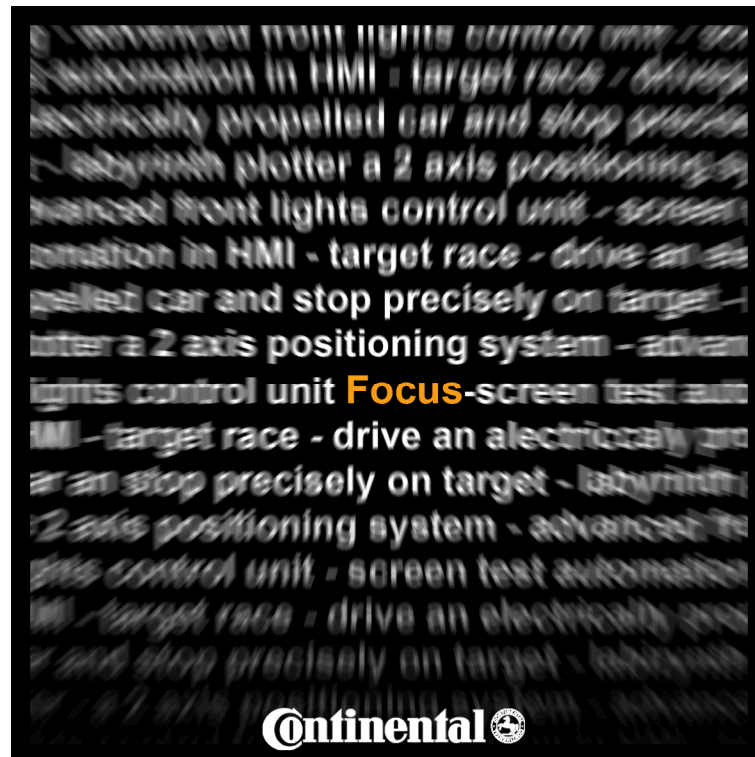




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Ediția a 5-a, **16 Aprilie 2011**



Advanced Front Lights Control Unit

Purpose:

The purpose of this document is to describe the Advanced Front Lights Control – feature at a comparable scale with the adaptive headlights present on a car nowadays on the market.



1. System composition

- 2 LED Matrix with 54LEDs each
- 2 stepper motors
- 2 potentiometers (1 for bending, 1 for leveling)
- 1 three way switch (OFF/Low Beam/High Beam)
- 2 LEDs (indicators for Low/High Beam ON)

2. System Blocks description

- 2 LED Matrix with 54 LEDs each
 - Each LED Matrix represents the headlamp of the car (1 for right, 1 for left)
 - Each LED Matrix is split in 2 as follows:
 1. bottom part for low beam/upper part for high beam
 2. by column, starting from left to right, and from right to left, depending on the potentiometer circular movement the light stream should move accordingly (cornering effect)
- 2 stepper motors
 - Move the complete LED Matrix according to the potentiometer (bending effect)
- 1 potentiometer
 - replacing the steering wheel
 - responsible for LED Matrix movement

3. System Functionality description

- Low Beam – obtained by turning ON the lower half of the LED Matrix (Fig. 1)

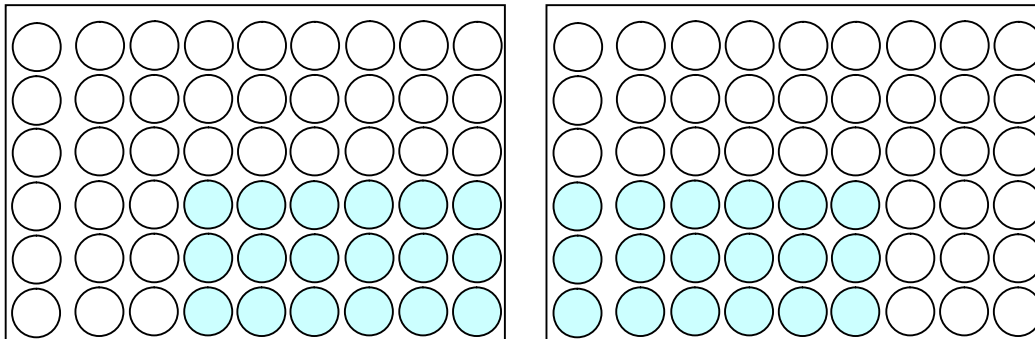


Fig. 1 – Low Beam ON

- High Beam – obtained by turning ON the upper half of the LED Matrix (Fig. 2)

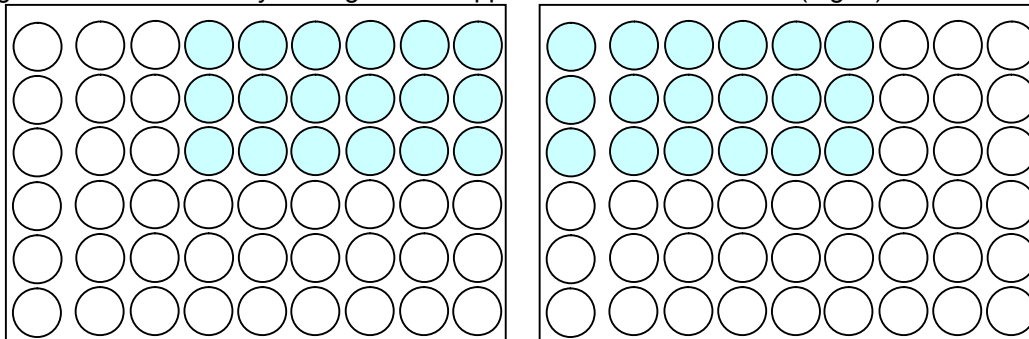
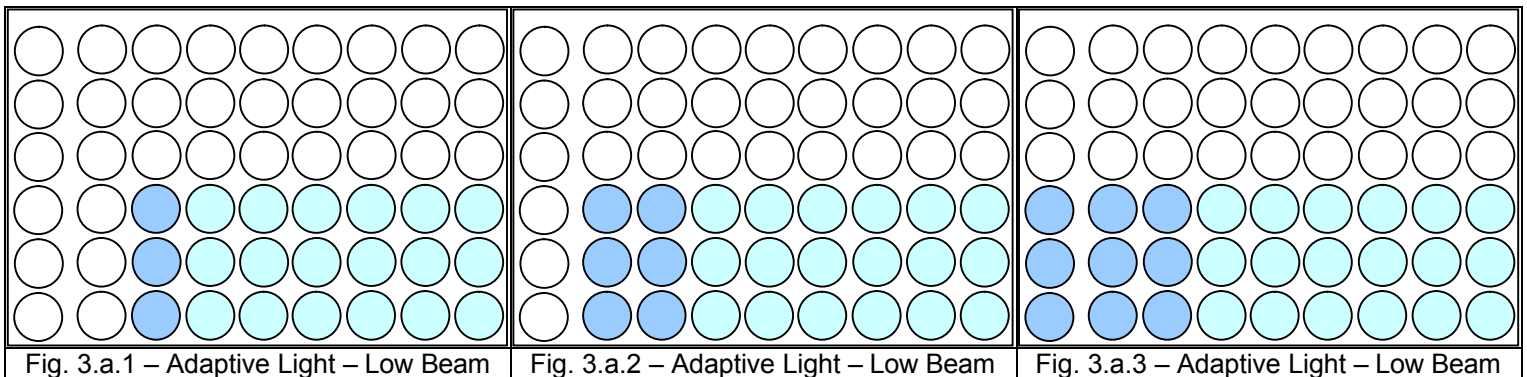
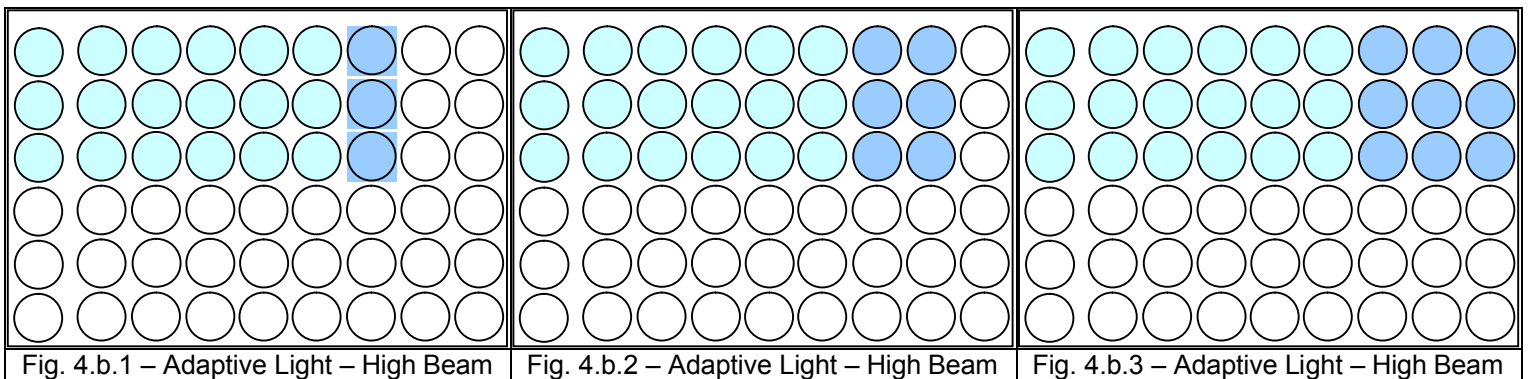
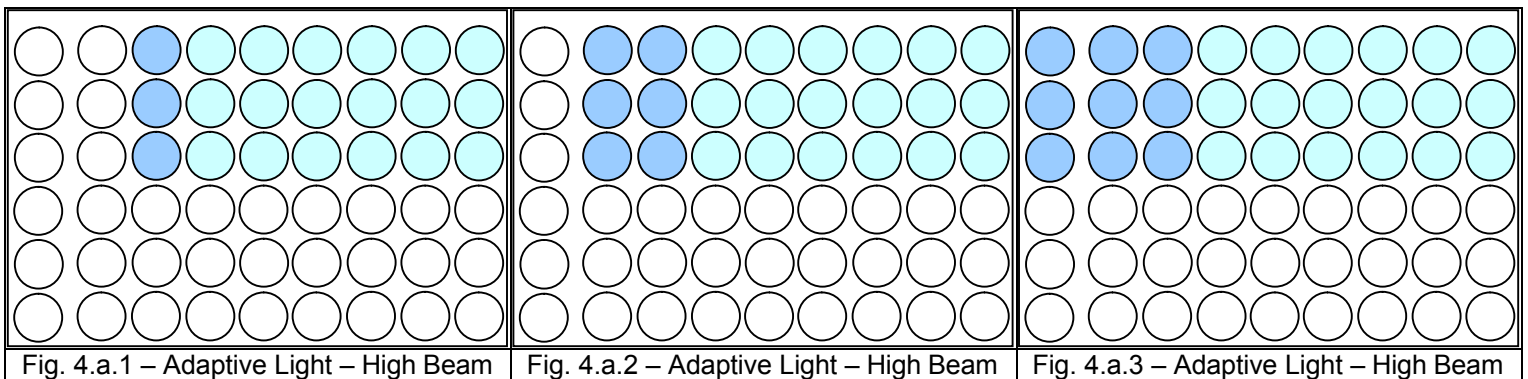
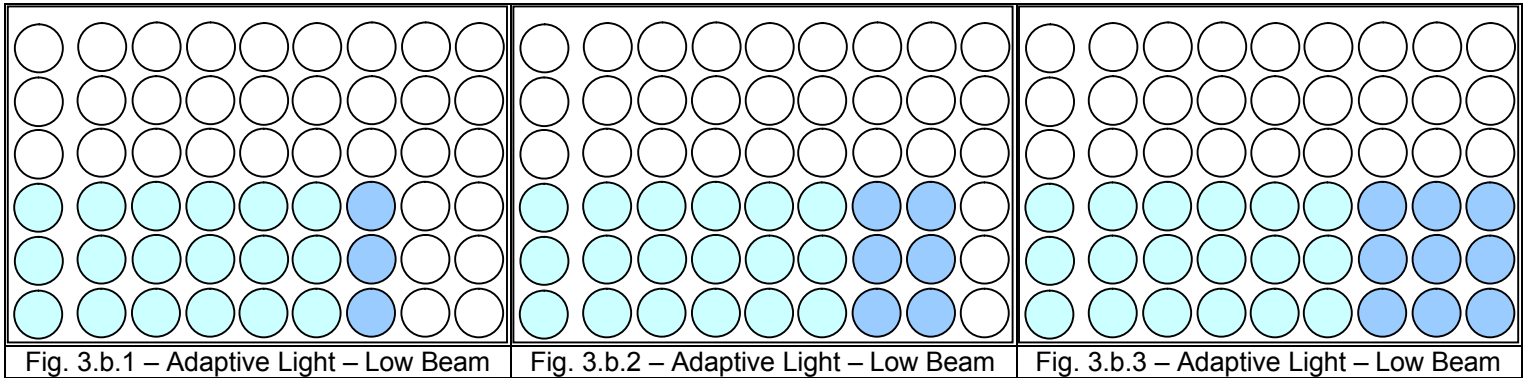


Fig. 2 – High Beam ON

- Bending
 - obtained by turning consecutively 2 columns of the LED Matrix (for complete right the last two LED columns are turned ON, and while moving towards Left the Potentiometer, the next 1 LED column is turned ON, while the first (towards right) LED column is turned OFF. (Fig. 3 & 4)





4. SW Requirements

SW Architecture should be built in a modular way, with interfaces clearly defined.

Application

- Cluster Display (Red LED = Lights OFF, Green LED = Low Beam ON, Blue LED = High Beam ON)
- Application Statemachine
 - o Low Beam
 - o High Beam
 - o Bending
 - o Leveling
 - o Diagnosis Manager
 - o Parameters Manager



- Middle/HW Layer
- Switch handling

Drivers

- LED Driver
- Motor Driver

5. HW description

- System is supplied on 12V battery of the car and is fully functional between 6 up to 18V
- Leveling system is fully functional between 9 up to 16V. Outside those values it will maintain latest position.
- For every switch position (different from Switch OFF) it is allowed a initialization of the leveling and cornering system. After initialization the system has to operate normally according to the status of the 2 potentiometers
- All system output should be protected against short circuit and overload and should operate normally after removing the short circuit/overload
- System has to withstand reverse polarity on supply voltages without damages. No functionality is required to operate
- System has to withstand voltages up to 28V for 3 minutes. No functionality is required to operate
- Current through LED has to be limited and adjusted with the LED temperature in order not to generate color temperature deviations on LED light

6. Ranking

- Red/Green LED (low/high beam ON/OFF) works
- Low/High Beam ON/OFF works
- Leveling works
- Bending works
- Diagnosis works
- Parameterization works
- Communication on LIN
- Overvoltage works (28V for 3 minutes)
- Reverse polarity works