

Loss Prevention Standard

LPS 1257: Issue 1.1

Requirements and testing procedures for radio linked fire detection and fire alarm equipment

The purpose of this standard is to ensure that fire detection and fire alarm system components using short range radio link communication facilities have adequate reliability and are suitable for use in systems complying with BS 5839-1:2002.

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PARTICIPATING ORGANISATIONS

This standard was approved by the LPC Fire and Security Board.

The following organisations participated in the preparation of this standard:-

Association of British Insurers / Lloyd's
Association of Chief Police Officers
Association for Specialist Fire Protection
British Fire Protection Systems Association
British Security Industry Association
Chief Fire Officers' Association
Door & Hardware Federation
Electrical Contractors Association
Health & Safety Executive
Risk Engineering Data Exchange Group
Royal Institution of Chartered Surveyors

REVISION OF LOSS PREVENTION STANDARDS

Loss Prevention Standards will be revised by issue of revised editions or amendments. Details will be posted on our website at www.redbooklive.com

Technical or other changes which affect the requirements for the approval or certification of the product or service will result in a new issue. Minor or administrative changes (e.g. corrections of spelling and typographical errors, changes to address and copyright details, the addition of notes for clarification etc.) may be made as amendments. (See amendments table on page 17)

The issue number will be given in decimal format with the integer part giving the issue number and the fractional part giving the number of amendments (e.g. Issue 3.2 indicates that the document is at Issue 3 with 2 amendments).

USERS OF LOSS PREVENTION STANDARDS SHOULD ENSURE THAT THEY POSSESS THE LATEST ISSUE AND ALL AMENDMENTS.

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FOREWORD

This standard identifies the evaluation and testing practices undertaken by LPCB for the purposes of approval and listing of products. LPCB listing of products and services for inclusion in the “Red Book” is based on the following:

- i. Satisfactory product performance during testing and audit testing by LPCB
- ii. Satisfactory product construction
- iii. Satisfactory system installation
- iv. Satisfactory manufacturing processes
- v. Satisfactory product or system service experience
- vi. Satisfactory verification by the LPCB of the establishment and maintenance of the manufacturer’s or service provider’s quality management systems

Further information concerning the requirements and procedures for obtaining LPCB certification of fire detection and alarm system components are given in LPCB Scheme Documents.

NOTES

Compliance with this LPS does not of itself confer immunity from legal obligations. Users of LPSs should ensure that they possess the latest issue and all amendments.

LPCB welcomes comments of a technical or editorial nature and these should be addressed to “the Technical Director” at enquiries@breglobal.co.uk.

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Listed products and services appear in the LPCB “List of Approved Products and Services” which may be viewed on our website: www.redbooklive.com or by downloading the LPCB Red Book App from the App Store (for iPhone and iPad), from Google Play (for Android devices) or from the Windows Store (for Windows 8 Phones and Tablets from 2014).

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1 INTRODUCTION

This document has been prepared to allow the evaluation of the fire detection and alarm equipment with radio link technology and the integrity and performance of the radio transmission link.

2 SCOPE

This standard specifies requirements and testing procedures for the LPCB certification and listing of fire detection and alarm system components that incorporate short range radio link technology, for use in fire detection and fire alarm systems for buildings in accordance to BS 5839-1:2002.

The fire detection and alarm systems components shall also comply with the appropriate published EN standards or LPS standards unless otherwise stated within this standard.

Note: It is anticipated that this standard will be superseded by the harmonised EN standard once it is published and BS 5839-1:2002 updated to take account of it..

3 DEFINITIONS

For the purposes of this standard, the following definitions and those given in EN 54-1:1996 and EN 54-2:1997 apply:

3.1 Radio Linked System

A system employing radio signalling to transmit signals between input devices, output devices and control and indicating equipment of a fire detection and fire alarm system.

The radio linked system may form the whole fire detection and fire alarm system or be part of a larger wired system.

3.2 Device

A uniquely identified component of the radio linked system which occupies a location/address on the radio linked system i.e. a detector, manual call point, sounder or input/output device.

3.3 Input Device

A device which monitors changes in physical phenomena, switches or inputs and reports such changes via a radio and/or hard wired link to the CIE, e.g. a detector or call-point.

3.4 Output Device

A device which when commanded by the CIE will change the state of an output, e.g. a sounder.

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3.5 **Supervisory Transmission**

A signal transmitted periodically to confirm the active presence of radio linked devices in the system.

3.6 **Tamper Condition**

The unauthorised or accidental removal of a device from its mounting surface, separation from a mounting base or separation of a device from its radio interface.

3.7 **Low Power Condition**

A low power condition is defined as when power sources in a device cannot support that device for at least 30 days of normal operation followed by 30 minutes in an alarm condition.

Note: The low power condition is intended as a maintenance warning and is different and separate from a fault condition. If no action is taken as a result of the low power warning and the battery capacity falls to a dangerously low point then a fault warning has to be given as specified in 4.5.7.

3.8 **Radio Relay Unit**

A radio linked device used to extend the radio range of a system by receiving signals from one or more remote transmitters and re-transmitting the signals to reach the intended receiver.

3.9 **Radio Part**

A component or part of a component incorporating the radio receiver and/or transmitter including the associated power supply, e.g. non rechargeable power source.

4 **REQUIREMENTS**

4.1 **General requirements for devices other than control and indicating equipment (CIE)**

In order to comply with this standard, the following products shall comply with the relevant standards as listed below, except where specified otherwise within this standard.

EN 54-3:2001	Fire alarm devices - Sounders
EN 54-5:2000	Heat detectors - point detectors
EN 54-7:2000	Smoke detectors - point detectors - using scattered light, transmitted light or ionization
EN 54-10:2002	Flame detectors - Point detectors
EN 54-11:2001	Manual call points
EN 54-12:2002	Smoke detectors - line detectors using an optical light beam
CEA 4021:2003	Multi-sensor detectors, which respond to smoke and heat, and smoke detectors with more than one smoke sensor
CEA 4022:	1999Aspirating smoke detectors
LPS 1265:2003	Carbon Monoxide fire detectors using electrochemical cells
LPS 1275:2005	Carbon Monoxide / Heat Multisensor Fire Detectors Using Electrochemical Cells

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4.2 Individual alarm indication

Each detector shall be provided with an integral red visual alarm indicator meeting the requirements of the relevant standard except that the indication may reset after 20 minutes.

4.3 Power supplies for devices other than CIE

Note: Where compliance with the following requirements cannot be practically tested, the manufacturer shall provide documentary evidence to demonstrate that the requirements can be met. This may be by calculations and/or statistical analysis of the performance of the device, where the load in normal operation shall take account of quiescent running with supervisory signalling and the required routine system testing. The operating currents under the claimed conditions should be verified by measurement.

4.3.1 The power for devices shall be supplied from at least 2 independent power sources. Each power source shall be capable of powering the device, in the event of the failure of the other source, for a minimum of 7 days normal operation followed by 30 minutes in the alarm condition. Any power supply using the mains as a power source shall comply with EN 54-4:1997.

4.3.2 The condition of each power source shall be monitored such that a fault signal is transmitted to the CIE within 15 minutes of the failure or disconnection of either one of the power sources.

4.3.3 Where the normal power supply is provided by batteries, a low power warning shall be generated before the batteries are discharged to a point where they can supply the device for 30 days normal operation followed by 30 minutes in the alarm condition.

4.3.4 Where the normal power supply is provided by batteries, the power supply shall have sufficient capacity to provide a minimum, normal operation life of three years over the range of +15°C to 35°C before the low battery condition is reached.

Note: If, in addition, a device is specified to operate in a wider temperature range than this, the battery lifetime within the specified temperature range shall be clearly stated in the technical data and supporting evidence shall be presented.

4.3.5 No condition of the power sources, including the condition during the period while the battery is becoming fully discharged, shall cause the transmitter or receiver to interfere with the transmission from any other device.

4.3.6 The transmission of the low power condition shall not take priority over the transmission of the fire, transmission or reception of command signals or tamper conditions. During a low power condition, the low power signal may be transmitted in lieu of the supervisory transmission.

4.3.7 If the radio part of the device is powered independently from the rest of the device, then its power supply shall meet all the requirements specified in 4.3.1 to 4.3.6. At least one power source shall be integral to the radio part.

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4.4 General requirements for Control and Indicating Equipment (CIE)

In order to comply with this standard, the following products shall comply with the relevant standards as listed below except where specified otherwise within this standard:

- EN 54-2:1997 Control and indicating equipment
- EN 54-4:1997 Power supply equipment

In addition to the requirements of EN 54-2:1997, Clause 7.1, the transmission, reception and processing of signals from manual call points shall be such that the CIE shall enter the fire alarm condition and transmit the signals required to trigger the appropriate fire alarm devices within 3 s of the operation of a manual call point.

Note: This additional requirement is required to meet BS 5839-1:2002, Clause 20.2 b).

The CIE may have provision for the automatic silencing of radio linked fire alarm devices after a period of at least 30 minutes in order to comply with BS 5839-1:2002, Clause 16.2.1 h). If provided, the configuration of this facility shall be limited to access level 3 and the manufacturer's instructions shall clearly specify how and under what circumstances this facility should be configured.

4.5 Additional requirements for fault indication at the CIE

Fault indications shall be given, as specified in Clause 8.2. of EN 54-2:1997, for the following conditions. The indications shall be separately indicated by LEDs or on an alphanumeric display:

- 4.5.1 The occurrence of a fault that causes the loss of supervisory transmission or interruption of the radio link between any radio linked device and the CIE shall be indicated at the CIE within 2 hours.

Note: This is the maximum time allowed to indicate such a fault. In practice, radio linked devices will normally have to transmit at more frequent intervals to allow for signal redundancy and to meet the requirements of 4.5.4 for small systems.

- 4.5.2 The CIE shall detect and indicate interference to the transmitted signals which may compromise the performance of the fire detection and alarm system. This shall be generated after 30 seconds of continuous interference at the CIE and indicated within 100 seconds. (See clause 4.12)

Note: Testing to clause 4.5.2 should be performed during testing to EMC requirements.

- 4.5.3 If the antenna is mounted externally to the outer housing, then both disconnection of the antenna and the short circuit of the wiring to the antenna shall be indicated at the CIE within 100 seconds.

- 4.5.4 If no valid transmissions are received for a period of 100 seconds, a fault shall be indicated at the CIE within 100 seconds.

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- 4.5.5 A device tamper condition shall be indicated within 100 seconds. It shall be possible to identify the individual device giving rise to the indication at the CIE at access level 2. This event shall remain until a manual operation is carried out at access level 2.
- 4.5.6 The failure of any power supply in a radio linked device shall be indicated within 100 seconds. It shall be possible to identify the individual device giving rise to the indication at the CIE at access level 1.
- 4.5.7 A fault indication shall be given at the CIE before the remaining battery capacity of any radio linked device falls to that equivalent to 7 days of normal operation and 30 minutes of alarm operation. It shall be possible to identify the individual device(s) affected at the CIE at access level 1 or 2. The fault indications for radio linked input devices (e.g. detectors) may be suppressed during the fire alarm condition. However, the fault indications for radio linked output devices (e.g. sounders, beacons or alarm signalling devices) shall not be suppressed during the fire alarm condition.

4.6 Indications of Low Power condition of devices at CIE

- 4.6.1 The CIE shall have provision for the indication of the low power condition of any radio linked devices, which shall be different from the indication of the fault warning condition.
- 4.6.2 Upon receipt of the low power signal from any radio linked device, the low power condition shall be indicated audibly and visually, at access level 1, using a clearly identified LED or an alphanumeric display. It shall be possible to identify the device giving rise to the low power warning condition, at the CIE at access level 2.
- 4.6.3 The low power condition indication may be suppressed during the fire alarm condition.
- 4.6.4 The low power condition indication shall only be cleared at access level 2 and shall be re-established in a period of not less than once in every 24 hours, until the low power condition of all affected devices has been cleared (e.g. by replacing the batteries).
- 4.6.5 The low power condition audible indication shall be capable of being silenced by means of a manual control at access level 1 or 2. This control shall only be used for silencing the audible indication, and may be the same as that used for silencing the audible indication in the fault warning condition.
- 4.6.6 The receipt of low power condition signals alone (i.e. without there also being a fault signal as specified in 4.5.7) shall not result in the CIE entering the fault warning condition.
Note: The CIE may have a low power condition output but this shall be different from the fault output.
- 4.6.7 The low power condition indications required above shall be given for each device that enters the low power condition.

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4.6.8 The indication of multiple low power conditions shall be dealt with as specified in EN 54-2:1997, Clause 8.2.3.

4.7 CIE design requirements

In addition to the requirements specified in EN 54-2:1997, the manufacturer's approval documentation shall also include:

- a) Details of the transmission frequencies used;
- b) Details of the radio signalling protocol;
- c) The radio regulatory Certificates for the equipment.

4.8 Electromagnetic Compatibility (EMC) requirements

The following EMC immunity tests shall be performed as described in EN 50130-4:1995 incorporating Amendments A1:1998 and A2:2003. These are applicable to all fire detection and alarm equipment including any radio transmitters and/or receivers.

Some of the following tests may not be applicable depending on the specific characteristics of the equipment under test (i.e. equipment is not AC mains powered):

- a) Mains supply voltage variations;
- b) Mains supply voltage dips and short interruptions;
- c) Electrostatic discharge;
- d) Radiated electromagnetic fields;
- e) Conducted disturbances induced by electromagnetic fields;
- f) Fast transient burst;
- g) Slow high energy voltage surges.

For the tests stated in 4.8, the criteria for compliance specified in EN 50130-4:1995 shall apply. In addition the equipment under test shall meet the performance requirements after the EMC conditioning, as detailed in the relevant product specific EN 54 specification appropriate to the equipment under test.

4.9 Additional EMC requirements

Equipment for test incorporating short-range radio link devices shall also comply with the EMC standard requirements of EN 301489-3:2000. This provides presumption of conformity of short range radio devices against the essential requirements of 1999/5/EC, the Radio and Telecommunications Terminal Equipment (R&TTE) Directive.

A test report from a UKAS or equivalent accredited laboratory shall be provided as evidence of this. If this evidence of compliance is not available the LPCB reserve the right to perform or subcontract the testing to ensure the equipment under test complies with the above requirements.

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4.10 Radio transmitters and receivers, EMC & Radio Spectrum Matters

Radio transmitters and receivers shall meet the radio spectrum utilization requirements of the R&TTE directive, in accordance with EN 300220-1:2005 and EN 300220-3:2000.

Additionally for radio receivers, the receiver parameters shall comply with the requirements of EN 300 220-2.

A test report from a UKAS or equivalent accredited laboratory shall be provided as evidence. If this evidence of compliance is not available, LPCB reserve the right to perform or subcontract the testing to ensure the equipment under test complies with the above requirements.

4.11 Antennae

4.11.1 Removal of an antenna external to the equipment shall require the use of a special tool or tools.

4.11.2 Any feed cable to an antenna external to the CIE shall be monitored for open or short circuit. (See also 4.5.3)

Note: Any external feed cabling should meet the appropriate requirements of BS 5839-1:2002, Clause 27.2d).

4.12 Detection of interference

The receiving equipment shall be able to detect an interfering signal of an amplitude level high enough to corrupt the correctly transmitted alarm signal, fault, supervisory, low battery condition signal(s) etc.

An interfering signal fault shall be generated after 30 seconds of continuous interference at the receiving equipment and indicated within 100 seconds following this detection.

Test methods to assess the requirements of this Clause are detailed in Annex A.

4.13 Messaging

Within a radio linked system, messages can become altered due to simultaneous or overlapping transmissions or interference. The format and coding of messages within the system shall be designed so that an alarm caused by such alteration of a radio message will occur no more than once in 10 years for the maximum number of radio linked devices that may be connected in accordance with the manufacturer's specification.

Note: Compliance with clause 4.13 cannot be practically tested. The manufacturer shall provide documented evidence to demonstrate that the system meets the requirement. This would normally be a statistical analysis of the system based on details of the message structure and coding. The system size and assumptions on the radio environment shall be clearly stated.

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4.14 Allowance for signal attenuation

Commissioning instructions shall include a procedure to ensure that the signal strength from each installed device is such that correct signalling could occur in the event of a further 12 dB of attenuation of the signal between the device and the CIE, devices and /or additional commissioning equipment.

5 PUBLICATIONS REFERRED TO:

BS 5839-1:2002	Fire detection and fire alarm systems for buildings - Part 1: Code of practice for system design, installation, commissioning and maintenance
EN 54-1:1996	Fire detection and fire alarm systems – Part 1: Introduction
EN 54-2:1997	Fire detection and fire alarm systems – Part 2: Control and indicating equipment
EN 54-3:2001	Fire detection and fire alarm systems – Part 3: Fire alarm devices - sounders
EN 54-4:1997	Fire detection and fire alarm systems – Part 4: Power supply equipment
EN 54-5:2000	Fire detection and fire alarm systems – Part 5: Heat detectors - Point detectors
EN 54-7:2000	Fire detection and fire alarm systems – Part 7: Smoke detectors - Point detectors using scattered light, transmitted light or ionization
EN 54-10:2001	Fire detection and fire alarm systems – Part 10: Flame detectors - Point detectors
EN 54-11:2001	Fire detection and fire alarm systems – Part 11: Manual call points
EN 54-12:2001	Fire detection and fire alarm systems – Part 12: Smoke detectors - Line detectors using an optical light beam
EN 50130-4:1995	Alarm systems. Electromagnetic compatibility. Product family standard: Immunity requirements for components of fire, intruder and social alarm systems. Including A1: 1998 & A2: 2003
EN 301489-3:2000	Electromagnetic compatibility and Radio spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 3: Specific conditions for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 40 GHz
EN 300220-1:2005	Electromagnetic Compatibility and Radio Spectrum Matters (ERM); Short Range Devices (SRD); Radio equipment to be used in the 25 MHz to 1 000 MHz frequency range with power levels ranging up to 500 mW; Part 1: Technical characteristics and test methods
EN 300220-2:2005	Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Radio equipment to be

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	used in the 25 MHz to 1 000 MHz frequency range with power levels ranging up to 500 mW;Part 2: Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive
EN 300220-3:2000	Electromagnetic compatibility and Radio spectrum Matters (ERM);Short Range Devices (SRD);Radio equipment to be used in the 25 MHz to 1 000 MHz frequency range with power levels ranging up to 500 mW;Part 3: Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive
CEA 4021:2003	Specifications for fire detection and fire alarm systems – Requirements and test methods for multisensor detectors, which respond to smoke and heat, and smoke detectors with more than one smoke sensor
CEA 4022:1999	Specifications for fire detection and fire alarm systems – Requirements and test methods for aspirating smoke detectors
LPS1265-1.0:2004	Requirements and Testing Procedures for the LPCB Approval and Listing of Carbon Monoxide Fire Detectors Using Electrochemical Cells

For undated references please refer to the latest published issue.

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Annex A – Test methods for detection of interference.

Reference level determination (RL)

The reference level RL of the receiving equipment under test shall be determined and used for the detection of interference test.

This measurement is to be conducted with the arrangement shown in Figure 1, in a shielded anechoic chamber allowing tests to be carried out with a distance of 3 metres between transmitting and receiving equipment.

The arrangement shown in Figure 1 shall be used but the signal generator shall be replaced by a suitable load.

The RL level determination shall be performed twice, once with the antenna positioned horizontally and the second with the antenna positioned vertically. The smallest reference level indicates the position of the antenna to be used for the subsequent detection of interference test. The receiving equipment shall be oriented for maximum sensitivity.

To determine the reference level, the attenuation should be increased until 5 or more alarm or fault messages out of 20 generated by the transmitting equipment are not received by the receiving equipment under test.

The reference level is the value observed on the spectrum analyser measured in dBm increased by 3 dB.

EXAMPLE : Value observed on the spectrum analyser is - 80 dBm

Reference level is $RL = -80 \text{ dBm} + 3 \text{ dB} = -77 \text{ dBm}$

The test procedure shall be repeated for each receiving equipment forming part of the considered RF link.

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Test arrangement for receiver

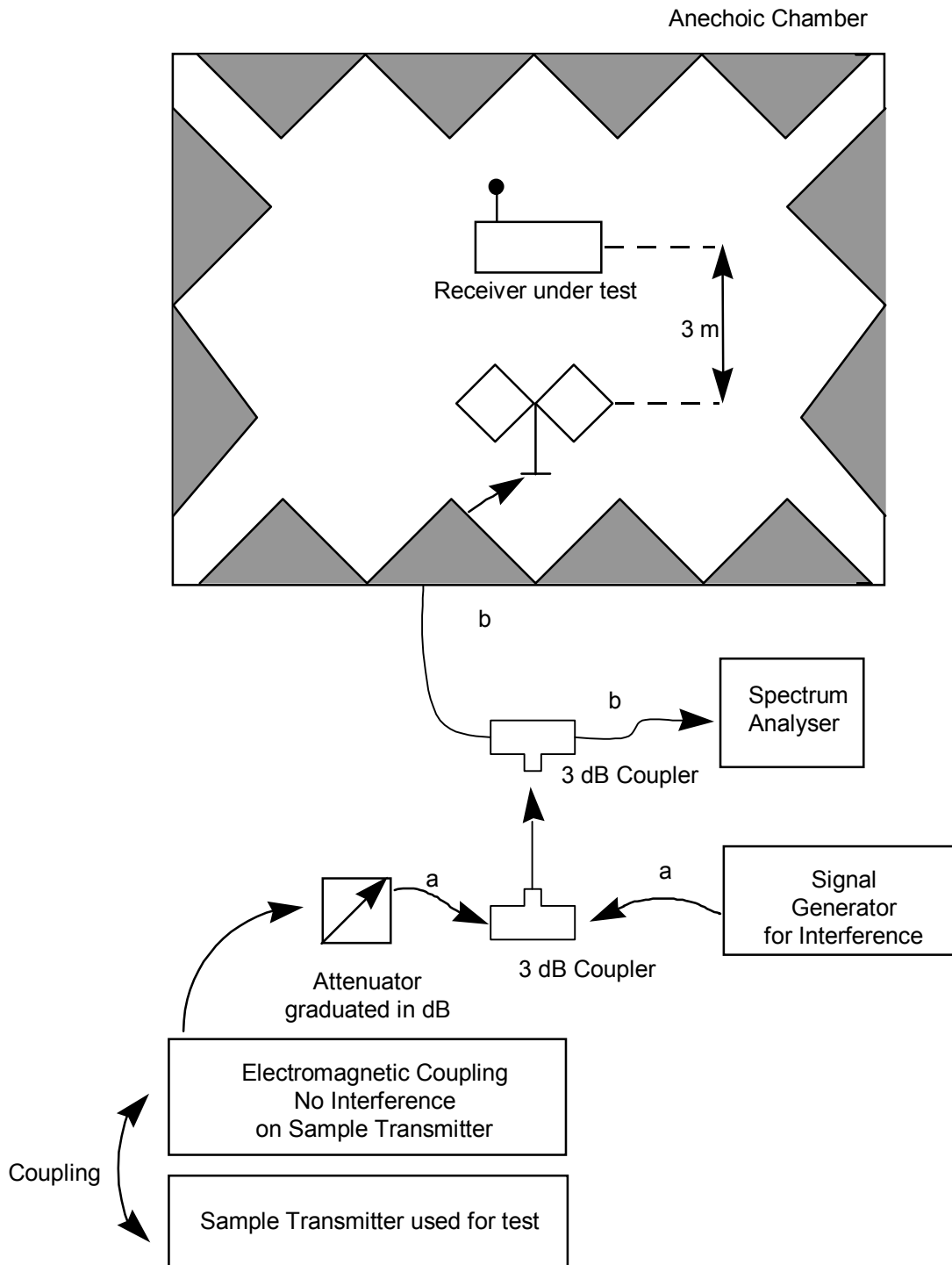


Figure 1

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Test for detection of interference

The manufacturer shall provide modified transmitting equipment (named the interfering equipment) for test purposes which shall be capable of continuous transmission using the same transmission protocol as that used by the receiving equipment under test. This interfering equipment shall use a different identification code so that it shall not normally be recognised by the receiving equipment. In addition, for equipment using more than one frequency, the interfering equipment shall allow a simultaneous transmission of all the frequencies used during the interference test or shall be fully synchronised on the frequency sequence of the standard transmitting equipment.

The equipment shall be arranged as shown in Figure 2 in a shielded anechoic chamber with a distance of 3 metres between transmitting and receiving equipment.

The RF signal strength level between the transmitting equipment and receiving equipment under test shall be established at the lowest Reference Level RL determined earlier, for the RF link being evaluated. The attenuation of the wanted transmission signal should be reduced until the observed signal level on the spectrum analyser is $RL + 20dB$.

The level of interference generated by the interfering transmitting equipment should now be increased until 5 or more alarm messages out of 20 generated by the standard transmitting equipment are not received by the receiving equipment.

This is the interference level (IL) of the interfering equipment, measured on the spectrum analyser and called level IL.

The transmission of the standard transmitting equipment (wanted signal) shall be stopped and the interference level IL generated by the interfering equipment shall be increased by 30dB (i.e. $IL+30dB$).

Verify the detection of interference in accordance with the requirements of Section 4.13.

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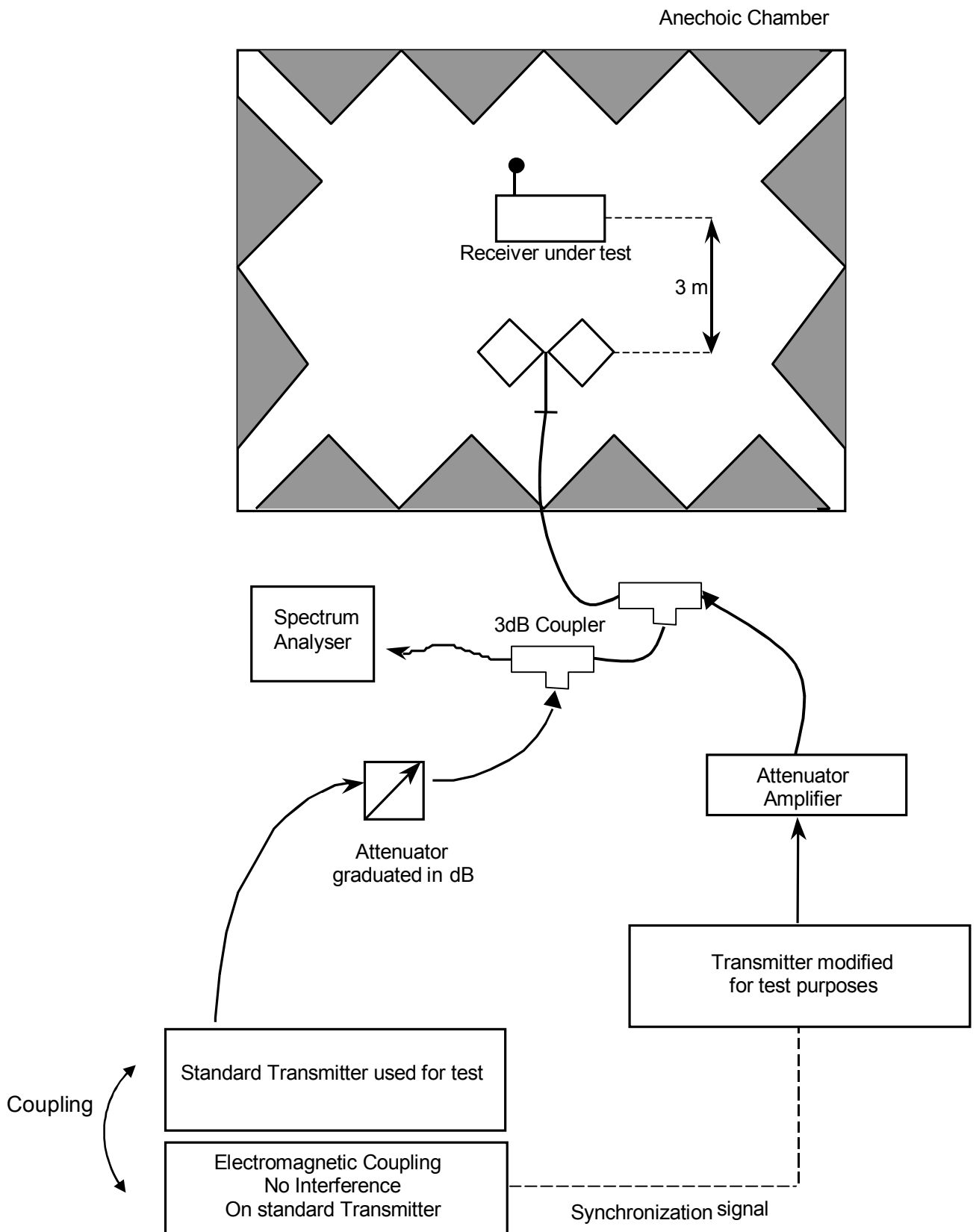


Figure 2

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Amendments Issued Since Publication

DOCUMENT NO.	AMENDMENT DETAILS	SIGNATURE	DATE
LPS 1257-1.1	<ol style="list-style-type: none"> 1. New front cover 2. Title added to header 3. Contents page moved to Page 1 4. Revision of Loss Prevention Standards added on Page 2 5. Notes amended on Page 3 6. Repagination 7. Update of copyright information 	DC	Jan.2014