Eye Alert System

EA410

USER MANUAL

Version 2014.07.21

I. Product introduction

The EA410 driver fatigue alarm system is the most advanced non-contact method to capture infrared images of people's eyes and the PERCLOS algorithms alerts the driver in time to protect your life and property.

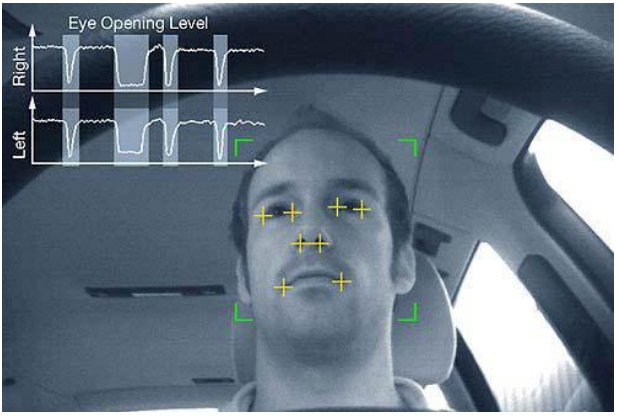
EA410 is small and intelligent, it does not block your vision, the base rotates as needed, the installation is very easy, and it can be installed right on the dashboard. The EA410 has a highly integrated infrared camera, a computer, image processing unit and alarm. The EA410 technology is protected by over ten patents.

II. Alarm theory

A driver may not be aware that they are in danger due to fatigue. A driver might feel they must continue driving. Our driver fatigue alarm system reminds the driver that he/she is in a dangerous state. The EA410 uses a PERCLOS algorithm to analyze the driver's fatigue level.

The state of the driver's eyes is constantly analyzed. The human retina reflects infra-red light in a manner that can be used to determine the eye's condition. This varies just prior to falling asleep. The EA410 knows you are falling asleep before you close your eyes.

If the EA410 determines the driver is in a dangerous state a sharp voice will alert the driver.



III. Features

- Works around the clock, both in the dark or the sun.
- Works with sunglasses or prescription glasses.
- Leading face recognition technology, patented PERCLOS algorithms to warn the driver.
- Patented mesh membrane pupil detection technology detects open but sleepy eyes.
- In addition to fatigue driving, if the driver does not focus on driving the system will respond.
- Intelligent high-speed recognition, the system can identify when you are in an urban areas or on the expressway, the system will automatically raise the alarm sensitivity on expressway.
- Compact, easy to install, will not affect the driver's field of view.
- Automatic sensitivity control, when the driver barely moves, the system will automatically raise the sensitivity. If he often turns his head, the alarm sensitivity will be automatically lowered, to reduce false alarms.
- Facial feedback indicator, the green light is on when the angle between lens and human face is proper.

TUNING

While sitting in the normal driving position, power up the EA410. After two seconds the EA410 will emit a power-on tone and light the STATUS INDICATOR for one second, after which the STATUS INDICATOR will either dim, flicker, or go off -- depending upon the extent to which the EA410 recognizes the driver's eyes. Adjust the pan and tilt of the EA410 unit to maximize the amount of time that the STATUS INDICATOR remains on.

ALERT STATUS

To be able to perform its function, the EA410 requires a brief period to become familiar with the driver's face before entering ALERT status. For most drivers, the EA410 will enter ALERT status after about a minute or so of normal driving. For drivers that wear eyeglasses, the unit may take as long as 5 minutes to enter the ALERT status. Thereafter, the EA410 will respond within two seconds to signs of fatigue or inattention

WARNING METHOD

Upon detecting signs of fatigue or distraction, the EA410 verbally warns the driver to "Pay Attention to the Road" while simultaneously setting the WARNING data output low for a few seconds.

If the driver brings his gaze back to the road or to the EA410 immediately, the EA410 resets and is armed to warn again in 10 seconds. However, if the driver fails to respond quickly to the warning, the EA410 will set off an alarm sufficient to startle the driver.

During initial testing the EA410 may at first seem less responsive than expected. The EA410 uses Video Analytics to recognize the characteristics of fatigue and distraction, taking into account conditions such as facial motion and pupil dilation together with eye closure. The unit will not respond as quickly to eye closure where conditions associated with fatigue or distraction are not present. (i.e., significant movements or continuous talking immediately preceding eye closure). Under other eye closure conditions the unit will warn in about 4-7 seconds. The sensitivity and speaker volume are preset from the factory for typical conditions. If local conditions require different settings, please contact technical support.

Model:	**Data WARNING when Power On**	**Data WARNING when Power Off**	**Data WARNING during Alarm, 15 seconds max**
EA410	3.3V	0V	0V

WARNING (output) – The output signal level is normally at ~4.3 volts relative to vehicle ground. WARNING drops briefly to ~0 volts each time the EA410 gives an audible warning for the driver to “Pay Attention to the Road”.

Name	**Color**
Power	Red
Ground	Black
WARNING	Orange

IV. Functional process

Two seconds after power is turned on, the green light will flash. At night the red infrared LED can also be seen. After 30 seconds, the system goes into the active state. The green light means your eyes are open, the light is off when your eyes closed, or not in view. When it is first installed, you adjust the position according to green light.

The EA410 will remind the driver before entering a dangerous driving status. The human retina will become less and less sensitive to the light outside, the artificial intelligence software inside the system is detecting the status continuously, and it will give an audible alarm to remind the driver take a rest.

The EA410 can also detect a distracted driver, such as talking with back-seat passengers, adjusting dashboard controls, reading, texting, picking up items on the floor, and give audible reminders to prevent accidents .

The EA410 response time is 2-3 seconds (2 seconds in highway mode, 3 seconds in urban settings.) Detecting items like looking at the mirror for too long, the alarm reaction time is 5 to 7 seconds, and then three short alarms will sound. The retina shrinks smaller and smaller in the 8 seconds before people enter an unconscious state, so the system can sound the alarm before it is too dangerous.

V. Installation

To install on the dashboard:

Clean the mounting surface in your vehicle. The EA410 has a metal base that can be either attached with double-sided tape or metal screws. Make sure the EyeAlert can still pivot on the mounting base.

To connect power:

The cable has wires for Battery power, Ground and Data. The power signal should be off when the vehicle is off. The Data wires can be either connected to an AVL or other data system. The data signals are 3.3 volt logic.

Operation:

The EA410 will begin to work after being powered on, now you can adjust the position according to the state of the green light facing you. After the green light is on, move your face around a small amount, if the green light stays on, that means the installation is good.

The angle between the driver and the camera should be less than 20 degrees.

VI. Attention:

- Do not open or repair the device.
- Do not operate the system while driving.
- Please handle carefully, do not drop.
- Do not use cleaning agents to clean the machine.
- Keep away from water or moist conditions.
- Do not rip, bend or squeezed the wiring.
- The EA410 does not recognize a person who has only one eye, white eyebrows, rough scars or wrinkles around eyebrows.
- If the temperature in the car is too high the EA410 may enter a sleeping mode to avoid damage, the system will re-start when cool.
- If the temperature is well below freezing, the device may not start immediately; wait for the cabin to warm up.

VII. Product History

Researchers at Carnegie-Mellon University, working with the National Highway Traffic Safety Administration, developed the PERCLOS algorithm to measure eye closure rates.

VIII. Highway Safety Group special legal statement:

Driver fatigue alarm system is only a warning product, and does not absolutely guarantee your driving safety. Please be advised that EA410 is not responsible for any driving accident.

Warranty

EyeAlert™ Driver Fatigue systems come with a one (1) year limited warranty. The Highway Safety Group warrantees EyeAlert™ products to be free from workmanship and materials defects including the enclosure, camera and electronics. The Highway Safety Group will cover 100% of the replacement cost for the first year. The Highway Safety Group does not warranty installation. This limited warranty does not cover replacement parts not approved in writing by The Highway Safety Group or if the EyeAlert™ is modified in anyway not approved by The Highway Safety Group in writing.

All implied warranties, including, without limitation, implied warranties of merchantability, fitness for a particular purpose, and non-infringement, are hereby expressly disclaimed. In no event shall The Highway Safety Group be liable to any person or business entity for any special, direct, indirect, punitive, incidental or consequential

damages arising out of or in connection with the use of EyeAlert™ product, including, without limitation, any lost profits or business interruption even if The Highway Safety Group has been specifically advised of the possibility of such damages whether based on contract, tort, strict liability or otherwise. Because some states do not allow the exclusion or limitation of liability for consequential or incidental damages, the above limitation may not apply to you.

EA410: Made In the USA and China

for the Highway Safety Group of LumeWay Products Inc.

Booklet: Printed in USA