

## Technical Note No 1

# ELECTROMAGNETIC COMPATIBILITY (EMC) - e mark and AES5

### Why be concerned about Electromagnetic Compatibility?

Automotive vehicle designers are incorporating increasing numbers of electronic systems in their products.

All electronic systems can produce an electromagnetic (EM) field. The design of a piece of equipment must limit the size of the EM field produced. Failure to limit this field may cause it to interfere with other equipment nearby and cause a malfunction. Since EM fields may be generated by systems both inside and outside the vehicle the systems must also function without error when operating in an EM field.

The use of electronic control units (ECU) in such safety critical areas as engine and power train management, anti-lock brakes, suspension control systems, vehicle lighting and direction indicators, creates potentially serious situations due to the possible effects of electromagnetic interference (EMI) from or to these units, as well as any communication equipment. Therefore, establishing electromagnetic compatibility (EMC) within the vehicle is essential.

Whilst EMC is important in many areas it is particularly relevant for electronic equipment in automotive vehicles both because their systems have to be located very close to each other and because of the potentially devastating risk of harm to people and property if vehicle systems fail.

### How can we ensure that our vehicles are not adversely affected?

This is where the e mark comes in.

An e mark is awarded to cars and equipment which has been tested to ensure that they do not give off emissions which will adversely affect other approved equipment. The testing must be carried out by an approved test house under conditions laid down by the EC in Directive 95/54. This directive also creates an appropriate method of testing for immunity to harmful emissions.

Vehicle manufacturers test the design of the electronic systems fitted in their factories. For each system they check that both the EM field produced is within specified limits and that the system can operate properly within an EM field. It is required by European law that all "after market" electronic equipment fitted to vehicles must undergo the same test that the vehicle manufacturer uses. If a system meets the requirements of the tests it is awarded a number which starts with "e". The test has therefore become known in the UK as the e mark test.

### If equipment has an e mark, why do we need AES5 as well?

AES5 is a UK specific test designed to discover if equipment will adversely affect, or be affected by, radios operating within the frequencies used by Police Forces and Fire Brigades. This is a separate test to e mark; it is only applied to those limited frequencies but it is much more rigorous than e mark. Being unable to receive and/or transmit clear instructions or requests could have very serious implications for the Health and Safety of both the users and the public they serve.

## **AES5 Certificates are only valid for two years - why?**

AES5 is an evolving test which has now (Nov. 2004) reached Issue 9. An example of its development is that Issue 8 required testing only in the relevant UHF and VHF frequencies. Issue 9 requires additional testing in the Airwave frequencies. If AES5 Certificates were valid for an unlimited period there would be no need for manufacturers and suppliers to update equipment in line with changing Police and Fire needs. Airwave is the United Kingdom's TETRA provider and operates at the same frequencies as European Emergency Service TETRA and TETRAPOL networks.

## **e mark tests result in either a full pass or failure - why is AES5 different?**

Some equipment submitted for AES5 testing will only be applicable to certain users, for example a Traffic Law Enforcement Speed Recording Video Device. It is unreasonable to demand that equipment does not conflict with radios using frequencies which it will not meet in practice. A Class 1 Pass at AES5 means that the equipment may be used with all Police and Fire frequencies covered by that Issue without question.

## **Can I get interference on my radio even if the equipment installed is certified to both e mark and AES5?**

Yes. One way might be that the equipment does not have a Class 1 Pass at AES5 and you are unfortunate enough to use a radio frequency, or frequencies, which clash with the equipment. Another explanation could be the physical installation of the equipment or the radio, including any wiring. A&ES (Automotive & Engineering Section) are able to give advice regarding installation if requested by Police or Fire personnel.

## **Where can I go to get more detailed help?**

Microbus are experts in EMC when applied to computer terminals. For further information, including testing and installation advice, they may be able to direct you to a relevant contact. You can of course find information on Directive EC 95/54 on the web and for information on AES5 you can contact the Automotive & Engineering Section, Communications Directorate of the Police Information Technology Organisation at PITO's London Headquarters.



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