

## Tests and Checks for Optronic and Performance Ignition systems

### Introduction

Every year a significant number of Optronic systems are returned to Autocar as faulty which pass all Autocar's tests perfectly and returned to the customer.

Consequently Autocar recommend the following checks are carried out on the ignition system installation before presuming an Optronic system is faulty.

### Identification of Ignition type

There are two main types of Lumenition Optical switching systems - the **Optronic** and **Performance Ignition** system. The easiest way to identify which system you have is the power module colour.

- If the power module is unpainted alloy it's an **Optronic** system.
- If it has a black painted alloy case it's a **Performance Ignition** system which operates in a different way to the Optronic and needs slightly different testing.

### Identification of Optronic Power Module type *(i.e. is it the current Mk17 or the earlier Mk16)*

#### PLEASE NOTE:

The **Optronic** system has been manufactured for well over 35 years. Replacement parts are available for the current Mk17 design first manufactured in 1983 but it says a lot for the quality of the **Optronic** system that Autocar still receive requests to test Mk16 systems still in use after 25 years!!!

The Optronic power modules have a plastic insert holding in place the wires exiting the casing.

- If that insert is made of White plastic, it is a Mk17 module and replacements are available.
- If the insert is made of Red or Black plastic, it is a Mk16 (or earlier) power module and replacements are **NOT** available.

It is also not possible to use a Mk16 optical switch with a Mk17 power module and vice versa, so if a Mk16 optical switch or power module fails a complete new **Optronic** system will be required.

This issue does not apply to **Performance Ignition system** power modules or optical switches for which spare parts are available for all models.

### General Installation Check for all systems

The quality of connection of the power module's Black wire to vehicle Earth is very important. Check you have a good, low resistance vehicle earth to the negative terminal of the battery – If in doubt test by temporarily connecting a wire directly from the Black wire to the negative terminal of the battery and checking if the situation has improved. It may help if the black wire is connected to vehicle earth with a separate nut, bolt and locking washer where the paint has been scraped to bare metal.

It is also a good idea to check the battery-to-chassis and chassis-to-engine earthing straps are sound and in good condition.

The power feed from the Ignition switch to the Red wire of the Power module should be checked in a similar manner.

If the unit is an **Optronic system** check that the three pin socket on the power module is making a good connection to the pins on the optical switch. To check this uncouple the connector and if necessary close up slightly the sockets on the power module connector with a sharp instrument and make sure the pins are gripped tightly.

Make sure your ignition leads are fully suppressed, are in good order and that the rotor arm and distributor cap are clean and working effectively.

### **Power Module Check - General**

If all of the above check OK and the symptoms persist, check the power module can spark the coil (the power modules usually either work every time or never work again, so an intermittent problem is unlikely to be caused by a power module fault).

The easiest method of checking power modules is as follows:

Unplug the king lead from the distributor cap and hold it close to the engine block so it can spark to earth. Unplug the optical switch from the power module and turn on the ignition. In the connector attached to the power module join together the blue and the black wires with a piece of wire several times in quick succession. The coil should fire a spark each time the wires are joined (for the Performance power module it will fire each time the wires are joined after the first time).

If there is no spark check the power and earth connections and re-test. If there is still no spark it is possible that the coil has failed. Substitute a known working coil and retest (make sure the coil has a resistance of about 3 ohms across the primary terminals including the ballast resistor if one is fitted).

If there is still no spark it is likely the power module has failed and needs to be replaced. Power modules cannot be repaired and a part number PMAZ should be ordered from your dealer.

### **Power Module Check – Performance Ignition system**

The Black coated power module for the **Performance Ignition System** – the constant energy module or CEM - works differently from the **Optronic** Power module. Unlike the Optronic power module the CEM is affected by electromagnetic interference (EMI) and **MUST** be used with fully suppressed ignition leads. Copper leads or leads using just suppressed caps are NOT be suitable for this system.

Excessive EMI within the engine bay (and ignition leads are not the only potential source) will cause the CEM to miss-operate. The symptoms of this might include poor running through miss-timed ignition events, coil overload through increased dwell angle or premature failure of the CEM.

### **Optical switch issues and testing**

On **first fitting** if during normal running or under acceleration the spark is irregular **or has become irregular after being re-timed** (see sections 3 to 6 below) it is possible the optical switch and chopper are not in phase with the rotor and/or the distributor cap. There can be several reasons for this:

#### **1. The optical switch has been installed in the wrong position.**

- Re-check the fitting instructions and make sure they have been followed correctly. On fitting kits which contain a full replacement baseplate or advance plate, make sure that has also been installed in accordance with the instructions.

**2. The wrong fitting kit has been installed for the fitted distributor.**

- Check the distributor model actually fitted to your vehicle is the distributor identified in the Optronic vehicle application list
- Check the fitting kit used to install the optical switch is the one identified for the fitted distributor in the Optronic application list.

**3. The wrong distributor cap or rotor arm has been fitted and is out of phase with the rotor position when the spark is generated.**

- Some models of distributor can be used with either clockwise or anti-clockwise rotation, depending on the vehicle on which they are fitted. Different distributor caps are required for each direction of rotation and whilst the wrong cap will appear to fit the distributor, the position of the plug turrets will be different and out of phase with the rotor arm. It is important you check you have the correct cap for the distributor model as fitted on your vehicle. If unsure you can check the phasing by using the phase check method detailed in paragraph 4 below.
- Rotor arm phasing can vary in a similar way and you must make sure the correct model of rotor arm has been fitted.

**4. The distributor has a vernier adjustment on the vacuum advance plate and static timing has been carried out with the vernier fully adjusted to one end of the scale.**

- Using a vernier adjuster on a vacuum advance plate changes the phasing between the optical switch and the rotor arm. If the Vernier screw is fully adjusted before static timing takes place, at speed or on acceleration the rotor arm may be too far away from the distributor cap plug turret for the spark to jump to the plug lead when the coil fires. Under this condition the spark may jump straight to vehicle earth causing a miss-fire.

**Phase Check Method**

- To check the rotor arm phasing, set up the Optronic for static timing as described in the installation leaflet. Mark the mid-point of the rotor arm on the outside of the distributor body. Replace the cap and check that the mark is directly opposite a plug lead turret on the distributor cap.
- If it is not, turn the Vernier screw to the middle of its adjustment, repeat static timing by loosening off the distributor retaining bolt and rotating the body of the distributor. Re-check the rotor arm phasing.

**5. The distributor has been assembled with parts from other distributor models which has altered the phasing between the rotor and the distributor cap.**

- This may include the rotor arm, distributor cap or distributor cam shaft. A way to check this is by substituting a distributor with the same model from another vehicle.

**6. The Optical Switch is not working effectively.**

- This is covered below under optical switch testing.

**Optical Switch Testing**

**NOTE: The following guidance presumes all the above checks have been performed first !**

If the Power module is sparking the coil as identified under "Power Module Check" above, reconnect the optical switch, rotate the distributor until the optical switch beam is not obscured by the chopper blade and with the ignition switched on break the beam rapidly several times with a good size piece of card or other opaque material. If the coil doesn't spark at all it is likely the optical switch has failed and the unit will need to be replaced.

### Intermittent Spark problems

Intermittent ignition failure is not likely to be caused by a failing power module (they tend to either work perfectly or never work again) but it **can** be due to a failing optical switch **but please be aware this is not a common problem** and similar symptoms can be due to:

1. Intermittent operation of a **failing ignition coil** where the heating and cooling of the coil in normal use can induce intermittent operation. If possible substitute another known working coil (if only for testing) and see if the problem clears.
2. **Intermittent connections in the earthing or power wiring** (including a failing ignition switch) or in the optical switch to power module connector. Please see "General Installation Check for all systems" above for the tests and checks to be performed to eliminate these issues.
3. **Intermittent connection of wires within the sheath.** This is more of an issue for the very flexible, loosely twisted wires from the optical switch which are more likely to break if the wire is pulled hard or trapped between the distributor and the cap. it can also be caused by the vacuum advance and retard pulling on wires inside the cap because they have been too tightly routed around the base plate. Test for broken wires by starting the engine and moving the wires around to see if you can induce irregular running or make the engine stop.

There is a *possibility* that the optical switch is failing. If it is there will be a very definite pattern to the intermittency which will be as follows:

- The ignition system works perfectly when the engine is cold but misfires or stalls as the optical switch is heated by the rising engine temperature. If the engine is stopped and left to cool for a few minutes (also cooling the optical switch) the engine will start and run perfectly but fail again a few minutes later when the distributor re-heats the optical switch – and so on.

No repairs can be made to Optical Switches and replacement will be necessary. If the optical switch is currently connected to a Mk16 power module (or an earlier version - see above for identification) a replacement optical switch is not available and a complete replacement Optronic system will be required.

### In Conclusion

If after all the above checks have been done you have not cured or satisfactorily identified a problem the complete system can be returned to Autocar for testing.

If the unit is within warranty return the components to the shop where you bought them. The dealer will then deal with us directly to determine any fault and the resolution.

If the unit is out of warranty you may return the units directly to Autocar Electrical Equipment Co. Ltd. There is a service charge for testing and return of the unit to an address in the UK. Return of the unit overseas or to outlying parts of the UK will be charged at a higher rate depending on carriage costs.

### Optronic Ignition Systems

A BRITISH INVENTION

*Manufactured by*

**LUMENITION**

A Division of Autocar Equipment Ltd.

49-51 Tiverton St. London SE1 6NZ England

Parent Nos. 1219833. 1252324. 1252559. 1279385. 1330453 1410782. 1417857. 1420814, 1437770.

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