

## LUCAS LIGHTING: PREFIXES USED

LFB***	Fog Lamps
LKB***	Signal Lamp Lenses, Rear Lamp Lenses
LPB***	Signal Lamps, Rear Lamps
LPC***	Rear Lamps
LPS***	Signal Lamps, Rear Lamps
LSB***	Headlamp Lenses
LUB***	Light Units
LWB***	Headlamps
LWC***	Headlamps
SB****	Sealed Beams



# Lighting

Fact Pack

## HID

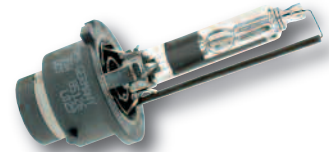
### High Intensity Discharge

- HID systems provide 200% more light on the road than a standard halogen bulb
- HID light can be used for low beam and high beam driving using an electromagnetic actuator to move a shield to switch between them
- The light produced is similar to daylight and is adapted to the natural viewing conditions of the eye
- Requires a wash/wipe system to keep the lenses clean to ensure consistent light distribution
- HID headlamp burners produce between 2,800 and 3,500 lumens (the measure of light output) from between 35 and 85 watts at 12.8 volts (standard halogen bulbs produce between 700 and 2,100 lumens using 40 to 72 watts)

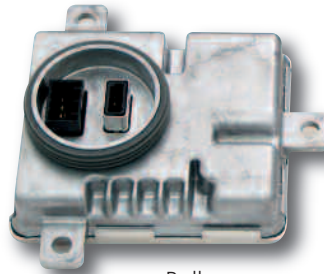
- HID bulbs are either designated "S" burners or "R" burners –
  - "S" burners have a plain glass shield and are used in projector type optics
  - "R" burners are designed for reflector type optics and have an opaque mask on certain parts of the shield to create the cut off boundary near the top of the low beam



"S" burner



"R" burner



Ballast



HID Cable

## DRL

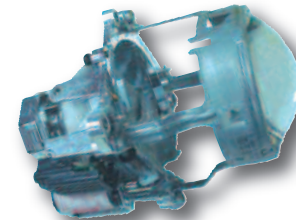
### Daylight Running Lamp

- DRL provides a constant light source
- DRL solutions come in different forms, from a simple bulb to innovative LED technology
- Since Feb 2011 all homologised lamps have had to be equipped with DRL
- Research shows DRL can contribute to a reduction in the number of accidents
- Use of side light as DRL:
  - **Advantages** - No additional reflector required, can be used on current vehicles that do not have a dedicated DRL
  - **Disadvantages** - Bulbs need to have a longer life due to higher energy consumption
- Integration of dedicated DRL:
  - **Advantages** – Special DRL lamps use less energy, conform to ECE regulations and have no effects on low beam lifetime
  - **Disadvantages** – Additional design required to accommodate DRL



## Polyellipsoidal Projector Lamps

- Enables headlamps to be more compact without the need for complex form reflectors
- The light source sits behind a condenser lens (looks like a magnifying glass). Between the lens and the light source is a plate or shield that is cut at an angle; this provides the low beam cut off and the 15 degree angle of kick up to the pavement side
- Some shields use a solenoid to pivot the shield to create a high beam, this system is called BiXenon or BiHalogen depending on which light source is used
- Later versions of the condenser lens also allow some light to be directed upwards to illuminate traffic signs



## LED

### Light Emitting Diodes

- LED is based on semiconductor technology; light is emitted directly out of the semiconductor when a forward voltage is applied
- Advantages of LED
  - The lifetime of an LED bulb can be up to 100,000 hours
  - Lower energy consumption is achieved due to the efficient conversion of electrical power
  - Within rear lamp applications, the response time, due to faster turn on times, is 0.2 seconds quicker than for standard incandescent bulbs, which equates to an extra 19 feet of response time when travelling at 65mph
- Disadvantages of LED
  - LEDs in headlamps have been in development for some time, but there are some limiting factors preventing mass production including high cost, regulatory delay and uncertainty and technical issues
  - LEDs produce a significant amount of heat per unit of light output, and this heat is produced at the rear of the LED

- LED lifespan is shortened through heat. To maintain lifespan at high power levels, a heat management system such as a heat sink or cooling fan is required, however these are typically expensive
- In cold weather, ice and snow cannot be melted from the headlamp lens due to the lack of heat produced at the front of the LED, instead it needs to be applied to the front of the lamp through a heat distribution system



## AFS

### Adaptive Front Lighting Systems

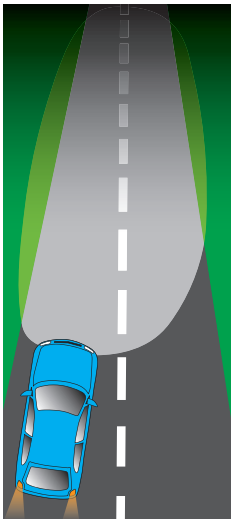


Fig. 1.



Fig. 2.

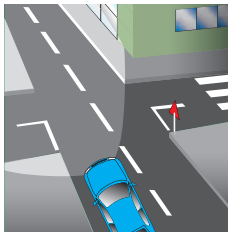


Fig. 3.

- These are adaptive lighting functions that adjust automatically to the course of the road
- **Fig. 1.** When motorway driving, the beam is projected further down the road by actuator motors to improve the illumination range from 130m to 160m
- **Fig. 2.** Dynamic curve – when a vehicle’s steering angle changes, the light of the low beam is swivelled horizontally to effectively look round the bend, providing increased light on the road by up to 70%
- **Fig. 3.** When driving around town at slower speeds, the beam can be enlarged to cover a greater proportion of the verge from 30 to 60 degrees
- Standard low beams can be turned on automatically if the lack of daylight requires it
- For rear lamp systems, a similar package has been put together by engineers:
  - Tail lamp illumination varies between night and day, being brighter at night
  - When braking, the force applied to the brake pedal can illuminate the lamp more brightly, for example under emergency braking an additional light source can be illuminated

## Powerwash

### Headlamp Cleaning Systems

- A powerwash system keeps the headlamp clean
- Headlamps using xenon bulb systems require by law a cleaning system that:
  - Has a water supply that can operate for at least 25 cleaning cycles
  - Has a cleaning efficiency of at least 70% on a soiled headlamp
  - Operates in a temperature range of  $-35^{\circ}\text{C}$  to  $80^{\circ}\text{C}$
  - Is for use up to 84mph
- The wash/wipe system prevents glare to oncoming vehicles by cleaning any dirt that may deflect the path of the light
- The cleaning system can be operated either when the headlamp is switched on, or with the operation of the windscreen cleaning system



## Load Levelling

### Vertical Aim Control

- This system adjusts the height of the headlamp beam
- Since 1998, ECE Regulation 38 states vehicles require adjustment to headlamps according to different loading conditions
- Manual vertical aim: adjustment made from inside the car
- Automatic vertical aim: adjustment made by sensors in the car when illumination on the road decreases dramatically

