.

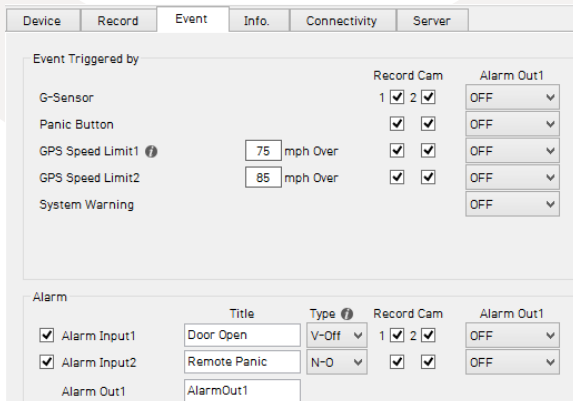
### Event Settings

This option allows you to set when the KP1S will record certain events for example when a panic button is pressed or G-sensor is triggered.

1. When using a standard power cable, you can set the unit to record when triggered by the G-Sensor, Panic Button and/or GPS Speed Limit.



2. When using a KP1S-INT1-S cable, you can also add an alarm output to the above settings.



3. When using a KP1S-INT2 cable, you can also add an alarm and signal to the standard cable settings (Shown Below).

The screenshot shows the 'Device' tab with the following sections:

- Triggered by:**
  - O-Sensor: ☒ Record Ch: ☒ Alarm Out1: N/A, Alarm Out2: N/A
  - Panic Button: ☒ Record Ch: ☒ Alarm Out1: N/A, Alarm Out2: N/A
  - GPS Speed Limit 1: 50 MPH Over, Record Ch: ☐ Alarm Out1: N/A, Alarm Out2: N/A
  - GPS Speed Limit 2: 70 MPH Over, Record Ch: ☐ Alarm Out1: N/A, Alarm Out2: N/A
  - Electronic Speed Limit 1: 50 MPH Over, Record Ch: ☐ Alarm Out1: N/A, Alarm Out2: N/A
  - Electronic Speed Limit 2: 70 MPH Over, Record Ch: ☐ Alarm Out1: N/A, Alarm Out2: N/A
  - System Warning: Record Ch: ☐ Alarm Out1: N/A, Alarm Out2: N/A
- Alarm:**
  - Alarm Input1: ☐ Title: Alarm1, Type: V-Off, Record CH: ☐ Alarm Out1: N/A, Alarm Out2: N/A
  - Alarm Input2: ☐ Title: Alarm2, Type: V-Off, Record CH: ☐ Alarm Out1: N/A, Alarm Out2: N/A
  - Alarm Input3: ☐ Title: Alarm3, Type: N-O, Record CH: ☐ Alarm Out1: N/A, Alarm Out2: N/A
  - Alarm Input4: ☐ Title: Alarm4, Type: N-O, Record CH: ☐ Alarm Out1: N/A, Alarm Out2: N/A
  - Alarm Out1: AlarmOut1
  - Alarm Out2: AlarmOut2
- Signal:**
  - Signal1: ☐ Title: Left, Record CH: ☐ Alarm Out1: N/A, Alarm Out2: N/A
  - Signal2: ☐ Title: Right, Record CH: ☐ Alarm Out1: N/A, Alarm Out2: N/A
  - Signal3: ☐ Title: Brake, Record CH: ☐ Alarm Out1: N/A, Alarm Out2: N/A
  - Signal4: ☐ Title: Reverse, Record CH: ☐ Alarm Out1: N/A, Alarm Out2: N/A

## Information Settings

This option allows you to adjust the Time Zone, GPS Time Synchronization, set your Vehicle ID and also the Driver ID. Click “Retrieve time settings from my PC” button to automatically set the daylight savings time and GMT time.

The screenshot shows the 'Configuration Settings' dialog box with the following sections:

- Date / Time:**
  - ☒ Daylight Saving Time: Retrieve time settings from my PC
  - Start: Month (3), Week No. (2), Day of Week (Sunday), Hour (2)
  - End: Month (11), Week No. (1), Day of Week (Sunday), Hour (2)
  - Time Zone (UTC): -6 : 00
  - GPS Time Sync: At Start Up
  - ☐ Manual Time Setting: 5/ 6/2016 3:23:37 PM
- System:**
  - Vehicle Speed Format: mph
  - ☒ SD Card Auto Format Feature
- Vehicle ID:**
  - Vehicle ID: [Empty field]
  - Driver ID: [Empty field]
  - [Empty field]
  - [Empty field]
  - [Empty field]

Buttons at the bottom: Settings, Initialize SD Card, About, Open, Save, Eject SD Card

The additional 4 form fields are used for Email connectivity service only and will be seen in the body of the KP1S generated email.

Vehicle ID	<input type="text"/>
Driver ID	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>

### Connectivity Settings

Enable the 3G or WiFi function on KP1S and adjust the settings for use, i.e. password, User ID, Authentication etc. Please refer to the Cellular Sim provider for these settings.

The screenshot shows a 'Configuration Settings' window with a 'Connectivity' tab selected. The 'Connectivity Type' section has 'Enable' checked. Under 'Service', the 'Type' is set to 'Server'. The 'Mobile Network' section includes fields for 'Dial No.' (with a '+99#' prefix), 'APN', 'User ID', 'Password', 'Authentication' (set to 'NONE'), 'SMS Center Number', and 'USB protocol Type' (set to '0'). The 'WiFi' section includes fields for 'AP', 'Authentication' (set to 'WPA'), and 'Password'.

When choosing the service type, if you choose email, you will be presented with the options explained on page 40 (Account and User Settings).

If you choose server, you will be presented with the Server options explained on page 41.



## Account Settings

In account settings, you can set an email account for KP1S for when you need to email commands. This account is also the email account KP1S will send emails from.

The screenshot shows the 'Configuration Settings' dialog box with the 'Email Setup' tab selected. The 'Outgoing Email Account Setup' section contains the following fields: 'Email Address' (youremail@yahoo.com), 'User Name' (youremail@yahoo.com), 'Password' (masked with dots), 'Use SSL' (SMTPS/POP3S), 'SMTP Server name' (smtp.mail.yahoo.com), 'Use SMTP Auth' (Use), 'POP3 Server name' (pop.mail.yahoo.com), 'POP3 sending frequency' (1 Min), and 'Admin Password' (masked with dots, with a hint (100000-999999)). Below this is the 'Live GPS Tracking Server' section with an 'Enable' checkbox (unchecked), and fields for 'URL', 'Account', 'Password', and 'Interval' (60, with a hint (5-600)). At the bottom are buttons for 'Settings', 'Initialize SD Card', 'About', 'Open', 'Save', and 'Eject SD Card'.

Set email address, email ID and Password. Contact your I.T. administrator or your email service provider for the Email setup details such as use SSL, SMTP & POP3 server information.

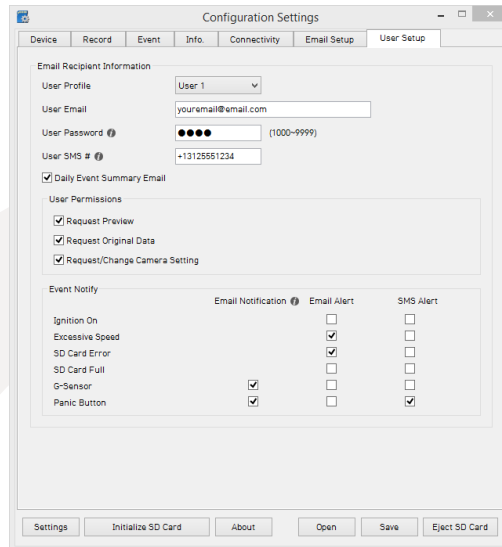
Set your password and POP3 check interval. The check interval time is the time between when KP1S will check your email address for any new emails.

## Live GPS Tracking Service

KP1S supports simple location tracking API while sending video email to each user account. A tracking server is required to receive the location data regularly based on interval settings. Set the interval settings (in seconds). The tracking service will send data on; Account ID, Recorder ID, Vehicle ID, Driver ID, GPS Data, G-Sensor Data and Recorder status.

## User Settings

This option allows you to set receiver information such as email or SMS for each user. There can be a maximum of 5 email recipients on each KP1S.



**Configuration Settings**

Device | Record | Event | Info | Connectivity | **Email Setup** | User Setup

**Email Recipient Information**

User Profile: User 1

User Email: youremail@email.com

User Password: (1000-9999)

User SMS #: +13125551234

☒ Daily Event Summary Email

**User Permissions**

☒ Request Preview

☒ Request Original Data

☒ Request/Change Camera Setting

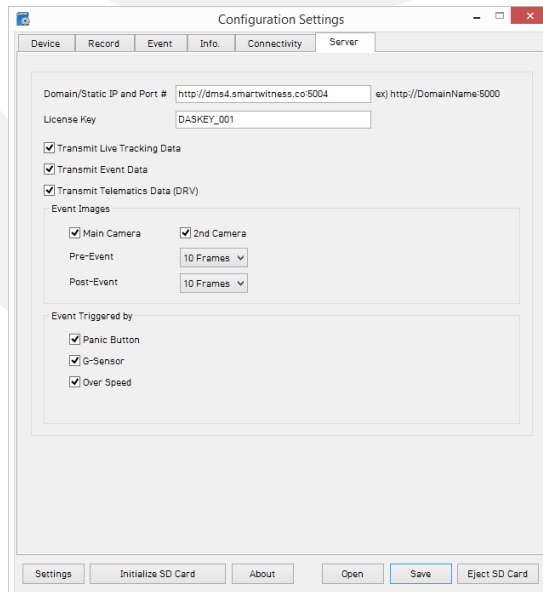
**Event Notify**

	Email Notification	Email Alert	SMS Alert
Ignition On	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Excessive Speed	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
SD Card Error	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
SD Card Full	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
G-Sensor	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Panic Button	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Settings | Initialize SD Card | About | Open | Save | Eject SD Card

## Server Settings

This option allows you to send KP1S data directly to a server (DMS Server software or integration with Telematics software required). For server setup details, please contact your local distributor or open a support ticket at [support.smartwitness.com](http://support.smartwitness.com)



**Configuration Settings**

Device | Record | Event | Info | Connectivity | **Server**

Domain/Static IP and Port #: http://dms4.smartwitness.co:5004 ex) http://DomainName:5000

License Key: DASKEY\_001

☒ Transmit Live Tracking Data

☒ Transmit Event Data

☒ Transmit Telematics Data (DRV)

**Event Images**

☒ Main Camera ☒ 2nd Camera

Pre-Event: 10 Frames

Post-Event: 10 Frames

**Event Triggered by**

☒ Panic Button

☒ G-Sensor

☒ Over Speed

Settings | Initialize SD Card | About | Open | Save | Eject SD Card

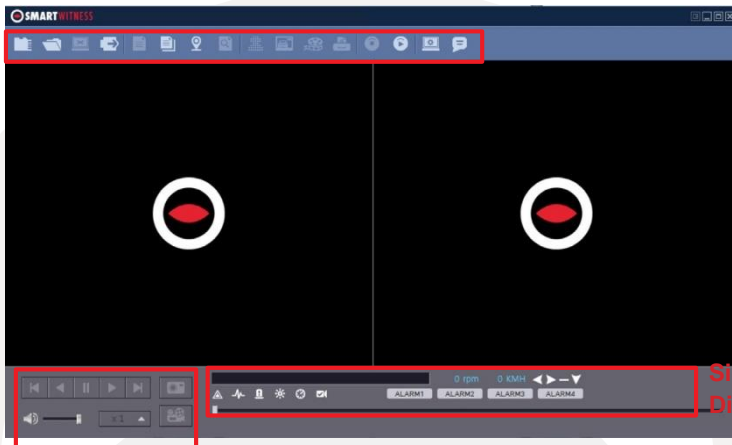
Insert the KP1S SD card and locate the software folder, now install the Analysis software, once installed you can double click on the desktop icon. The main screen will then be displayed as follows:



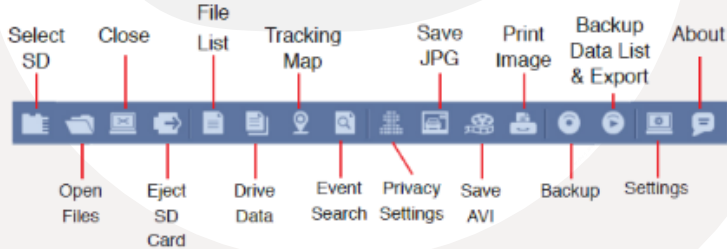
**Control Buttons**

**Playback Control Buttons**

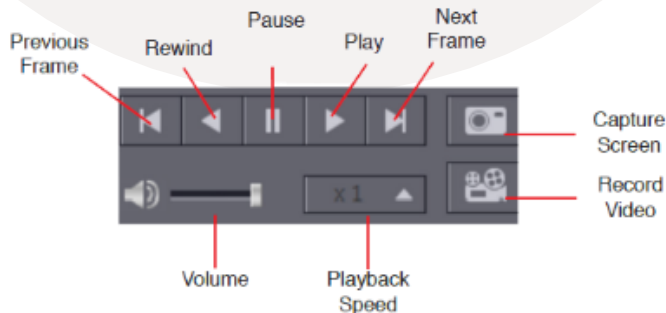
**Signal & Alarm Display Bar**



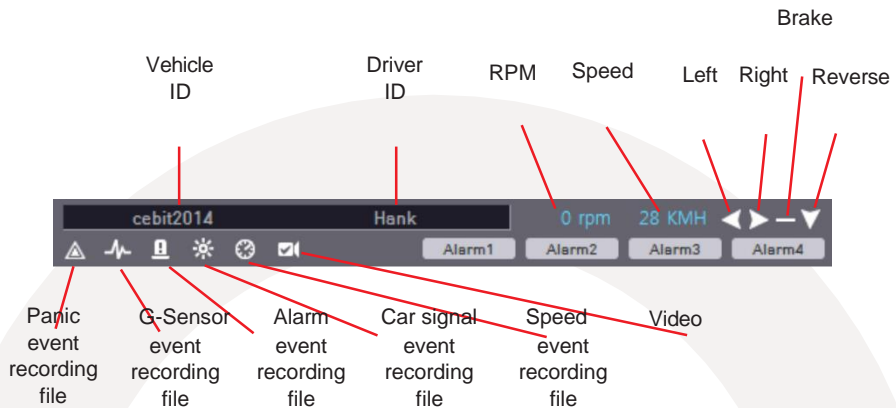
**Control Buttons**



**Playback Control Buttons**



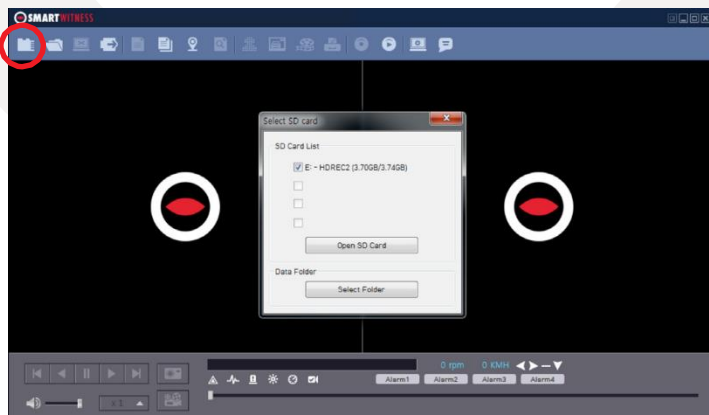
## Signal / Alarm Indicator



## Playback

Insert the SD Card to your PC. Make sure that the SD Card is properly recognized.

After confirming that SD card is recognized correctly in the PC, open the KP1S analysis software and click the "Select SD Card" button. Then, select the correct SD card from the list (Shown below).



Then, select an SD card and then click the 'Open SD Card' button.

The list of data tab "continuous" and "event" is displayed on the right side of the screen.

The recorded data is displayed under each tab, as shown below:

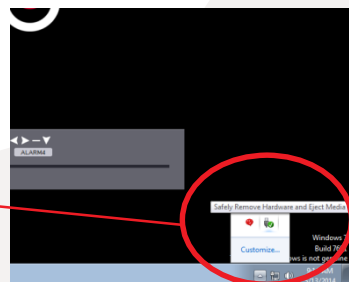


The Playback file list can be separated from the main screen and you can hide it or change the position.

In addition, the file list can be displayed on the screen as well by clicking the "File List" button.

You can end the Video playback by clicking the "close" button.

When finished, click the "disconnect safely and removing the SD card" button and remove the SD card from your PC.



**Open Files**

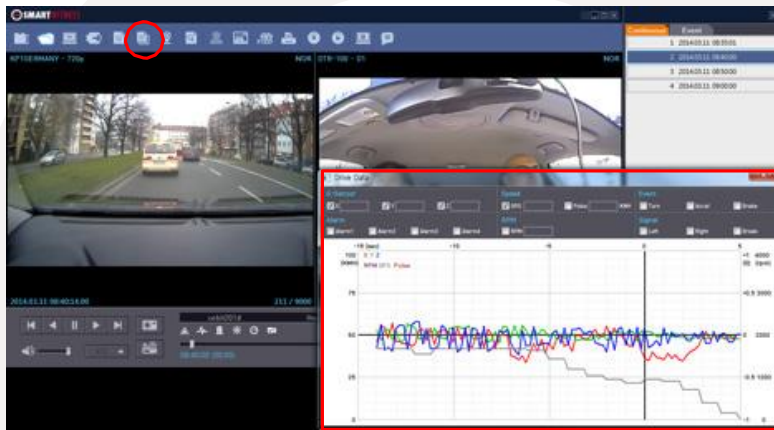
If you want to play a specific file that has been backed up on the PC or SD Card, click the "Open files" button.

Select the specific MDD file you want to play and click the "Open" button. The image of the selected file will then be displayed and you can click the 'Play' button to play the file.

## Drive Data

KP1S can record not only video and audio, GPS information, speed but also vehicle information like the alarm, G-Sensor, brake, speed Pulse and RPM together (INT-2 power adaptor is required for Speed Pulse & RPM)

The recorded information can be Analyzed and played through the KP1S Analysis software.

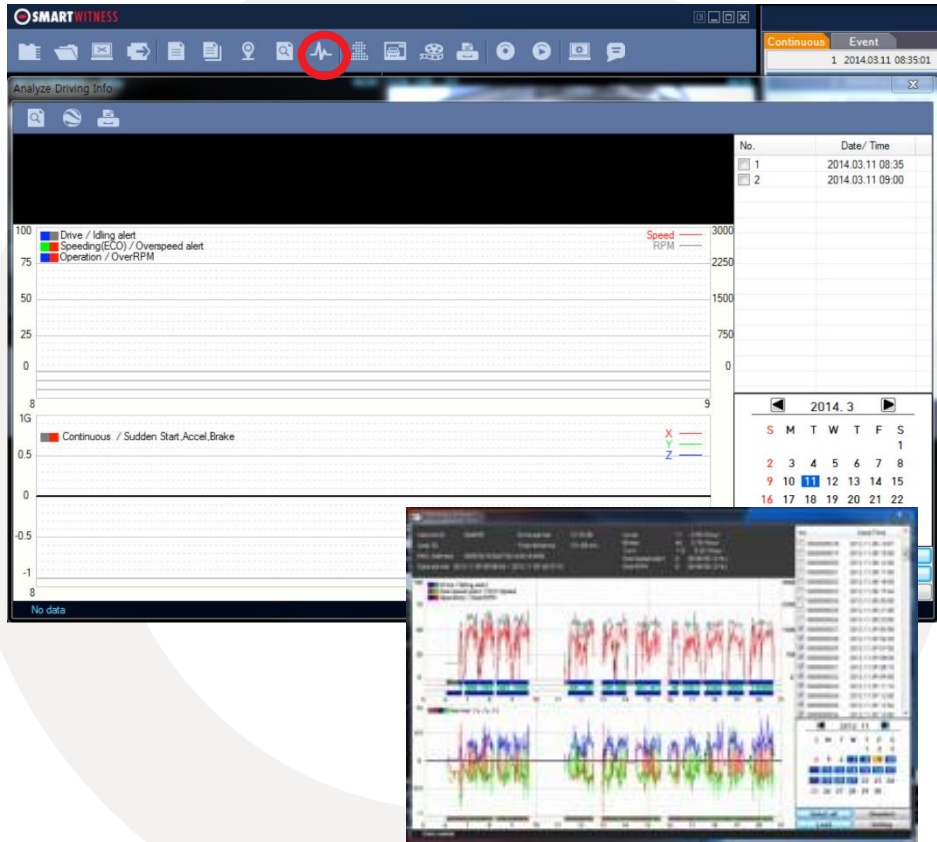


The default setting only displays the G-sensor graphs but other information may be added by checking the boxes in the upper part of the screen. Other information included;

- **G-Sensor:** (X axis: red, Y axis: green, Z axis: blue, based on the positioning of the main unit) is shown with the data reference point zero-point calibrated and positive shocks as (+) and negative shocks as (-).
- **Speed:** GPS measured speed is displayed in grey while the speed-pulse measured speed is displayed in red.
- **RPM:** Displayed in purple.
- **ALL TRIGGERS** (signals and alarms) are displayed on the bottom of the screen with the grey bar meaning the trigger is activated.

## Analyze Drive Data

During the viewing, click the Analyze Drive data button to view the below Analyze Drive Data screen.



From the calendar in the bottom right corner, choose the date you wish to inspect among the dates highlighted in blue. Dates that are not highlighted in blue, do not have the relevant data.

All data from the selected date will be automatically chosen from the selection on the right. You can unselect data that you do not need. When data is selected, click the 'Load' button to load the data.

A summary of information can be found on the top of the window including; vehicle ID, user ID, total duration and total distance. In addition you can Analyze the number of over-accelerations, over-decelerations, sharp turns, over-speeding, over-RPMs (INT-2 required) that exceeded the pre-set limit.

### **Top Graph**

The top graph shows the speed (red) and RPM (grey) and below are three indicator bars that show driving patterns. The first bar shows driving (blue) and idling (grey) and the second bar shows the speed.

White means that the vehicle was within both the permitted speed and eco-speed limit, green means above eco-speed but within permitted speed limit, and red means above the legal speed limit. The last bar shows the state of the engine where white means the engine is off, blue means it is running properly within the pre-set RPM limit, and red means over acceleration, i.e. exceeding the pre-set RPM limit.

### **Bottom Graph**

The bottom graph shows the G-sensors. The x-axis is in red, y-axis in blue, and z-axis is green.

The indicator bar below shows jolts in the G-sensor values, i.e. G-sensor values that exceed the pre-set limit. Grey means normal conditions, red means jolts in the x-axis direction, blue in the y-axis direction, and green in the z-axis direction.

Configurations for this function can be set by clicking the [Setting] button in the right bottom corner. The limits for G-sensor, permitted speeding, excessive RPM, and eco-speeding can be set under the 'Analyze' tab and ranges for the two graphs can be set under the 'Component' tab.





## Analysis Criteria Settings

This option allows you to adjust the change the analysis criteria settings. To access this menu, go to 'settings' click 'analysis criteria settings' and you will be presented with the following screen.

The 'Analysis Criteria Settings' dialog box contains the following fields and controls:

- Acceleration/Brake:** A dropdown menu set to '+-0.40G'.
- Overspeed:** A numeric input field set to '80' with units 'km/h' and a dropdown set to '30' with units 'sec'.
- RPM Limit:** A numeric input field set to '2400' with units 'r/min' and a dropdown set to '30' with units 'sec'.
- EcoSpeed:** A numeric input field set to '60' with units 'km/h' and a dropdown set to '30' with units 'sec'.
- Idle Time Limit:** A numeric input field set to '30' with units 'min'.
- Buttons:** 'OK' and 'Cancel' buttons at the bottom right.

## **Acceleration/Deceleration**

This sets the criteria for excessive acceleration and deceleration. This is measured in G-force, so if acceleration or deceleration exceeds the G-force limit, it will be counted as excessive.

## **Speed Limit**

This option allows you to set the criteria for excessive speeding. You can set the value limits between 0-999km/h. In the example above, the limit has been set to 80km/h for 30 seconds, so therefore if the vehicle goes over this speed for over 30 seconds, it will count as excessive speeding. If you go over that speed but for under 30 seconds, it will not count as excessive speeding.

## **RPM Limit**

Set the limit for excessive RPM. The RPM limit can be set from 0-9999 RPM and the time can be set by selecting the drop down menu. In the example above the limit has been set to 2400 RPM for 30 seconds. If this limit is exceeded, it will count as excessive.

## **Eco-speed Limit**

Set the criteria for eco-speed limit. The eco-speed limit can be set higher or lower than the speed limit and can be set from 0-999 km/h and the time can be set by selecting the drop down menu. In the example on page 43, the limit has been set to 60km/h for 30 seconds. If this limit is exceeded, it will count as excessive.

## **Idle Time Limit**

Set the criteria for eco-speed limit. The idle time limit can be set for any length of time. In the example on page 43, the limit has been set to 30 minutes. If this limit is exceeded, it will count as excessive idling.

All of the above criteria are used in the grading process for grading driver's safety and eco-score.

## Grading Criteria Setting

The criteria for grading driver's safety and eco-score can be set in these settings.

The safety and eco-grading criteria have 7 and 8 separate components respectively. A weighted average of these component scored are used to determine an overall score.

Grading for each criteria is set to 4 levels (A,B,C & D) and if the driver's score is lower then they will receive an F for fail. Each criteria can be given a different weight depending on the importance you place on each one but all weights must add up to 100.

To get into this menu, enter the 'Settings' menu, and click the 'Grading Criteria Settings'.

The screenshot shows the 'Grading Criteria Settings' dialog box with the following data:

	A	B	C	D
Sdn Start Cnt (per hour)	0.40	0.60	0.80	1.00
Accel Count (per hour)	0.40	0.60	0.80	1.00
Brake Count (per hour)	0.40	0.60	0.80	1.00
Speeding Count	0.40	0.60	0.80	1.00
Speeding Duration Ratio	20.00	30.00	40.00	50.00
Peak Speed Relative to Speed Limit	10	20	30	40
Avg Speed Relative to Speed Limit	-50	-30	-10	0
Excess Eco-speed Count (per hour)	0.40	0.60	0.80	1.00
Excess Eco-speed Duration Ratio	20.00	30.00	40.00	50.00
Excess RPM Count (per hour)	0.40	0.60	0.80	1.00
Excess RPM Duration Ratio	20.00	30.00	40.00	50.00
Idling Count (per hour)	0.40	0.60	0.80	1.00

Buttons at the bottom: Point/Weight Set, Export, Import, OK, Cancel.

This is an identical duplicate of the screenshot on the left, showing the same 'Grading Criteria Settings' dialog box with the same data and controls.

## Sudden Start Count

This option sets the grading criteria the amount of sudden starts per hour. The assessment of this criteria is based on the (acceleration/deceleration). For example, if a driver drove for 8 hours in one day and had 4 sudden starts during that time, their score for that criteria will be 0.5 and based on the settings in the image above, they would be graded as B.

This criteria is used in both safety and eco grading, but the weights can be set separately.

## **Sudden Acceleration Count**

This option sets the grading criteria the amount of times there is a sudden acceleration per hour. The assessment of this criteria is based on the (acceleration/ deceleration). For example, if a driver drove for 8 hours in one day and had 4 sudden accelerations during that time, their score for that criteria will be 0.5 and based on the settings in the image on the previous page, they would be graded as B.

This criteria is used in both safety and eco grading, but the weights can be set separately.

## **Sudden Deceleration Count**

This option sets the grading criteria the amount of times there is a sudden deceleration per hour. The assessment of this criteria is based on the (acceleration/ deceleration). For example, if a driver drove for 8 hours in one day and had 4 sudden decelerations during that time, their score for that criteria will be 0.5 and based on the settings in the image on the previous page, they would be graded as B.

This criteria is used in both safety and eco grading, but the weights can be set separately.

## **Speeding Count**

This option sets the grading criteria the amount of times the driver exceeds the speeding limit for the amount of time set in the 'criteria settings'. The overall value is set as a ratio of the amount of time speeding to the time driving as a percentage. For example, if a driver drove 8 hours in a day but was speeding for 1 hour in total, their score for this criteria would be 12.5% and based on the image on the previous page, they would be graded as A.

This criteria is used in both safety and eco grading, but the weights can be set separately.

## **Peak Speed Relative To Speed Limit (kmh/mph)**

This option sets the grading criteria for speeding and calculates the peak speed the driver drove, relative to the speed limit. The value can be set from 0-999km/h. The assessment of this criteria is based on the speed limit option in the 'Analysys Criteria Setting'. This criteria is used for safety grading.

## **Average Speed (kmh/mph)**

This option sets the grading criteria for speeding and calculates the average speed the driver drove, relative to the speed limit. The value can be set from 0-999km/h.

The assessment of this criteria is based on the speed limit option in the 'Analysis Criteria Setting'. This criteria is used for safety grading.

## **Excess Eco-speed Count**

This option sets the grading criteria for eco speeding and is calculated per hour. For example, if a driver drove 8 hours in a day but was exceeding the eco-speed limit 4 times, their score for this criteria would be 0.5 and based on the image on page 43, they would be graded as B.

The assessment of this criteria is based on the eco-speed limit option in the 'Analysis Criteria Setting'.

This criteria is used for eco grading only.

## **Excess Eco-speed Duration**

This option sets the grading criteria for eco speeding and is calculated as a ratio of time speeding and is set as a percentage. For example, if a driver drove 8 hours in a day but was exceeding the eco-speed limit for 1 hour, their score for this criteria would be 12.5% and based on the image on page 43, they would be graded as A.

The assessment of this criteria is based on the eco-speed limit option in the 'Analysis Criteria Setting'.

This criteria is used for eco grading only.

## **Excess RPM Count**

This option sets the grading criteria for excessive RPM and is calculated per hour. For example, if a driver drove 8 hours in a day but exceeded the RPM limit 4 times, their score for this criteria would be 0.5 and based on the image on page 43, they would be graded as B.

The assessment of this criteria is based on the RPM limit option in the 'Analysis Criteria Setting'. This criteria is used for eco grading only.

## Excess RPM Duration Ratio

This option sets the grading criteria for excessive RPM over the RPM limit set. This value is estimated as a percentage of the amount of time driving. For example, if a driver drove 8 hours in a day but was exceeding the RPM limit for 1 hour, their score for this criteria would be 12.5% and based on the image on page 43, they would be graded as A.

The assessment of this criteria is based on the RPM limit option in the 'Analysis Criteria Setting'. This criteria is used for eco grading only.

## Idling Count

This option sets the grading criteria for idling and is calculated per hour. For example, if a driver drove 8 hours in a day but exceeding the idle time limit 4 times, their score for this criteria would be 0.5 and based on the image on page 43, they would be graded as B.

The assessment of this criteria is based on the RPM limit option in the 'Analysis Criteria Setting'. This criteria is used for eco grading only.

### PLEASE NOTE

Once the grading criteria settings has been adjusted and saved, it can be exported into an '.ini' file and then imported into another version of the analysis software.

This means that you can set each KP1S quicker than manually adjusting the settings in each version of the software.

## Grading Method

**Grades:** Each criteria is given a grade of A, B, C or D and anything lower is given a grade of F for fail. Therefore each grade will be assigned a limit that if exceed, the score will go down to the next grade. If the driver exceeds the limit for the D grade, they will be given an F.

**Weights:** Each criteria can be given a different weight when calculating the safety and eco grades to provide flexibility to the operator in assessment.

**Grading & Scores:** Each grade is assigned a score; A=100, B=80, C=70, D=60, F=50. With this score, the safety and eco-scores are assessed by a weighted average of the relevant criteria scores.

The total score is an average of the safety and eco scores.

Below is an example of how scores can be calculated for each criteria.

Eco Grade	Weight	Driver 1	Driver 2
Sudden Start Count	20	A (100)	C (70)
Sudden Acceleration Count	10	A (100)	A (100)
Sudden Brake Count	20	C (70)	A (100)
Speeding Count	20	A (100)	C (70)
Speeding Duration Ratio	10	C (70)	A (100)
Peak Speed	10	A (100)	A (100)
Average Speed	10	A (100)	A (100)
Eco Score		91	88
Eco Grade		A	B

### Scoring Break Down

#### Driver 1:

Eco Score =  $20 \times 100 / 100 + 10 \times 100 / 100 + 20 \times 70 / 100 + 10 \times 70 / 100 + 10 \times 100 / 100 + 10 \times 100 / 100 = 91$  **Eco Grade A**

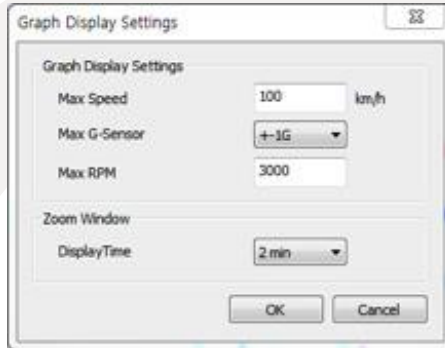
#### Driver 2:

Eco Score =  $20 \times 70 / 100 + 10 \times 100 / 100 + 20 \times 100 / 100 + 20 \times 70 / 100 + 10 \times 100 / 100 + 10 \times 100 / 100 = 88$  **Eco Grade B**

As you can see, each driver got 2 C grades, however as they were weighted differently, their eco grades are different.

## Graph Display Settings

The results of the driver analysis can be shown on a graph. To adjust the graph display, click on the 'Graph Display Settings' option.



**Max Speed:** Set the graph's upper speed limit (0-999 km/h)

**Max G-Sensor:** Set the graph's upper G-Sensor limit, by selecting a value from the drop down menu (+-1G, +-2G, +-3G)

**Max RPM:** Set the graph's upper RPM limit (0-9999)

**Zoom Window Display Time:** Set the time scale for the graph to be in zoom mode by selecting a value from the drop down menu (1 min ~ 10 mins).

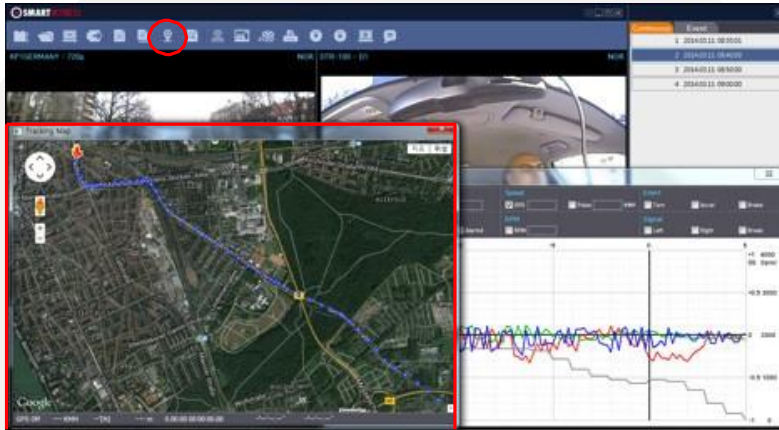
The graph settings will applied to the following window displays: Manual Mode, Data Search, Driving Data and the Zoom Graph.

Default settings are: Max Speed (100 km/h), Max G-Sensor (+-1G), Max RPM (3000).



## Tracking Map

During playback, if you click the tracking map button, the screen below will pop up showing a map of the region, the route and the location of the vehicle with an orange arrow.



If the map is not displayed, make sure that the PC is connected to the internet correctly.

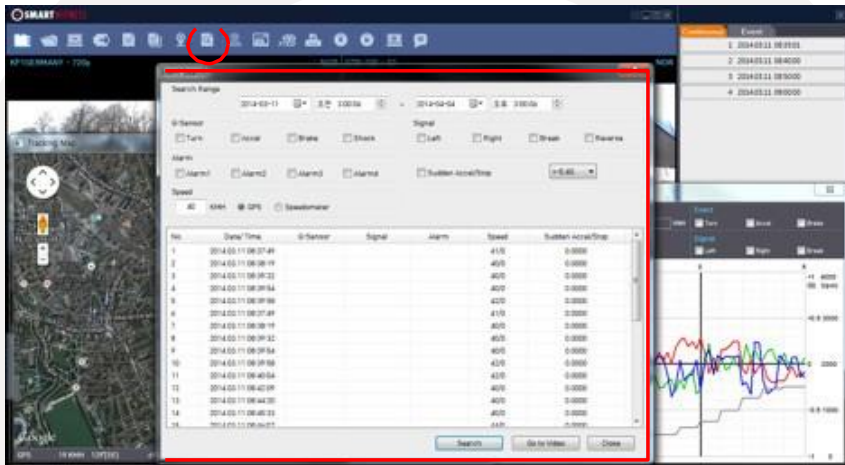
The KP1S Analysis Software is composed of a main screen, drive data screen, drive data analysis screen and the tracking screen. These screens can be displayed independently and their location and size changed to improve the use and management of data.

In addition, it is also possible to display using multiple monitors. By using different screen modes of Viewer software, you can play / Analyze video data more efficiently.

## Event Search

With the KP1S, searching and finding the data is made easy. Utilizing supplementary data such as g-sensor, signals, alarms, speed, and RPM, you can find incidents and events quicker than monitoring the vast amounts of video and audio recordings.

Click the 'Event Search' button to access the event search screen.



Firstly, set the search range.

If you select the type of events you want to search for like G-sensor, signal, alarm, speed, etc and then click the 'Search' button.

Select the data you want to play from the list and click the 'Go to Video' button and the video that you selected will be displayed on the screen.

## Privacy Masking Settings

KP1S allows you to set the mosaic area on each channel for privacy protection.

When backing up the data as a JPG or AVI format and playing in the Viewer software, you are able to make a mosaic processing on the area you have set.

To do this, put the pause the video and click the 'Privacy settings' button. The privacy setting screen will pop up.

Using the scroll down, select the camera you wish to set up.

On the selected camera view, blur out the area you wish to protect by left-clicking on the sections. You can select multiple areas.

You can also unselect, selected areas by right-clicking the blurred areas.

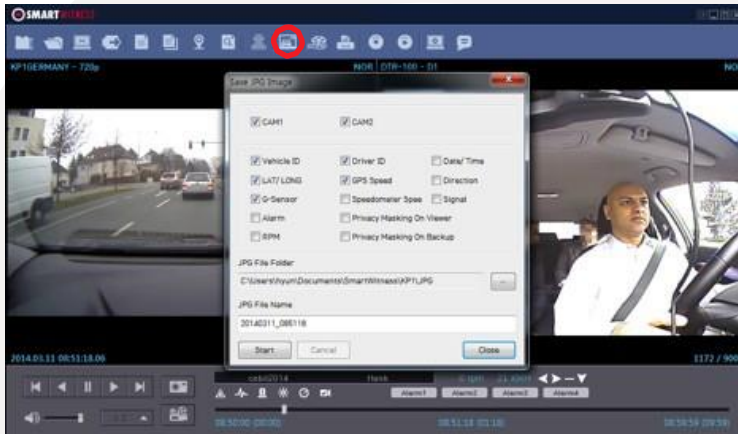
To select all or clear all, click on the 'Select all' or 'UnSelect All' buttons on the bottom, respectively.



## Save As JPG

This function will create a still frame j-peg back up of any point in the video file.

After finding the precise time you want to save, pause the playback and click the “Save JPG” button and the below screen will pop up.



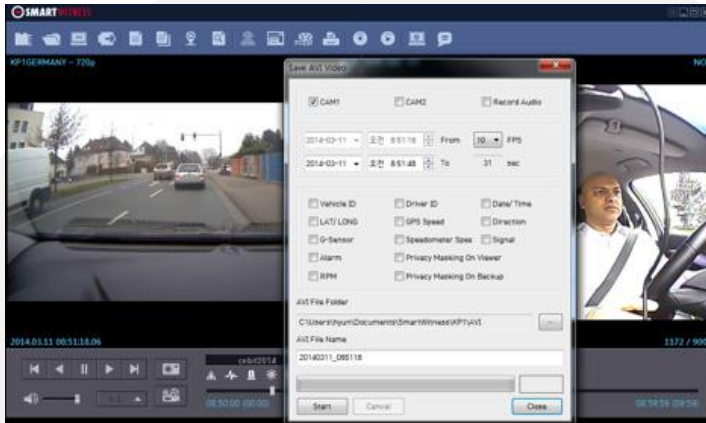
To select the channel you want to save, check all the information you want to include from the options shown. The selected information will be imprinted on the image itself. Choose the folder you want to save the image to and click ‘start’.

The file will be saved in the default folder of “My Documents\SmartWitness\KP1S\JPG” if you do not specify a Folder.

If you check “Privacy Masking”, the image will include the blurs.

## Save As AVI

This function will create a still frame AVI video back up of any point. To do this, pause the video at where you wish to start saving and click the 'save AVI' button.



Check the cameras you wish to convert into an AVI file and if you wish to include audio, check the [Audio Ch] box and scroll down to the channel you wish to include.

\* Multiple video channels can be converted but only one audio channel can be recorded and that one audio channel will be included in all AVI conversions. (The starting time is automatically set to the time that was paused at the start of this process and cannot be changed).

Select the frame rate (FPS), from 1 to 30, you wish to use. (For the best video stream, use 30 FPS).

Check the supplementary information you wish to include in the video. The selected information will show up as text on the video itself.

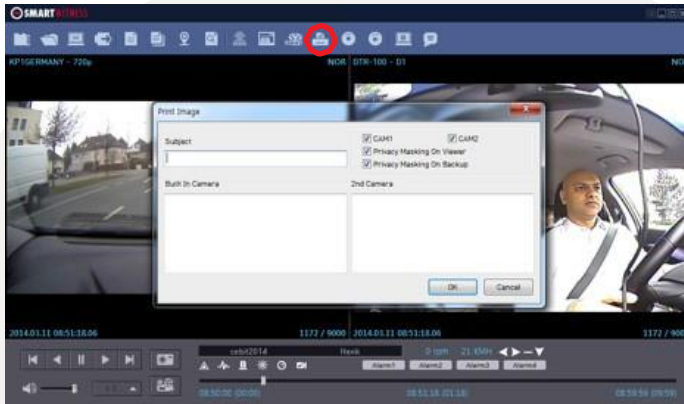
Choose the folder you wish to save the AVI file and type a file name. (The default folder is "My Documents\SmartWitness\KP1S\AVI" and the default name is the date and time.)

A video of each camera will be made into an AVI file.

The maximum length of video you can convert is ten minutes.

## Print Image

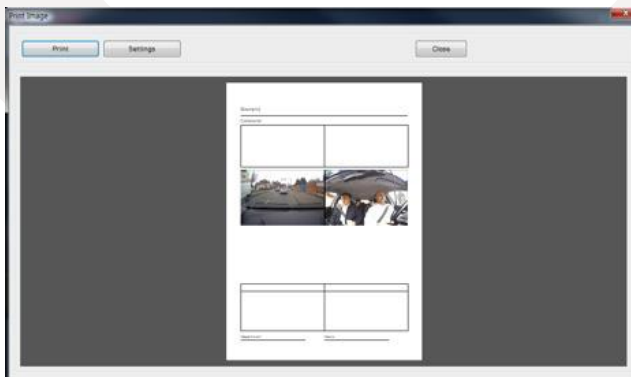
You can print selected images with accompanying information for reporting purposes. To do this, when playing the video press the 'Print Image' button' (Shown below).



Check all camera images you wish to include in the report. Then, type the title of the report and any comments about the situation or other reminders.

If the Privacy Masking box is checked, the pre-set blur effect will be applied.

When you click 'OK', a preview of the report like the one below, will be pop up.



After checking all the information, press the 'Print' to print the report.

## Data Backup

You can back up the recorded data on your PC or other data storage media.

KP1S offers an option to store data by type to ease management of data. You can also input additional data such as Vehicle ID, Driver ID, title, and comments to help in administration.

Click the 'Backup' button.



Check all the camera boxes you wish to back up and set the time you wish to backup.

(The start time is when the video was paused and cannot be changed once you start this process).

Input all the information you wish to include in the back up file including Driver ID, User ID, title, and comments.

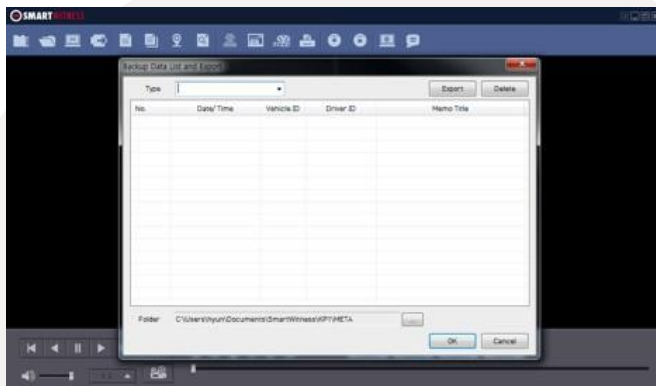
Then, select the folder where you wish to save the backup file. (The default folder is "My Documents\SmartWitness\KP1S\BACKUP").

Press [Start] to create the backup file. These backed up files can be accessed from the Backup List.

**The maximum amount of time you can back up is ten minutes.**

## Backup List

You can use the data backup list to play data files easier that have been backed up. To do this, click the 'Backup List' button (below).



Choose the folder where the backup files are at the bottom of the screen. (It will automatically show the last folder that was accessed.)

Then, select the report type by scrolling down the options.

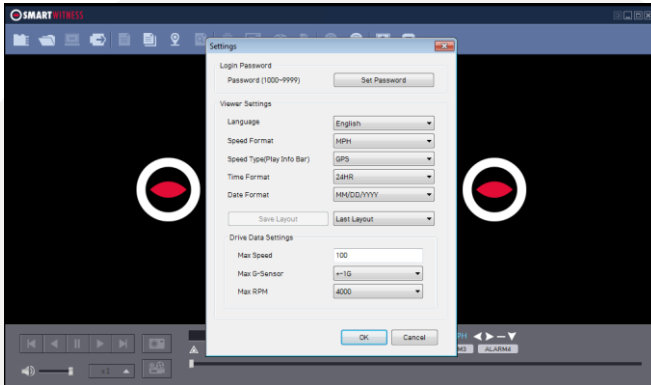
The files are listed showing the "Date/Time, Vehicle ID, Driver ID, Title".

Check the box next to the file you wish to play back and click 'OK'. Finally, double click the file and video files will show on the Viewer.



## Software Settings

You can use the data backup list to play data files easier that have been backed up. To do this, click the 'Backup List' button (below).



Click the 'Set Password' button. Password for the KP1S Analysis Software can be set with any number between 1000-9999.

[Note] The PC Software will not be able to run without a password, so please make sure to keep the password in a safe place.

### KP1S Analysis Software Settings

**Language:** Selectable from "Japanese / Korean / English/ Spanish/ Russian".

**Velocity Form:** Select from "km/h" or "mp/h".

**Speed Type (Play information bar):** Selectable from the vehicle speed pulse or GPS.

**Time Unit:** Selectable from "24HR" or "AM / PM".

**Date Format:** Selectable from "YY/MM/DD", "MM/DD/YY" or "DD/MM/YY".

**Default Layout:** The program will launch with the Default Layout

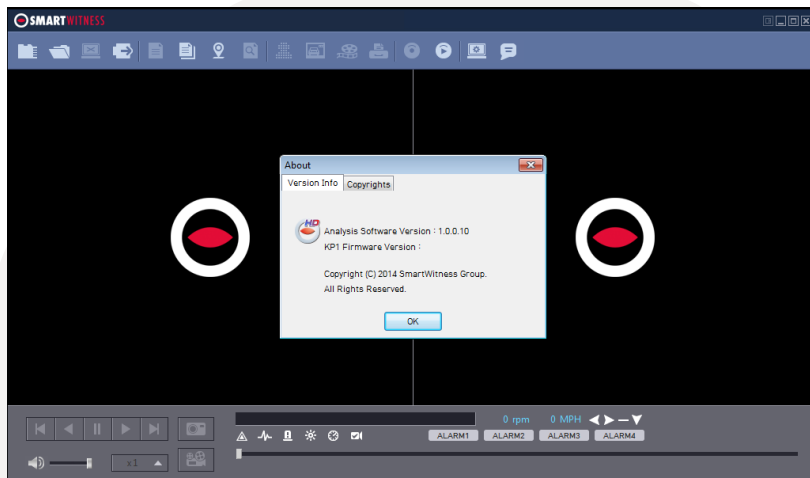
**Last Layout:** The program will launch with the same layout as it was when it was closed.

### Drive Data Settings

The graph scales for the Drive Data Window will be modified according to the settings.

## About

You can check the version information of the KP1S Analysis software. Click the 'About' button to see the below pop up.



Here, you can check the software version and KP1S firmware version number. For updates please check with your supplier/distributor.

## 7. Notification Email Templates

### Alert Message

#### Email from KP1S

The KP1S will send an email notification to alert you when an incident happens. Below explains the content and subject header of the emails.

#### Email Subject:

ALERT > Vehicle ID > Date-Time

For Example: ALERT > Y122 VVE > G > 16/04/2014-17:39:17

#### Email Body:

IGNITION ON  
SPEED LIMIT EXCEEDED  
SD CARD 1 ERROR  
SD CARD 2 ERROR  
SD CARD 1 FULL  
SD CARD 2 FULL  
PANIC  
ALARM 1  
ALARM 2  
ALARM 3  
ALARM 4

## Event Notification

### Email from KP1S

The KP1S will send an email notification when an incident happens. Below explains the content and subject header of the emails.

#### Email Subject:

ID > Vehicle ID > Event Type > Date-Time

For Example: ID > Y122 VVE > G > 16/04/2014-17:39:17

#### Email Body:

Vehicle ID: Y122 VVE

Driver ID: Joe

Policyholder Name: Bloggs Limited

Policy Number: KP1S23456789

Contact Name: Joe Bloggs

Contact Number: 07712 345 678

Type: G

[Location<sup>#1</sup>: 50 mph - X=0.3g, Y=0.2g, Z=0.9g<sup>#2</sup>](#)

[OK<sup>#3</sup>](#)

Links:

#1: kml file

#2: Run Google Maps

#3: Request Original

In the above example, the type will start with the event type. The different types of event are as follows:

G = G-Sensor, P = Panic, A1 = Alarm1, A2 = Alarm2, A3 = Alarm3, A4 = Alarm4

The email will then attach an AVI file of the incident and show as follows:

AVI file (10sec, QVGA): 1st camera only (Pre)4 seconds + (Event)1 second + (Post) 5 seconds

AVI file name: ID\_Date\_Time.avi

KML file name: ID\_Date\_Time.kml (KML: Google Earth File)

## Daily Report

Email from KP1S

**Email Subject:**

ID>Vehicle ID>DR>Date-Time

For example: ID>Y122 VVE>DR>2014/04/16-17:39:17

**Email Body:**

2014/04/15> 9:39:13 > G

2014/04/15> 10:39:13 > P

2014/04/15> 11:39:13 > A

Total: 3

## 8. Email Alerts

### Emailing the KP1S

You can email the KP1S to receive alerts from the camera for alarm triggers, video data and speeding etc. The KP1S will email details of the data requested, however not as detailed as the event notifications.

For example an email alert will send details of an alarm trigger, (ALERT > Y122 VVE > 2014/04/16-17.39.17 / ALARM1).

### Request Original Data

#### Send an Email to KP1S

##### Email Subject:

R\_>\_Date-Time\_>\_Password (This is the user password. Set using the configuration software.)

For example: R\_>\_2014/04/16-17:39:17\_>\_5555

When you have sent the email request, the KP1S will send the following email back to the registered email address.

##### Email Subject:

ID > Vehicle ID >V > Date-Time

For example: ID > Y122 VVE > V > 2014/04/16-17:39:17

V= Video

R= Record Data

Attach mdd file (The Max file size is 10MB or 10 seconds): 1st camera + 2nd camera video. When requesting the video again, the email will attach an MDD file. This file can only be played through the KP1S Analysis Software.

## Request System Info

### Send an Email to KP1S

#### Email Subject:

I\_ > \_Admin Password

For example: I\_ > \_55555

When you have sent the email request, the KP1S will send the following email back to the registered email address.

#### Email Subject:

INFO>Vehicle ID

For example: INFO>Y122 VVE

#### Email Body:

DR ID: B2MP21400031

VEHICLE: Y122 VVE

DRIVER: Joe

CALL NUMBER: 077 1234 5678

## Request Preview

### Send an Email to KP1S

#### Email Subject:

Event Type\_ > \_Date-Time\_> \_Password

For example: G\_ > \_2014/04/16-17:39:17\_> \_5555

When you have sent the email request, the KP1S will send the following email back to the registered email address.

**Email Subject:**

ID>Vehicle ID >T>Date-Time

For example: ID > Y122 VVE > T > 2013/11/16-17:39:17

T= Thumbnail video

Attach AVI file (10sec, HD or 10sec VGA or 10sec QVGA): 1st camera only (Pre) 4 seconds + (Event)1 second + (Post) 5 seconds

The AVI file resolution can be set in the settings on the analysis software.

AVI file name: ID\_Date\_Time.avi

KML file name: ID\_Date\_Time.kml

**Remote Configure**

**- To Change KP1S Settings**

**Send an Email to KP1S**

**Email Subject:**

S\_>\_Admin Password

For example: S\_>\_555555

Attach setting.ini file

Note that this command requires you to enter the admin password and not the user password that can be used in other requests.

To send the 'setting.ini file' use the config tool to adjust the settings to your requirements and click the 'save' button and then 'select folder' button. This will create the file that you can attach on the email to the KP1S and apply these settings to the unit.

All commands have to be sent from one of the registered users that can be set in the KP1S Configure Software.



When you have sent the email request on the previous page, the KP1S will send the following email back to the registered email address.

**Email Subject:**

S\_>\_Admin Password: REQUEST TITLE  
For example: S\_>\_555555:>Remote Configure

**Email Body:**

INVALID PASSWORD  
INVALID REQUEST  
INVALID ARGUMENT: Without setting .ini file or misspelling  
NOT ALLOW: Can't change that setting  
UPDATE SETTING: Successfully changed setting.ini  
ALREADY UPDATE SETTING: Already changed setting.ini  
SAME SETTING:  
UNEXPECT: Unexpected error

## 9. SMS Templates

### **SMS: Alert Message**

**SMS from**

**KP1S SMS**

**Body:**

ALERT > Y122 VVE > 2014/04/16-17.39.17 / *IGNITION ON*

ALERT > Y122 VVE > 2014/04/16-17.39.17 / *SPEED LIMIT EXCEEDED*

ALERT > Y122 VVE > 2014/04/16-17.39.17 / *SD CARD1 ERROR*

ALERT > Y122 VVE > 2014/04/16-17.39.17 / *SD CARD2 ERROR*

ALERT > Y122 VVE > 2014/04/16-17.39.17 / *SD CARD1 FULL*

ALERT > Y122 VVE > 2014/04/16-17.39.17 / *SD CARD2 FULL*

ALERT > Y122 VVE > 2014/04/16-17.39.17 / *PANIC*

ALERT > Y122 VVE > 2014/04/16-17.39.17 / *ALARM1*

ALERT > Y122 VVE > 2014/04/16-17.39.17 / *ALARM2*

ALERT > Y122 VVE > 2014/04/16-17.39.17 / *ALARM3*

ALERT > Y122 VVE > 2014/04/16-17.39.17 / *ALARM4*

ALERT > Y122 VVE > 2014/04/16-17.39.17 / *G-Sensor*

## 10. Recording Time Table

### Continuous Mode

Resolution	Quality	FPS	SD Card (in Hours)			
			4GB	8GB	16GB	32GB
HD (720P) 1280x720	Super	30	1.8	3.5	7.1	14.2
		1	8.4	16.7	33.4	66.9
	High	30	2.2	4.4	8.8	17.6
		1	10.2	20.5	40.9	81.9
	Normal	30	2.9	5.8	11.6	23.2
		1	13.2	26.4	52.8	105.7
VGA 640x480	Super	30	4.3	8.5	17	34
		1	18.6	37.2	74.4	148.9
	High	30	5.5	11.1	22.2	44.4
		1	23.4	46.8	93.5	166.7
	Normal	30	8	16	31.9	63.8
		1	31.5	62.9	125.9	166.7
QVGA 320x240	Super	30	14.2	28.4	56.8	113.6
		1	48.1	96.2	166.7	166.7
	High	30	16.8	33.7	67.3	134.6
		1	53.8	107.6	166.7	166.7
	Normal	30	20.6	41.3	82.6	165.1
		1	61	122	166.7	166.7

Camera 1			Camera 2			SD Card (in Hours)			
Resolution	Quality	FPS	Resolution	Quality	FPS	4GB	8GB	16GB	32GB
HD (720P) 1280x720	Super	15	D1 720x480	Super	15	2.1	4.3	8.6	17.2
		1			1	6.1	12.2	24.4	48.8
	High	15		High	15	2.7	5.4	10.8	21.6
		1			1	7.6	15.3	30.6	61.1
	Normal	15		Normal	15	3.7	7.3	14.6	29.3
		1			1	10.2	20.4	40.9	81.7
VGA 640x480	Super	30	HD1 720x240	Super	30	2.8	5.7	11.4	22.8
		1			1	13.2	26.3	52.7	105.4
	High	30		High	30	3.6	7.3	14.6	29.2
		1			1	16.5	33	66.1	132.2
	Normal	30		Normal	30	5.1	10.1	20.3	40.6
		1			1	22.1	44.3	88.6	166.7
QVGA 320x240	Super	30	CIF 352x240	Super	30	7.6	15.2	30.5	61
		1			1	31.3	62.6	125.1	166.7
	High	30		High	30	9.2	18.3	36.6	73.2
		1			1	36.3	72.5	145.1	166.7
	Normal	30		Normal	30	11.5	22.9	45.8	91.6
		1			1	43.1	86.3	166.7	166.7

\*This is a guideline only. Actual results may vary depending on a variety of factors.

## Limitation of the total file number

### In Event Record Mode:

1 camera recording: The number of files is limited to a maximum of 3,000.

2 camera recording: The number of files is limited to a maximum of 2,000.

## In Continuous Record Mode:

Regardless of the number of cameras, the maximum recording number is 1,000.

## At the Dual (Continuous + Event) Record mode

1 camera recording, maximum recording number (Event folder: 2,000, Normal folder: 1000)

2 camera recording, maximum recording number (Event folder: 1,500, Normal folder: 1000)

### PLEASE NOTE

If the number of recorded files will exceed the maximum (1,000), then they will be overwritten on the SD card starting with the oldest first.

Therefore, please backup data regularly to avoid losing any important files.

## Event Mode

Resolution	Quality	FPS	4GB	8GB	16GB	32GB
VGA 640x480	Super	30	750 Events	1500 Events	3000 Events	3000 Events
	High	30	900 Events	1800 Events	3000 Events	3000 Events
	Normal	30	1350 Events	2700 Events	3000 Events	3000 Events

Camera 1			Camera 2						
Resolution	Quality	FPS	Resolution	Quality	FPS	4GB	8GB	16GB	32GB
VGA 640x480	Super	30	D1 720x480	Super	30	375 Events	750 Events	1500 Events	2000 Events
	High	30		High	30	450 Events	900 Events	1800 Events	2000 Events
	Normal	30		Normal	30	700 Events	1400 Events	2000 Events	2000 Events

# 11. SPECIFICATIONS

## Dual Recording Mode

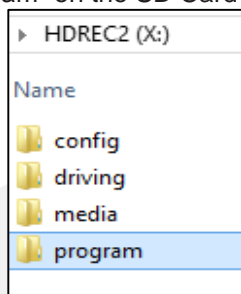
Camera 1			Camera 2			SD Card				
Resolution	Quality	FPS	Resolution	Quality	FPS	Record Folder	4GB	8GB	16GB	32GB
VGA 640x480	Super	1	D1 720x480	Super	1	Normal	5 Hours	10 Hours	20 Hours	40 Hours
		30			30	Event	185 Events	370 Events	740 Events	1480 Events
	High	1		High	1	Normal	6 Hours	13 Hours	26 Hours	52 Hours
		30			30	Event	225 Events	450 Events	900 Events	1500 Events
	Normal	1		Normal	1	Normal	9 Hours	18 Hours	37 Hours	74 Hours
		30			30	Event	350 Events	700 Events	1400 Events	1500 Events

# 11. SPECIFICATIONS

Image Sensor	2 Megapixel Colour CMOS Sensor
Angle of View	170°
2 <sup>nd</sup> Camera	Camera 2 - 5V Camera In
Voice	Built-in Microphone
Video Resolution	1280x720, 640x480, 320x240 2 <sup>nd</sup> Camera NTSC: 720x480, 720x240, 352,240 PAL: 720x576, 720x288, 352,288
Recording Format	Video: H.264 Audio: G.711
Frame Rate	30FPS (15 FPS on each channel when using 2 cameras)
Recording Modes	Normal (Continuous) Event (G-Sensor, Panic, Alarm) Dual (Continuous + Event)
Recording Time	<b>Event:</b> 20 sec before, 20 sec after <b>Continuous:</b> Minimum: 1 Minute ~ Maximum: 167 Hours
Memory	Supports 2 SD Cards of up to 32GB each (Class 10)
GPS	Internal GPS
G-Sensor	Internal 3-Axis G-Sensor
RTC	Internal Battery
Buzzer	Recording Start, Error
LED	4 LEDs (Red, Orange, Blue, Green)
Super Capacitor	Enables the recording of the last file before shut down
PC Software	KP1 Config Software / KP1 Analysis Software
Power Input	Cigarette Jack: Input - DC 12V/24V 2A, Output: DC 5V 3A Power Adaptor: Input - DC12/24V, Output: DC 5V 3A Junction Box: Input - DC 12V/24V 2A, Output: DC 5V 3A
Alarm In / Out	KP1-INT1-S: two alarm inputs, one output KP1-INT2: four alarm inputs, two outputs
Signal Input	KP1-INT1-S: ignition KP1-INT2: ignition, speed, rpm, left, right, brake, reverse
Size & Weight (WxHxD)	110x57x57mm / 0.15KG
Operation Temp	-10°C ~ +55°C

## Firmware Upgrade

1. To begin the firmware upgrade, you will need to install the KP1S Configuration Tool software on your computer. The firmware must be provided by SmartWitness technical support or your distributor. For full details on installation, please go to section 4 on page 23.
2. Then, initialize your SD Card using the KP1S configuration software.
3. Make a folder called "program" on the SD Card as shown below.



4. Copy the "KP1S\_2.2.X.bin" file into the SD card's 'program' folder.
5. Make sure KP1S is turned off and insert the prepared SD card into KP1S SD slot 1 and turn on the power.

Upgrading the unit will usually take about 1 to 2 minutes. The green & blue LEDs will alternate during the firmware update process.

**PLEASE NOTE**

**DO NOT TURN OFF THE POWER DURING UPGRADING.**

If the upgrade fails, "KP1S" unit should be returned to your local distributor.

6. Once the upgrading is finished, KP1S will automatically boot to its programmed recording settings.



Optional Accessories

Power Adaptor: KP1S-INT1-S



Shutdown Delay Time Set using KP1 Configuration Tool

Connection

Type

KP1-INT1-S

Power Off Delay

6

 Hours

30

 Min

0

 Sec

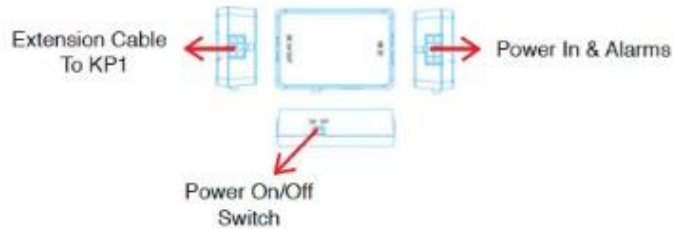
- Black (Ground)
  - Red (Power Battery +)
  - White (Power ACC +)
  - Green (Alarm In, NC/NO), (External panic button+)
  - Black (Ground), (NC/NO Alarm-)
  - Orange (Alarm In, Voltage on/off (3~70V))
  - Yellow (Alarm out), Low(0V) to High (5V)
- Power Specifications  
Input: DC 10-32V, 200mA  
Output: DC5V, 2500mA

Optional Accessory:  
Remote Panic Button (P/N: SW-PB)



Setting Remote Panic Button on config tool

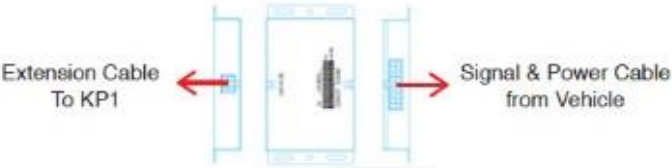
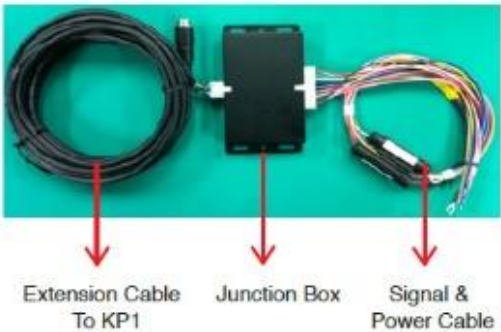
Alarms	Title	Type	Record On	Alarm Out1
<input type="checkbox"/> Alarm Input1	Alarm1	N-Off	<input type="checkbox"/>	N/A
<input checked="" type="checkbox"/> Alarm Input2	Panic Button	N-Off	<input checked="" type="checkbox"/>	N/A
Alarm Out1	AlarmOut1			



Input Voltage	DC 12V / 30V 2000mA
Output Voltage	DC 5V 3000mA
Operation Temp.	-20°C ~ +60°C

Optional Accessories

Junction Box: KP1S-INT2



Cable Descriptions

	Battery -
	RPM
	Speed
	Reverse
	Brake
	Right
	Left
	Battery +
	Alarm Out 1A, 1B, 2A & 2B
	Alarm In 1, 2, 3 & 4
	ACC

Input Voltage	DC 12V / 24V 2000mA		
Output Voltage	DC 5V 3000mA		
Operation Temp.	-20°C ~ +60°C		
When Used at 12V		When Used at 24V	
Initial Voltage	12.39V	Initial Voltage	23.3V
Power Cut Voltage	11.9V	Power Cut Voltage	22.7V

## Junction Box DIP Switch cont'd

### 1. Switch (On: Low, Off:High)



### 2. Delayed Shutdown Time Setting

DIP Switch No.			Time
1	2	3	
OFF	OFF	OFF	1 Min
ON	OFF	OFF	30 Min
OFF	ON	OFF	1 Hour
ON	ON	OFF	2 Hour
OFF	OFF	ON	4 Hour
ON	OFF	ON	15 Min
OFF	ON	ON	—
ON	ON	ON	0

### 3. Power On Delay Time Setting

DIP Switch No.		Time
4	5	
OFF	OFF	0 Sec
ON	OFF	5 Sec
OFF	ON	10 Sec
ON	ON	30 Sec

### 4. Not Used

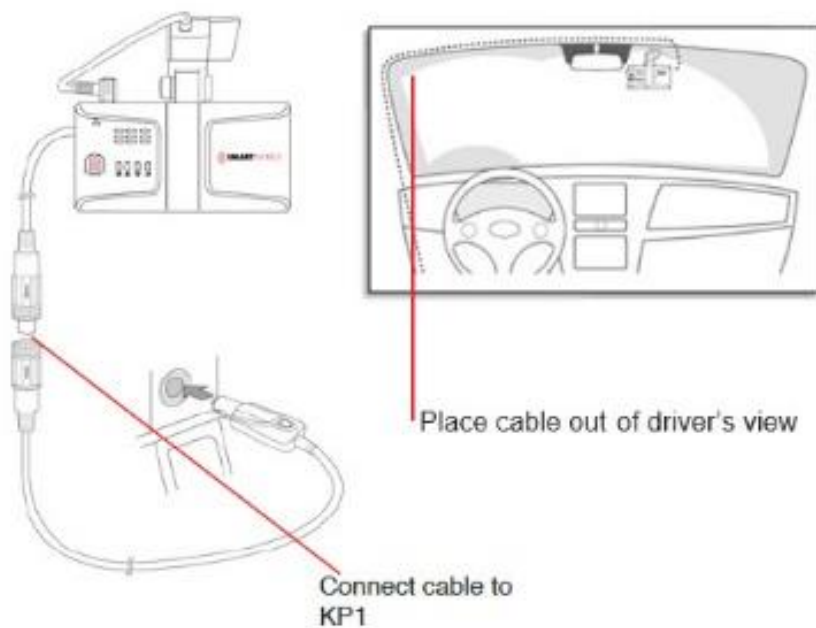
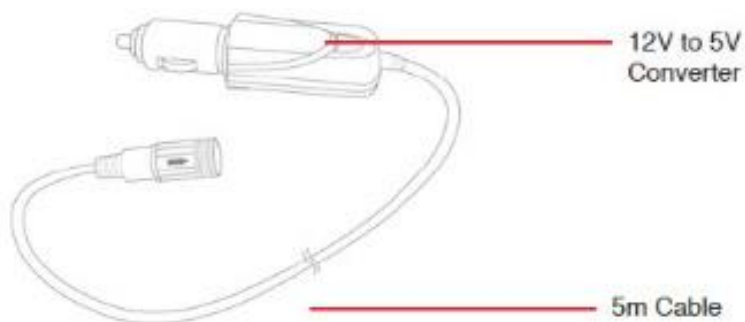
DIP Switch No.		Description
6	7	
Not Used	Not Used	Not Used

### 5. 12v / 24v Setting

DIP Switch No.		Voltage
8		
OFF		12V
ON		24V

### Optional Accessories

### Cigarette Power: KP1S-CIGAR



## LCD Monitor with Rear Camera & KP1S



- 1) RCA "Y" Splitter (part of "KP1-YC")
- 2) Rear Camera Video RCA male input into Y Splitter
- 3) LCD female RCA Video input 1 connected to Male RCA of Y splitter
- 4) RCA to 2.5mm stereo connection from Y splitter to KP1 cam input 2
- 5) KP1 cam input 2 connected to 2.5mm stereo to RCA input of Y splitter
- 6) KP1 power cable
- 7) 12V power cable for rear backup cable (IGN+)
- 8) Trigger cable for video input 1 of LCD monitor. Connected to rear backup sensor
- 9) 12V power input for monitor (IGN+)
- 10) Ground (bat-) for LCD monitor

## Technical Support

For Technical Support, please contact your local distributor. Or go online:

<http://support.smartwitness.com>

## Limited Warranty

This product is supplied with a 2 year warranty. The Warranty excludes products that have been misused, (including accidental damage) and damage caused by normal wear and tear. In the unlikely event that you encounter a problem with this product, it should be returned to the place of purchase.



## NOTES



