LANGER
EMV-TECHNIK

Operating instructions
E- and B-field sources

Probe sets H1, H2 and H3

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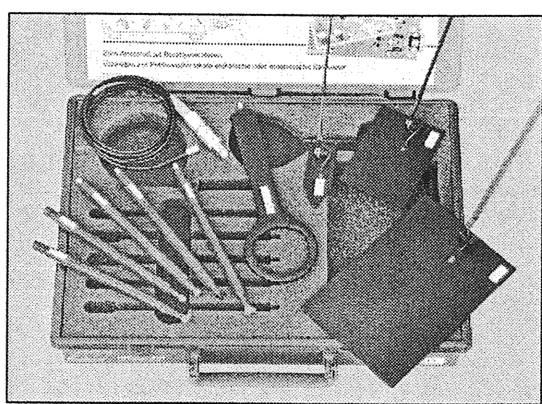
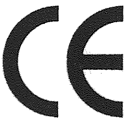
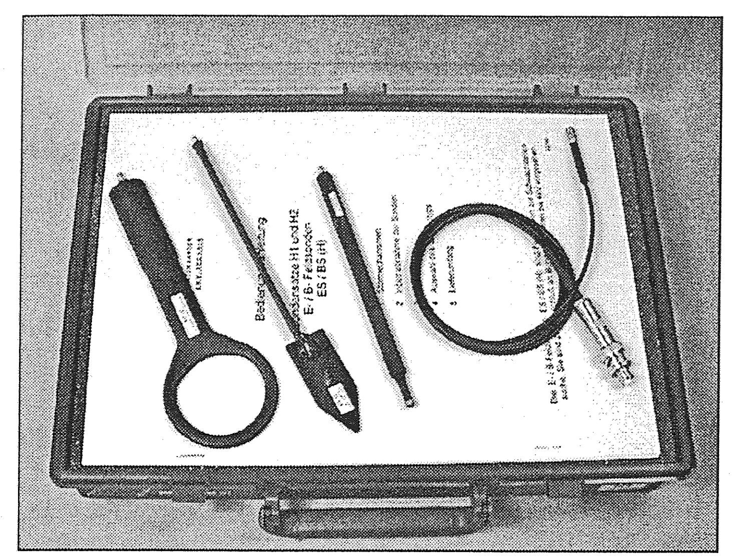
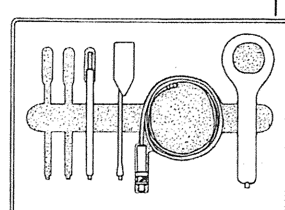




The E- and B-field probes, ES (h) / BS (h), are field sources for the detection of disturbance immunity weak spots in electronic modules and equipment. They are designed to be used with burst generators.

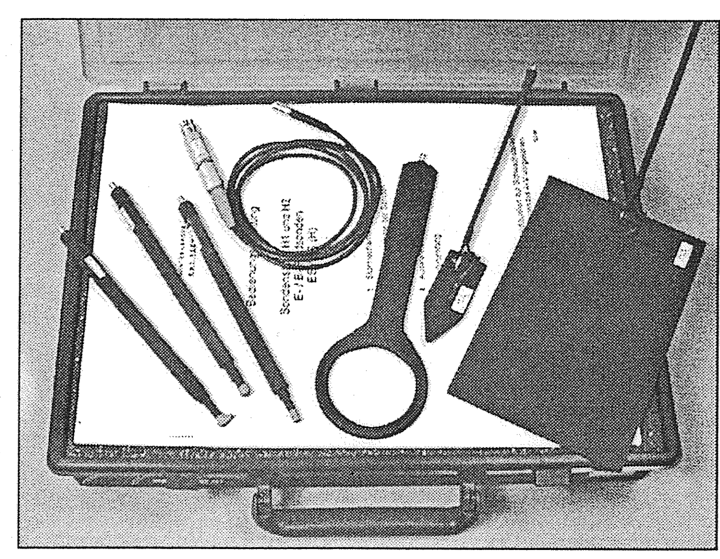
1. Contents

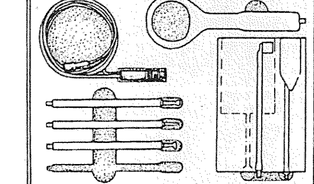




Set H 1

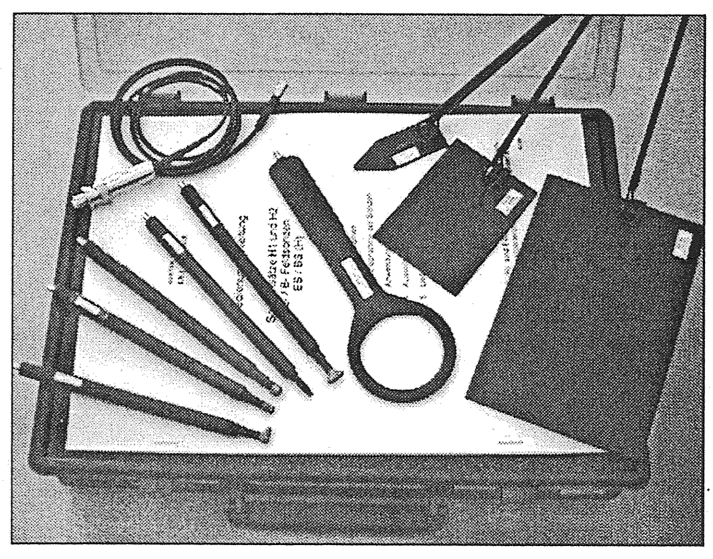
B-field source	BS 02	(h)
B-field source	BS 04 DB	(h)
E-field source	ES 02	(h)
High-voltage cable		
Operating instructions		
Case	338x260x57 mm	

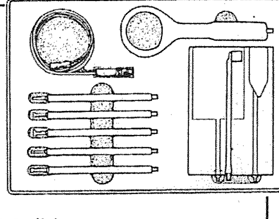




Set H 2

B-field source	BS 02	(h)
B-field source	BS 04 DB	(h)
B-field source	BS 05 DB	(h)
E-field source	ES 00	(h)
E-field source	ES 02	(h)
E-field source	ES 05 D	(h)
High-voltage cable		
Operating instructions		
Case	338x260x57 mm	





Set H 3

B-field source	BS 02 (h)	
B-field source	BS 04 DB	(h)
B-field source	BS 05 DB	(h)
B-field source	BS 04 DK	(h)
B-field source	BS 05 DU	(h)
E-field source	ES 00	(h)
E-field source	ES 01	(h)
E-field source	ES 02	(h)
E-field source	ES 05 D	(h)
High-voltage cable		
Operating instructions		
Case	338x260x57mm	

No liability is accepted for consequential damage.

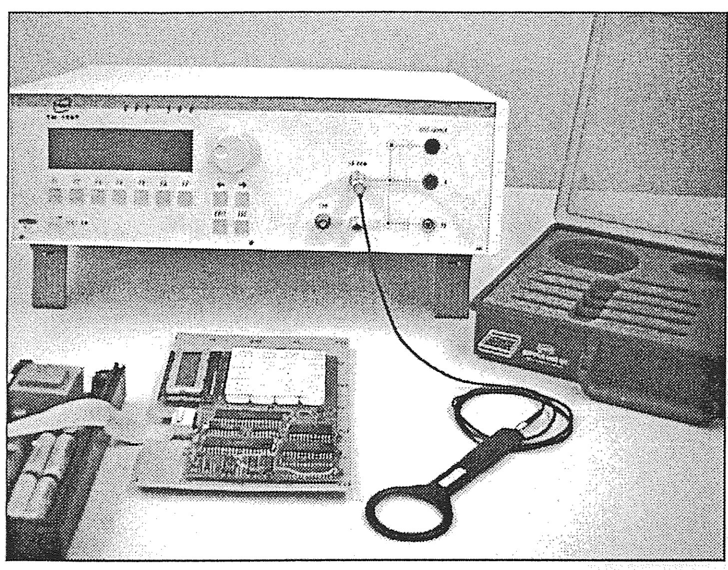
2. Brief Description

Utilization

With the field sources from the probe sets, it is possible to simulate fast transient electric and magnetic pulse fields in electronic equipment and on electronic modules for development-accompanying investigations of disturbance immunity.

The aim of its utilization is the location of disturbance immunity weak spots (Burst, ESD) in electronic equipment so that preventive measures can be effected.

The probes can only be used in conjunction with a burst generator complying with EN 61000-4-4.



Measuring place with burst generator and unit under test

Connection to burst generators

The probes are fed with disturbance signal quantities from a burst generator via the high-tension cable contained in the probe set.

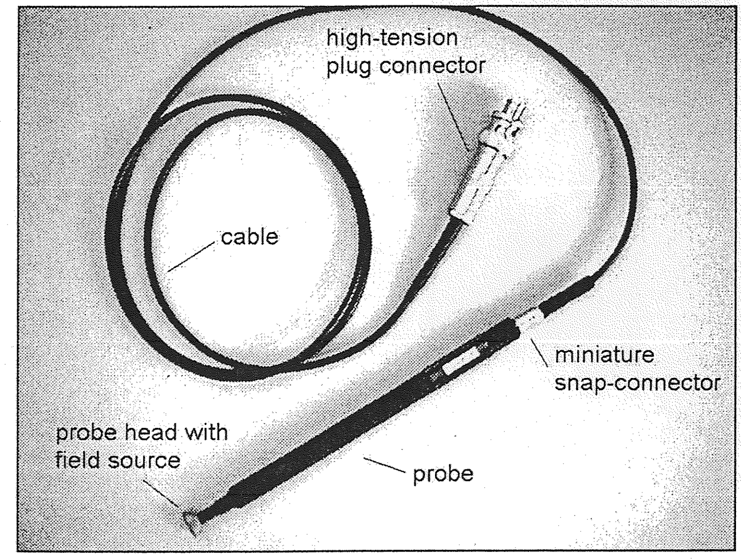
Only burst generators complying with EN 61000-4-4 may be used.

The maximum feed voltage to the probes is 4.4 kV (peak value).

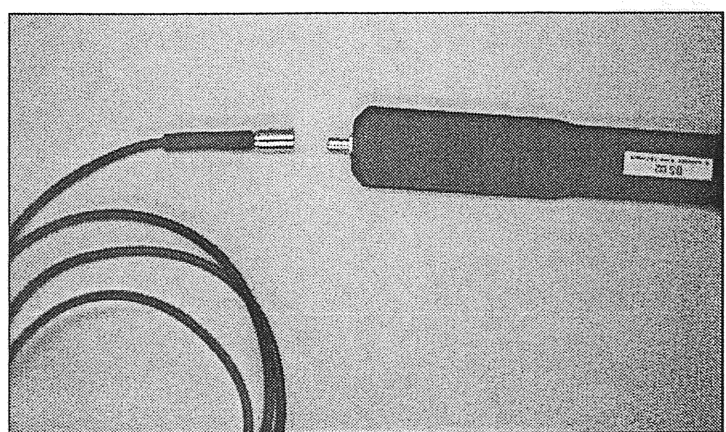
The fixing of the probe into the miniature snap-connector on the high-tension cable should only be carried out under a no-voltage condition.

The snap-connector allows a quick swapping of probes.

The high-tension plug connector is connected to the burst output socket on the burst generator.



Field source with high-tension cable



Snap-connector: Field source / high-tension cable

Principle of operation

B-field probes: The burst generator feeds, via the high-tension cable, a pulse current to the induction coil located in the probe tip (field source). A magnetic pulse field is generated in the induction coil. This magnetic field pulse exits the probe and, with appropriate proximity, influences the unit under test.

E-field probes: The burst generator feeds, via the high-tension cable, pulse voltages to the couple-electrode located in the probe tip. A pulse-shaped electric field is generated in the probe tip through the voltage transient.

The field antipole is formed by the generator earth for the ES 00, ES 01 and ES 02 probes. The ES 05 D probe has its own field antipole.

Method of usage

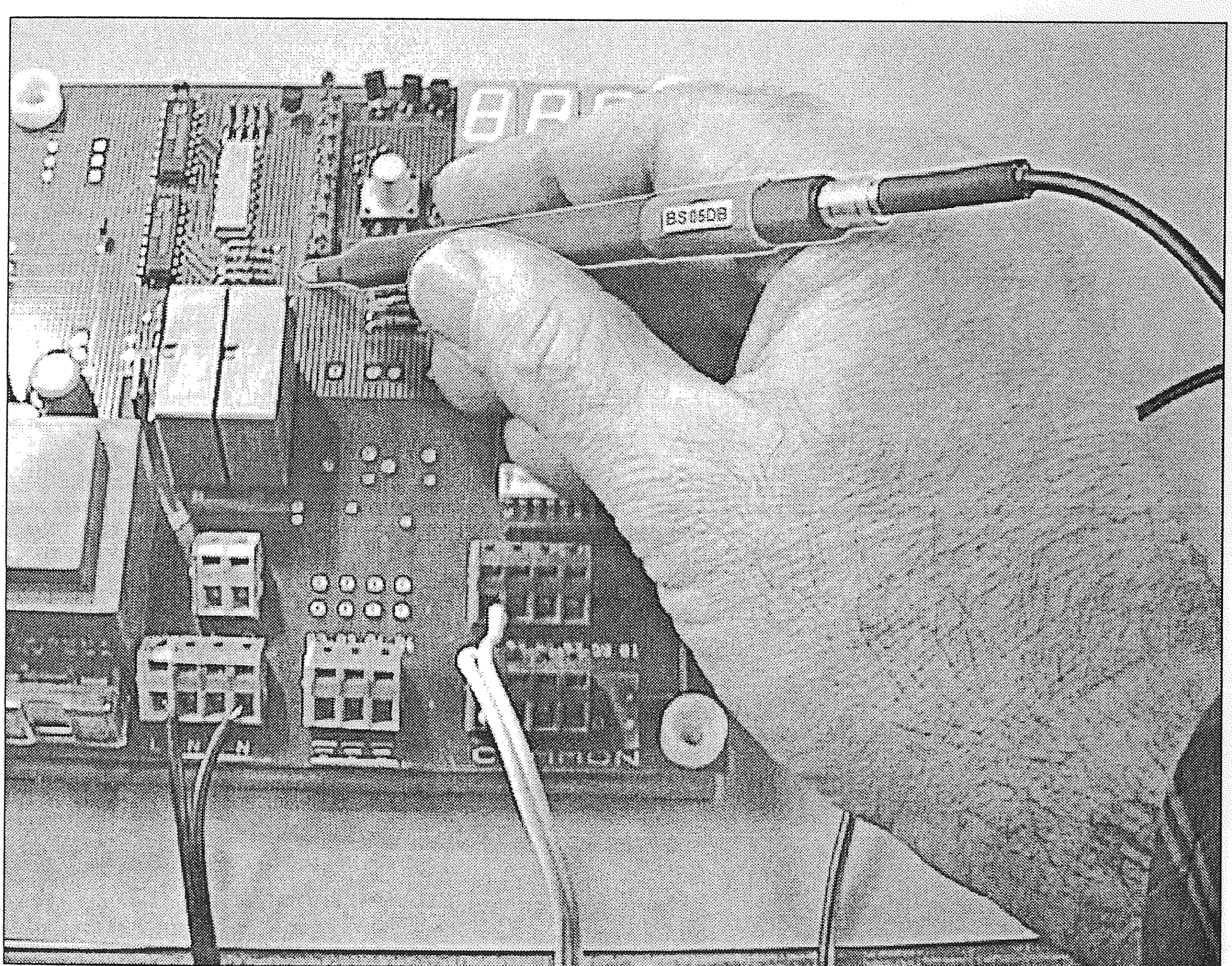
The probes are manually directed over the unit under test.

Corresponding to probe size and separation, the pulse fields influence through the surface of the part being tested.

Tracks and components are selectively pulsed using appropriate usage methods.

Function failures in the tested part indicates an disturbance immunity weak spot.

The part being tested can be damaged through an excessive level of disturbance.

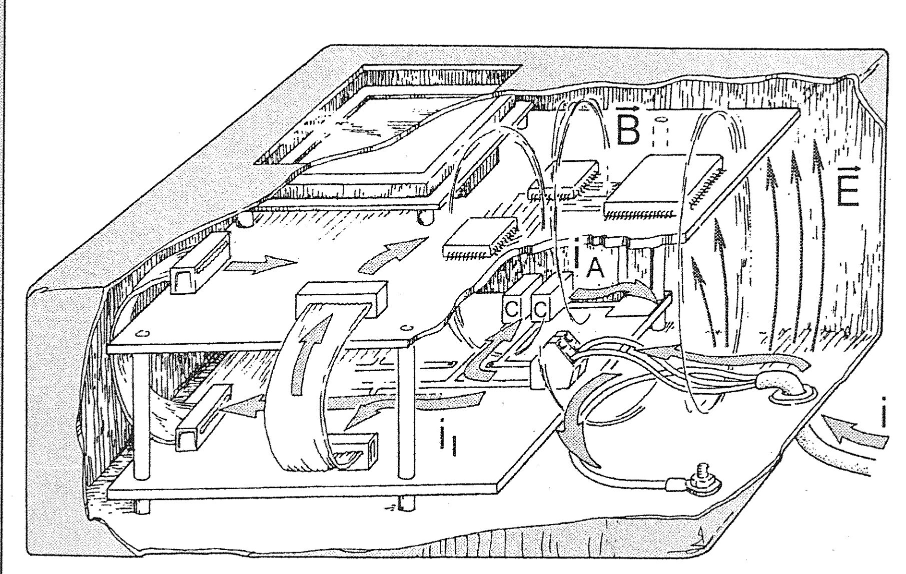


Applying the field sources

3. Disturbance mechanisms

- Electronic modules have, depending on **layout** and **IC-sensitivity,** different levels of disturbance immunity.
- Precisely definable **weak spots** are the cause of Burst and ESD sensitivity. The formation of such weak spots depends mainly on the GND/Vcc/signal track geometry and the type/manufacturer of the IC's utilized.
- Disturbance pulse current (I_{IP}) infiltrates electronic modules via conductors or capacitance. Electric disturbance fields **(electric field strength E)** or magnetic disturbance fields (magnetic flux density B) caused by the disturbance current radiate the surface of the modules.
- **Magnetic pulse fields (B)** or **electric pulse fields (E)** are the major physical quantities which cause flat modules to be influenced.
- A weak spot is normally only magnetic-sensitive or only electric-sensitive.
- In practice, both weak spot types are relevant. For example, in disturbance events, electric fields which influence electric-sensitive weak spots can occur.
- The currents caused by the electric field can produce magnetic fields which themselves influence magnetic-sensitive weak spots (see illustration below).
- The disturbance effects of the two mechanisms overlap and are difficult to separate.
- Due to the different physical mechanisms each of the two weak-spot types requires different EMC measures.
- Usually, only a few disturbance immunity weak spots exist on one module and these are often confined to small surface areas.
- The module is immune to disturbance when these weak spots are located and corrected.
- The burst magnetic fields radiating on the module surface or within equipment spaces can be measured with special magnetic field probes without reverse reaction (Set S2).
- With the EMC sensors, reference disturbance thresholds can be modeled and influenced logical signals captured (E1, Test Unit Monitoring System, OSE 100).

Field distributions



Electric pulse fields (E) are radiated from the cables carrying the disturbance current and these mainly influence signal connections which have a high-impedance signal source.

Disturbance current (I) infiltrates the unit via the input cable. The internal disturbance current (I_I) is reduced by the bypass current part (I_A) leaving the unit via the bypass capacitor current paths (C). The magnetic fields B shown in the illustration can influence electronic modules located within some decimeters. Not all B fields infiltrating the module surface have an influencing effect. Usually, only small areas are B field sensitive. To be observed is that magnetic fields are not only produced in the area of feed cables and protective earth connections by disturbance currents (I). Participating to a large extent are also bypass capacitor (C) current paths and internal GND and Vcc connections.

4. Measurement principle

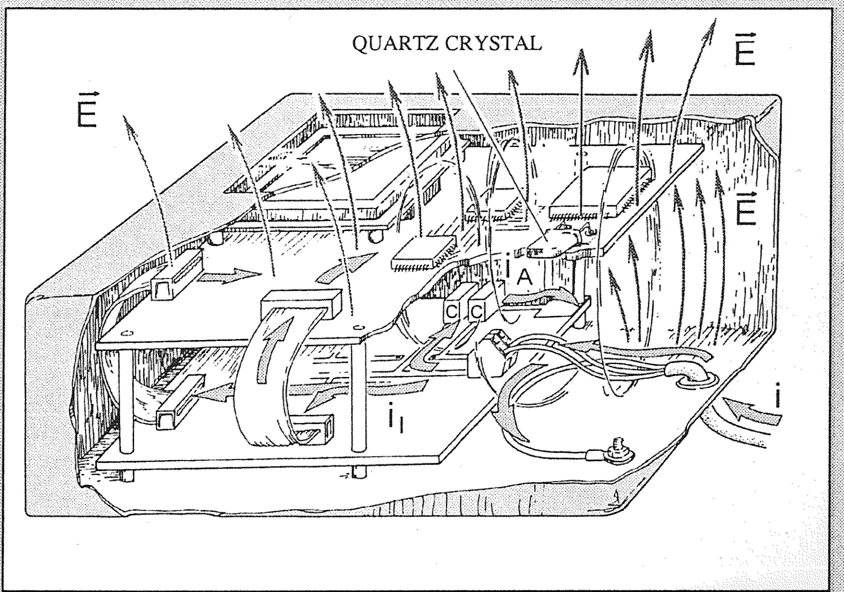
Reference point

During disturbance immunity testing to standard, the unit under test (UUT) is externally subjected to disturbance (disturbance) quantities.

The disturbance quantities infiltrate the UUT and are distributed over the electronic modules in an unknown manner.

The entire module surface is subjected to electric and magnetic pulse fields.

The weak spots, usually confined to a small area (in illustration, for example, the quartz oscillator), cannot be located with these distributed disturbance quantities.



It cannot be ascertained which component or which track run has caused the immunity failure. If the failure spot in the module is not known, it is not possible to take on-target corrective action to the layout, the circuitry or components used.

Strategy

The field sources contained in the probe set produce an area-limited electric or magnetic pulse field

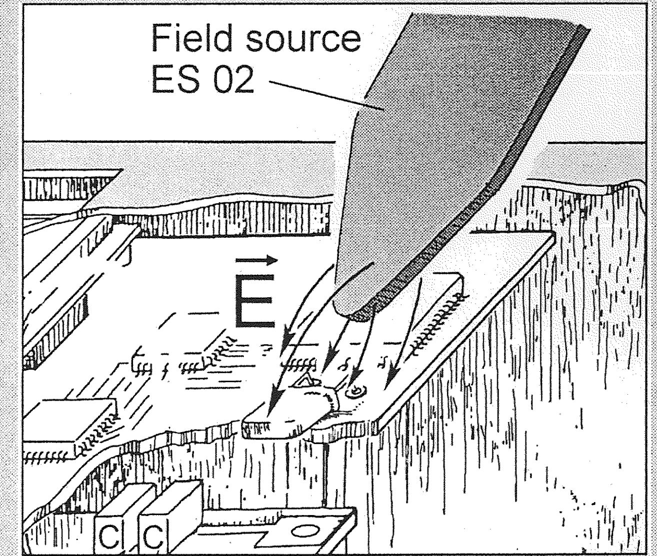
This pulse field has, at the point of influence, the same pulse parameters (slope, peak value, pulse width) as that field, produced during testing to standard, which is distributed over the entire module.

The magnetic flux density B of the probe's field source causes the same inductive-effects on signal connections (track runs) as that caused by testing to standard.

The pulse field produced by the E-field probe's field source causes the same influence to high-resistance signal connections and components (e.g. in illustration, the quartz oscillator) as that field produced during testing to standard.

Signal connections or components are selectively pulsed with the field at the probe tip.

A weak spot is located when a function failure is caused.

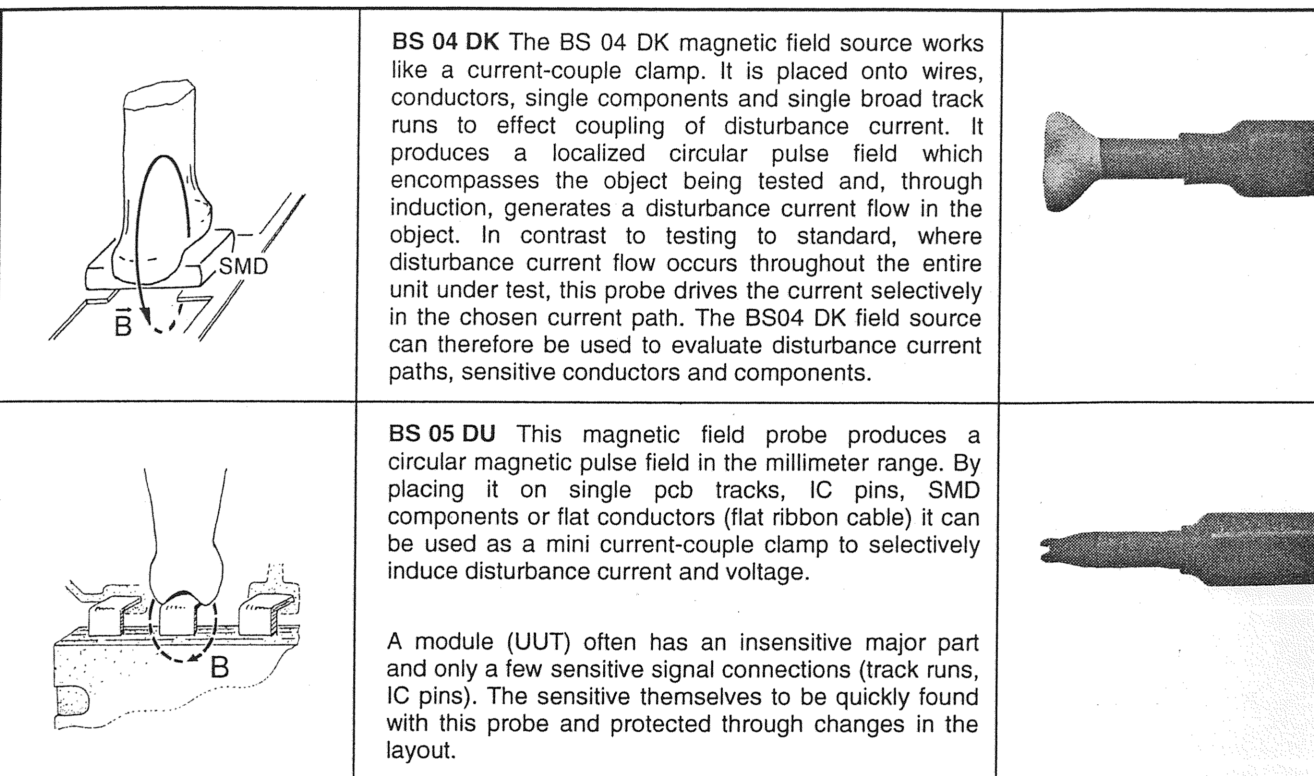


Peculiarities

The failure pictures for the located weak spots must be evaluated. Critical weak spots are those having a failure picture identical with the failure picture seen during testing to standard.
It should be observed that the triggering of the function failure with the probes disturbing quantities involves a hardware and software dependent hit-probability. This hit-probability is formed by a disturbing pulse occurring at the same time as a critical phase of the unit function used. Different test times are required for different module functions. When, for example, a RESET function is affected, the hit-probability is 1 - the unit reacts immediately with a function failure. When a bus function is affected, the reaction time can take minutes.

5. Probe types

Usage	Description	Shape
	BS 02 The magnetic field source produces a B field beam of > 5 cm diameter. It has the same suitability for investigations of complete units and modules. The size of the probe allows location of magnetic-sensitive weak spots through large-area radiation of, case surface and inner areas, connectors, modules with track run structures and IC's.	
	BS 04 DB The field source generates a B field beam of millimeter size (> 3 mm). The field beam exiting from the face side of the probe is used to sense the pcb surfaces. This makes it possible to locate weak spots in layout and pcb component areas. Critical track run sections, components and component connections can be located.	
	BS 05 DB The magnetic field source produces a very fine B field beam (Ø > 1 mm) at the tip of the probe and is therefore suitable for locating of point-shaped weak spots. The field beam is used to sense the surfaces of pcb's and components. The small diameter and the concentrated bundling of the beam makes a high resolution possible. Before using the BS 05 DB probe, the weak spot should be approximately located with the BS 02 or BS 04 DB probe.	
E	**ES 05 D** The E-field source has a narrow line-shaped probe head and is envisaged for the searching of weak spots in track run and component areas. It is suitable for coupling E-field into track runs, wires, component connections (pins) and components, particularly single SMD components like resistors and capacitors. For E-field coupling, the probe head is positioned onto single tracks, SMD components or wired components. Single plug contacts or single cores of ribbon cables can also be investigated.	
	ES 02 The E-field probe can, with its pointed end, be used for locating small E-field sensitive weak spots (track runs, quartz oscillators, pull-up resistors, IC's). The area of the field source allows large-area coupling into case surfaces and inner areas, connectors, and modules with track run structures and IC's (e.g. bus systems and LCD displays).	
	ES 01 The E-field source makes the coupling of an electric field into large areas possible. The probe is suitable for pulsing area and line-shaped weak spots ranging from 5 to 10 cm expansion and, in the probe range, fits between the ES 02 and ES 00 field sources (see corresponding description) because for some applications the ES 02 source can be too small and the ES 00 source too large.	
	ES 00 With the E-field source, large-area or line-form electric field coupling is possible (1.5 dm²). Electric-sensitive weak spots can often stretch 10 to 15 cm across a module (LCD display, Bus system). These weak spots do not react to small field sources. Large-area field sources, like the ES 00, are necessary to locate these types of weak spots. The source can also be used for coupling into cases.	



BS 04 DK The BS 04 DK magnetic field source works like a current-couple clamp. It is placed onto wires, conductors, single components and single broad track runs to effect coupling of disturbance current. It produces a localized circular pulse field which encompasses the object being tested and, through induction, generates a disturbance current flow in the object. In contrast to testing to standard, where disturbance current flow occurs throughout the entire unit under test, this probe drives the current selectively in the chosen current path. The BS04 DK field source can therefore be used to evaluate disturbance current paths, sensitive conductors and components.

BS 05 DU This magnetic field probe produces a circular magnetic pulse field in the millimeter range. By placing it on single pcb tracks, IC pins, SMD components or flat conductors (flat ribbon cable) it can be used as a mini current-couple clamp to selectively induce disturbance current and voltage.

A module (UUT) often has an insensitive major part and only a few sensitive signal connections (track runs, IC pins). The sensitive themselves to be quickly found with this probe and protected through changes in the layout.

Designation key

Example: **BS 04 DB (h)**

Field type	Size	Attenuation	Special field formation	Version
BS Magnetic field source **ES** ES Electric field source	**00** size **01** **02** . . .	**D** common-mode attenuation	**B** field bundling **K** circular field through compensation **U** circular field	**(h)** for connection to burst generators meeting EN 61000-4-4, (is not printed on the probe)

6. Usage

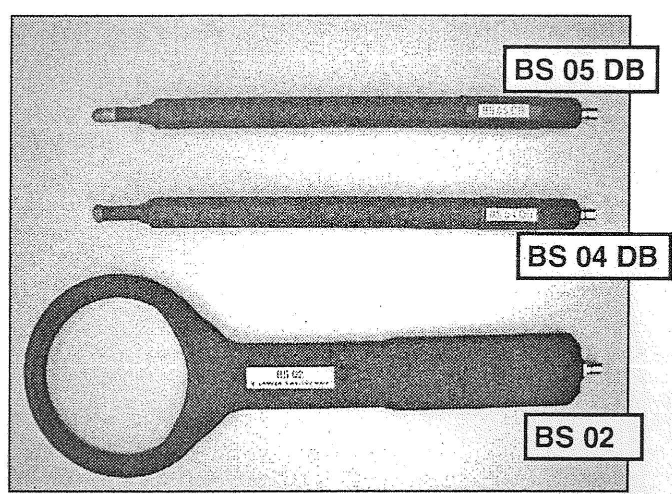
6.1 Searching for weak spots on modules

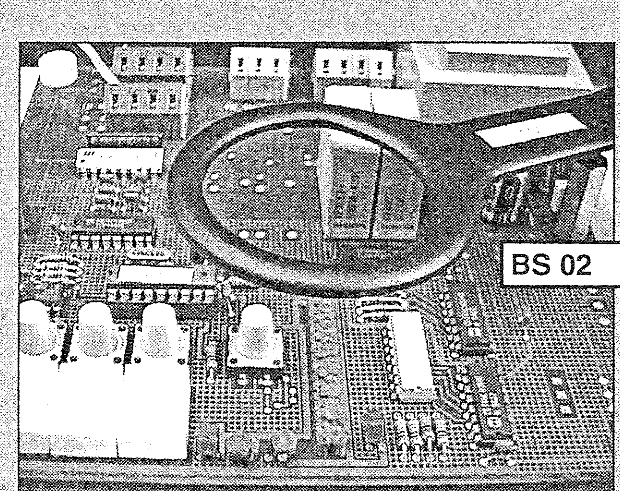
1. Magnetic

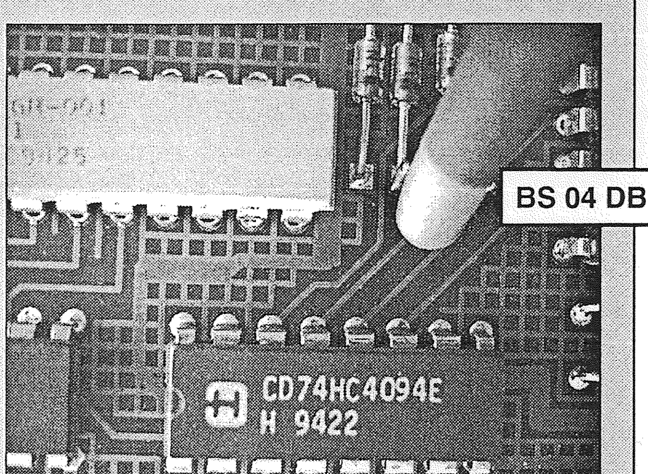
Magnetic-sensitive surface areas (weak spots) on pcb's are formed from signal tracks which have their potential increased by GND or Vcc inductive loops. When a pulse field infiltrates the inductive loop area, a voltage pulse is induced in the signal track and this pulse may influence the connected IC inputs.

To be observed is that the pulse should not be injected on the track but beside the track in the loop cross-section area. The BS 02, BS 04 DB and BS 05 DB magnetic field probes produce a field bundle (or beam) for the location of these induction loops. The field sources produce field bundles of different diameters. The field bundle size must be chosen to fit the opening of the induction loop.

The largest field bundle diameter is produced by the BS 02 probe and the smallest diameter by the BS 05 DB.







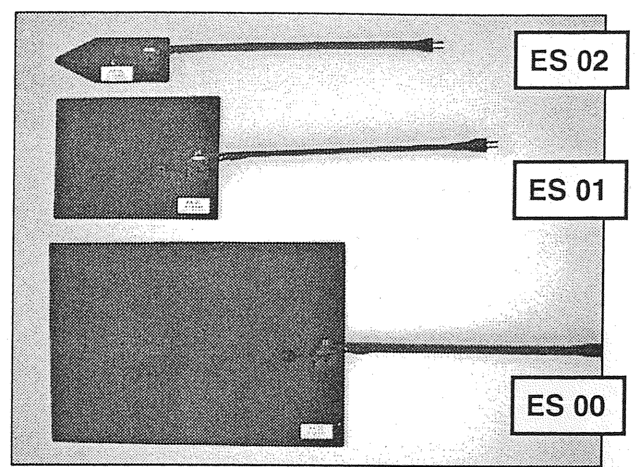
The BS 02 is suited for:
1. Locating large weak spots (>2 cm) on pcb's with little GND surface area.
2. Rough location of smaller weak spots (< 2 cm).

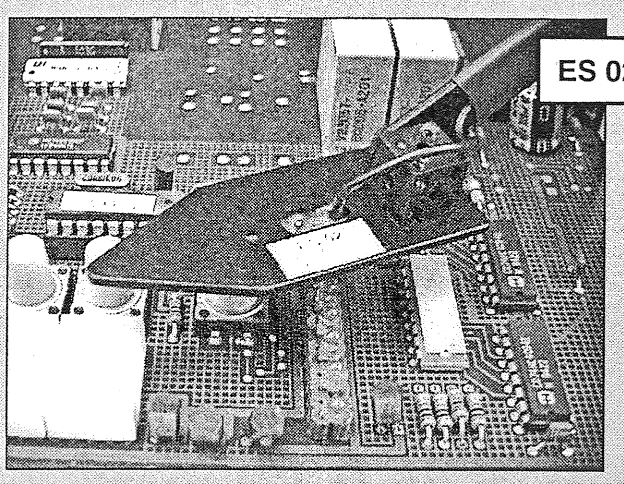
The BS 04 DB and BS 05 DB probes are used for locating weak spots < 2 cm.

2. Electric

Electric-sensitive surface areas of pcb's are primarily formed by tracks and components which have a high-resistance driving source. The sensitivity of these weak spots is lowered when the track surface area and/or the driver resistance is reduced.

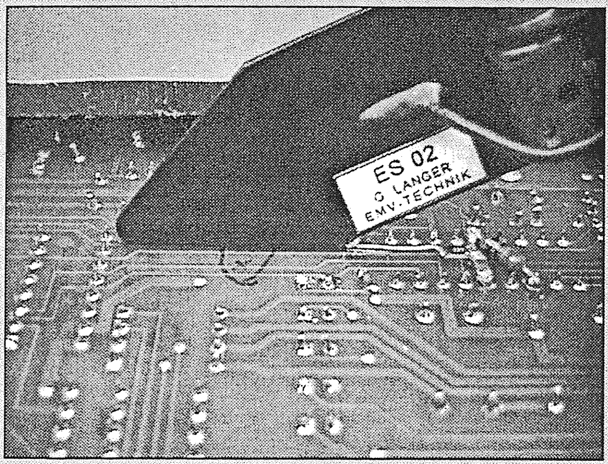
The ES 02, ES 01 and ES 00 probes allow the subjection of area sizes ranging from 1 cm^2 to 1.5 dm^2. The three probes are graded in size. Dependent on probe size the corresponding area can be pulsed with an E-field.





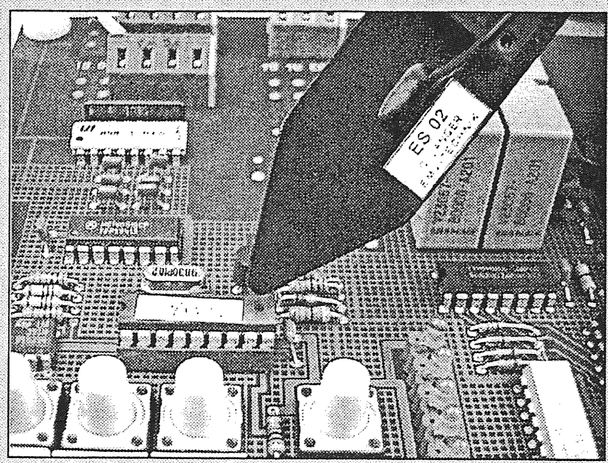
To subject the module to E-field, the flat of the probe is guided parallel to the module. The area subjected corresponds to the surface of the probe. The electric field strength can be increased by reducing the separation distance.

Components raised from the surface are subjected to a greater field strength.



The nearing, or laying on, of the probe edge produces, in contrast to the flat of the probe, a line-shaped influence.

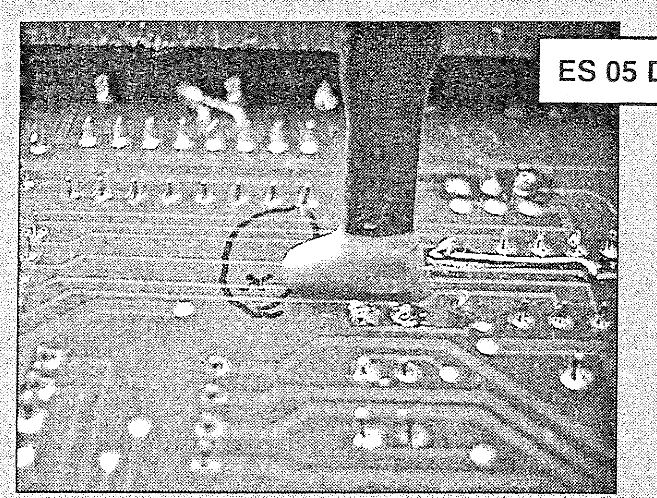
Laying the probe edge on a conductor will cause it to be particularly subjected to the electric field.



The tip of the ES 02 probe allows a square centimeter area to be pulsed.

Sensitive components of this size (IC's, quartz oscillators) are locatable.

Connecting module GND to generator earth increases the effectiveness of the probes.



With the ES 05 D probe, SMD and small wired components as well as pcb tracks can be selectively pulsed. The field source permits an exact localization of the weak spot.

An evaluation and rough localization can be made by particularly sensitive components and conducting lines with the ES 00, ES 01 or ES 02 probe.

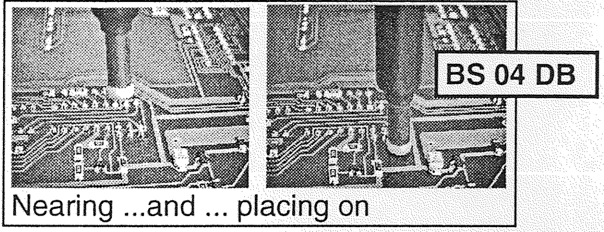
The pin-point locating is carried out with the ES 05 D probe.

3. Work sequence

- In two stages, first the magnetic-sensitive and then the electric-sensitive weak spots are located.
- Determination of a sensitivity (magnetic or electric) occurs in two steps:

  In a first step, a large surface probe is used for quick searching over the module (magnetic BS 02 or electric ES 00, ES 01, ES 02)

  In a second step, the identified sensitive area is searched with a probe having a smaller probe head or a probe tip to permit exact localization of the weak spot (magnetic BS 04 DB, BS 05 DB or electric ES 05 D or tip of ES 02)
- The probe is guided over the surface of the module. At the same time, the generator voltage is increased in steps or the separation distance reduced in steps. The separation distance for the large probes (BS 02, ES 00, ES 01, ES 02) should be between 2 and 10 cm, for the small probes (BS 04 DB, BS 05 DB, ES 05 D or tip if ES 02) between 0 and 3 cm.
- When the field sources of the probes (BS 04 DB, BS 05 DB, ES 05 D) are placed vertically on the module surface, the highest possible resolution and therefore selectivity regarding sensitive components and tracks is obtained.



Nearing ...and ... placing on

- The weak spot is located when the function failure occurs. No further reduction in separation or generator voltage increase should then be made.
- Weak spots are already recognizable with a 500 V generator output voltage.
- The effect of the E-field probes is increased when the generator earth is connected to the GND of the unit under test.
- Usually larger areas are sensitive in one or two-layer modules when they have a GDN and Vcc conducting system.

6.2 Disturbance immunity of signal inputs

Signal paths and signal inputs can be selectively tested for disturbance immunity with the special circle-shaped field of the **BS 05 DU** probe.

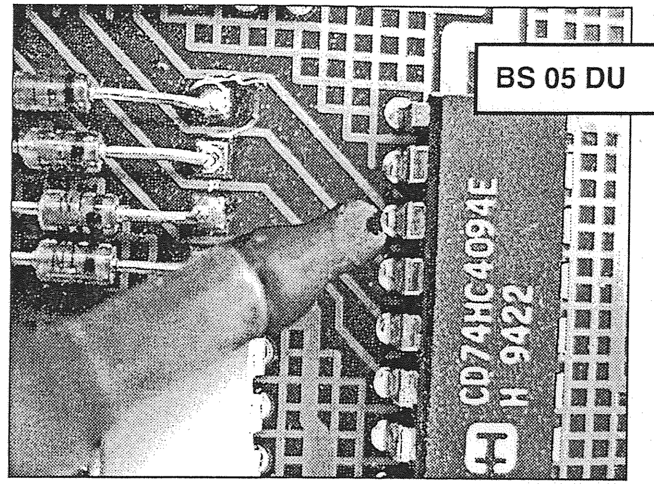
Sensitive inputs can be potential weak points and can be treated with corrective measures.

The signal conductors, either on the module or between the modules, leading to the signal inputs are selectively encompassed with the circular magnetic pulse field of this field source.

A voltage is induced in the encompassed conductor which has an influencing effect on the corresponding electronic input.

The **BS 05 DU** probe is used for coupling on pcb tracks, IC pins, cores of flat ribbon cable, plug pins, small SMD components, etc. Thicker conductors and components can be pulsed with the BS 04 DK probe.

To be noted is, magnetic field coupling with the BS 05 DU probe particularly affects signal connections with a driver having a low resistance (TTL, HC, HCT, AC, ACT ...).
Signal connections having a high resistance driver (Pull-up, Quartz oscillators ...) can be tested with the E-field probe, ES 05 D.

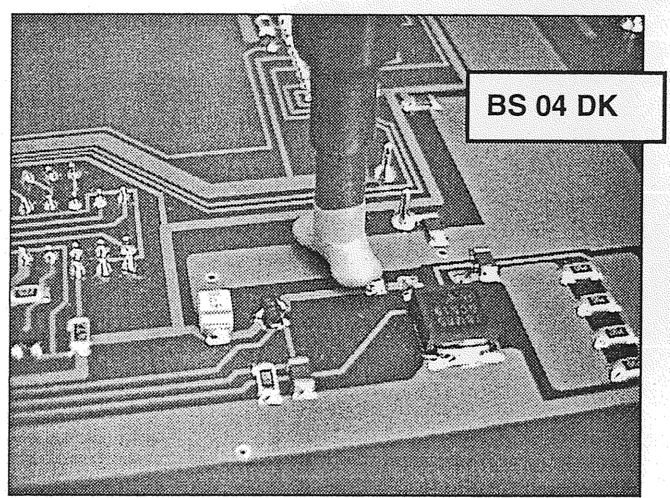


6.3 Selective pulsing of disturbance current paths

Electronic modules can have many arrival paths for external disturbance current. On the module, these paths branch (bypass capacitors, screen, GND). Branched GND systems commonly exist on two-layer modules.

With the circular field of the **BS 04 DK** probe, conducting sections of these paths can be selectively encompassed with magnetic pulse fields. A voltage pulse is induced which selectively drives a current pulse over the corresponding conducting section. To be noted is, the effectiveness is increased in current loops having low resistance.

It is possible to couple on GND/Vcc pcb tracks, components, cable screen, screen connections, auxiliary supply feeds and bypass capacitors.



6.4 Evaluation of modules

The disturbance immunity of modules can be divided into two parts:

1. Disturbance field immunity of the module surface.
2. Conductor disturbance immunity of connections/plug and socket connectors.

The disturbance field immunity of the module surface can be ascertained through pulsing with homogeneous pulse fields.

The module is subjected, either entirely or in sections, to a homogeneous pulse field having defined pulse shape and defined peak value. The field strength at the module surface is gradually increased until function failure occurs.

The disturbance field immunity is separately ascertained for both field types with probes:

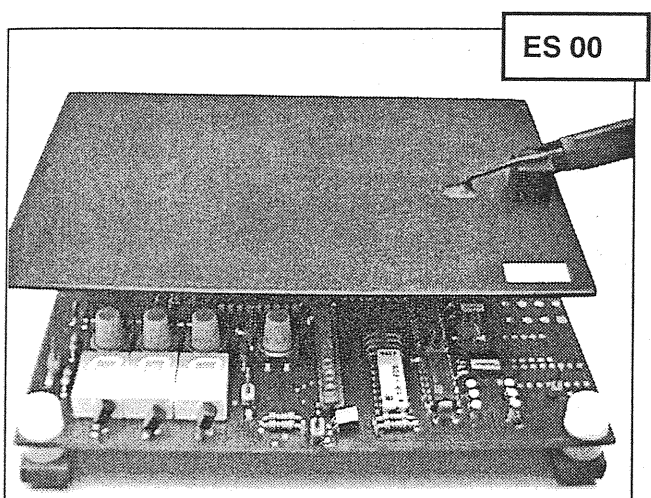
ES 00 electric pulse field

BS 02 magnetic pulse field.

Electric pulse field

The **ES 00** probe is positioned over the module surface with approx. 2 cm separation.

The generator voltage is slowly increased until function failure occurs.
The generator voltage at failure is a measure of the module's E-field disturbance immunity.


ES 00

Magnetic pulse field

The **BS 02** magnetic field probe is positioned over the module surface with approx. 3 cm separation.

Beginning with the lowest generator voltage, the BS 02 probe is guided over the module with constant separation so that all areas are similarly subjected.

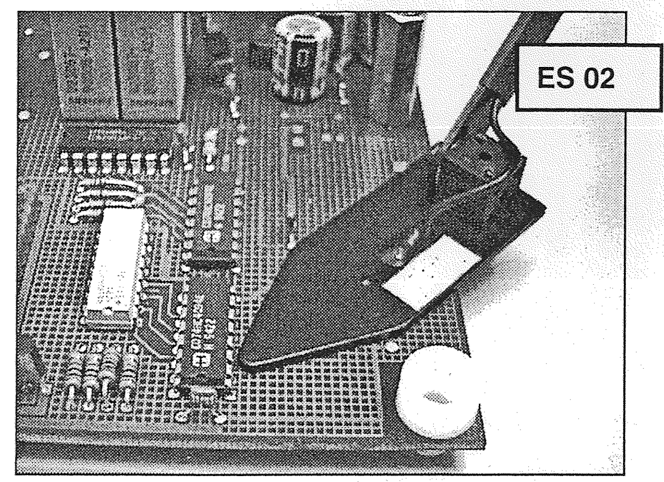
The generator voltage is increased by one step (approx. 100 - 500 V) if no function failure has occurred.

The generator voltage reached is a measure of the module's B field disturbance immunity.

- Both sides of the module are pulsed with positive and negative polarity.
- The generator voltage should not be further increased after function failure has occurred.
- Each function failure type can be allocated an disturbance threshold.

6.5 Capacitive coupling of pulse current

Capacitive coupling of pulse current is achieved by laying the **ES 02, ES 01 or ES 00** probe onto metallic surfaces of modules, cases or construction parts. The size of the induced pulse current is relative to the coupling surface area and probe separation. A selection can be achieved by laying on the probe edge. The pulse current can influence components and conductors directly. An indirect influence exists through magnetic field coupling and magnetic-sensitive weak spots.


ES 02

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7. Safety instructions

- Do not use damaged or defective probes.
- Max. feed voltage: 4.4 kV burst
- The probes are only to be used with the accompanying cable.
- The probe should only be mounted/removed under a no-voltage condition. The cable is only to be driven when a probe is fitted.
- The investigations should be started with the lowest generator voltage setting.

!

The probes are only to be driven with burst generators conforming to EN 61000-4-4.

- The operating instructions of the burst generator being used should be observed.
- The probes are only to be used on electronic equipment or modules defined as units under test.
- The probes are only to be used by persons who have the necessary EMC knowledge and are suitably qualified to work with electric and magnetic fields.
- The test area should always be supplied via a filtered power supply.
- ***Attention!*** Function-related proximity fields and disturbance transmission can develop when the probes are driven with an disturbance quantity generator.
- It is the responsibility of the user to implement measure so as to ensure that products installed outside of their company's EMC environment are not detrimentally affected (particularly through disturbance transmission).

This can be achieved by:

- Maintaining the appropriate safety distance.
- Using screened rooms or those providing screening.

The fields produced by the probe can, function-related, through excessive influences lead to destruction of IC's (latch-up) in the unit under test.

Protection is offered by:

- not bringing the probe nearer after occurrence of function failure.
- quickly interrupting of the unit's supply in event of latch-up.

8. Measuring place layout

8.1 Requirements on the unit under test

The field sources are used to evaluate disturbance immunity weak spots on or between (connector, cable) electronic modules. As these weak spots are identified through function failure, it is necessary for the module to be tested in a functioning condition. When the module is not capable of functioning separately, it must be tested in conjunction with an appropriate electronic environment. This could be the equipment of which the module is a part, parts of the equipment or a simulation environment.

For development-accompanying investigations, the surface of the module must be accessible to the field sources. This can be achieved when:

a) The module can be driven when it is laid out separately (with auxiliary supply).

b) Access with probes to the module is possible in its built-in condition.

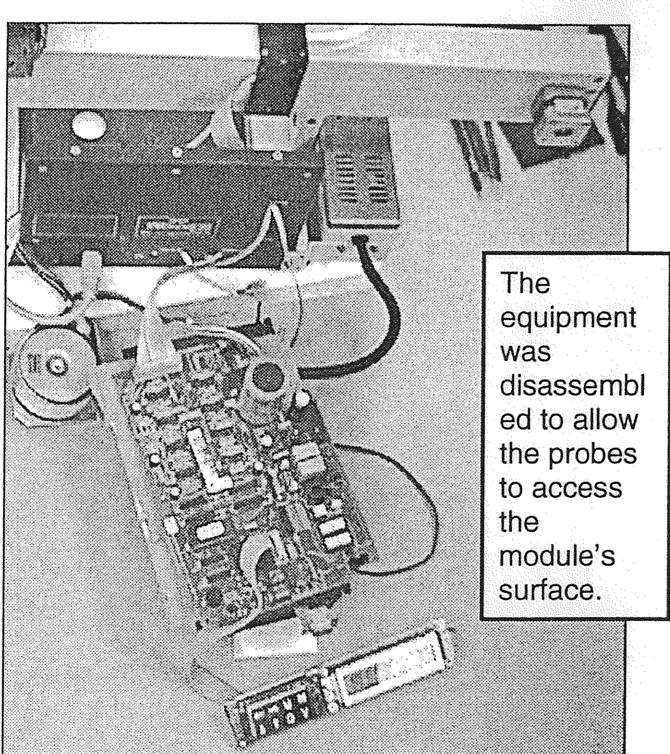
c) Special openings can be made in the equipment case.

d) The equipment can be driven when disassembled.

e) The module can be driven with an adapter.

During the investigations, regardless of possible disassembly:

1. The function failure must be able to be seen or heard.
2. An emergency OFF for the unit under test must be accessible.



The equipment was disassembled to allow the probes to access the module's surface.

8.2 Measuring place layout to EN 61000-4-4

(not absolutely necessary)

A layout to standard (EN 61000-4-4) can be used when modules within a functioning equipment are to be investigated. The 10 cm separated metal surface and special PE-connections are not prerequisites for working with probes. The magnetic field probes BS are very much independent of such environment.

The effectiveness of the E-field probes ES are affected by metallic connections between equipment and surroundings and by a metallic background. Generally, these increase the effect of the E-field probes.

When the surface of the module is to be pulsed, the equipment must possibly be driven in a disassembled condition. When E-field probes are then used, it is possible that the metal environment of the standard layout results in undesired influences so that the layout on a wooden table is preferable. However, when specific disturbance current paths of the equipment and the equipment surroundings play a role in the investigation, a measuring place layout to standard is to be favored.

8.3 Layout on wooden table

The use of a wooden table is recommendable when distortion of the E-field by metal surrounding is to be prevented. Large metal objects within a circumference of approx. 1 meter should be removed.

Furthermore, the effect of the E-field sources is dependent on the connection between generator earth and the unit under test. An HF-advantaged connection normally strengthens the effectiveness of the E-field sources. In special cases, the GND of a module can be connected directly to the generator earth.

The effectiveness of the magnetic field probes BS is very much independent of the surroundings of the unit under test.

8.4 Layout in any other environment

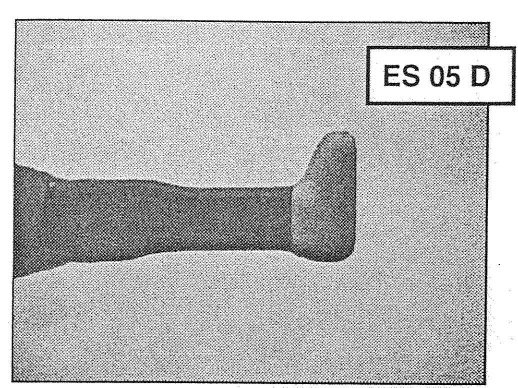
During the use of E-field sources the effect of metal parts, which are not part of the module or are outside of the immediate vicinity (30 cm), on the measuring result can generally be ignored. A check for occurrence of unallowable falsifications should be made.

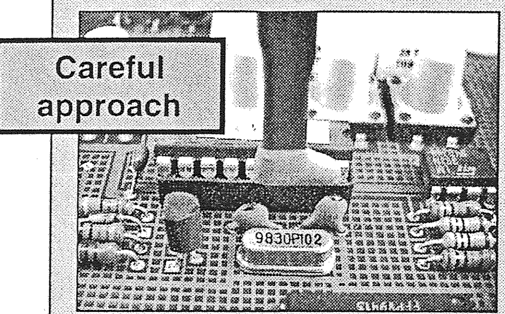
9. Examples of usage

9.1 Field source ES 05 D

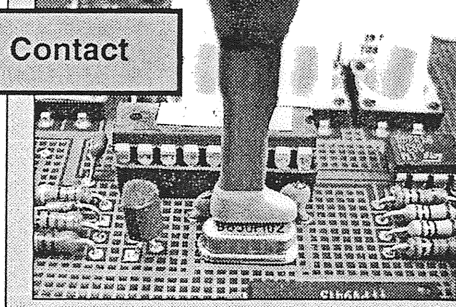
The probe head of this field source has the shape of a shoe. The sole of the shoe and the tip emit vertical electric pulse fields.

The probe is designed for pulsing smaller objects (<10 mm).



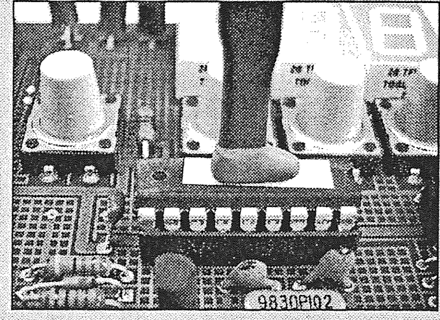


Beginning with a separation of approx. 5 cm, the sole of the field source is brought nearer to the component or track run to be tested. The initial generator voltage should not exceed 1000 V. The field source must not be brought closer after function failure. Before the investigation is continued, the generator voltage should first be reduced and thereafter the separation distance reduced. This sequence is repeated step-like until the sensitive component/track has been exactly located.



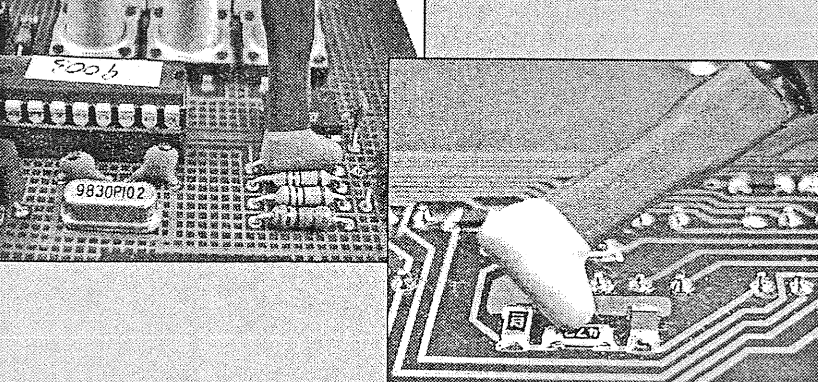
The highest selectivity can be obtained by placing the probe head onto the component or track. The electric field emerging from the sole then has the shortest coupling path to the tested area. For this, the sole must make full contact.

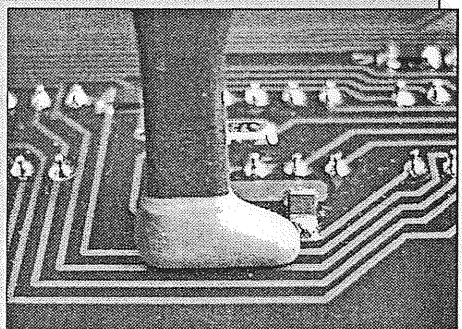
The setting of the generator voltage should be so that the influencing ceases as soon as the probe is slightly moved away from the tested object.



Contact with the probe tip allows small E-field sensitive SMD components to be located (1206, 0805, 0603).

When making contact with insensitive components, the generator voltage can be in the kV range. Highly-sensitive areas react at 200 V with a 1 cm separation.





The probe has current displacement compensation (common-mode attenuation) so that parasitic couple current and magnetic fields are supressed. To maintain the effect of the common-mode attenuation, it is advantageous to HF-isolate the generator earth from the GND of the module. A connection between GND and the generator increases the E-fieldeffect but also negatively affect the current displacement compensation.

Preferable use, on: pcb tracks, SMD or wired resistors and capacitors, IC's, plug connector pins, cable cores, Quartz oscillators, resonators

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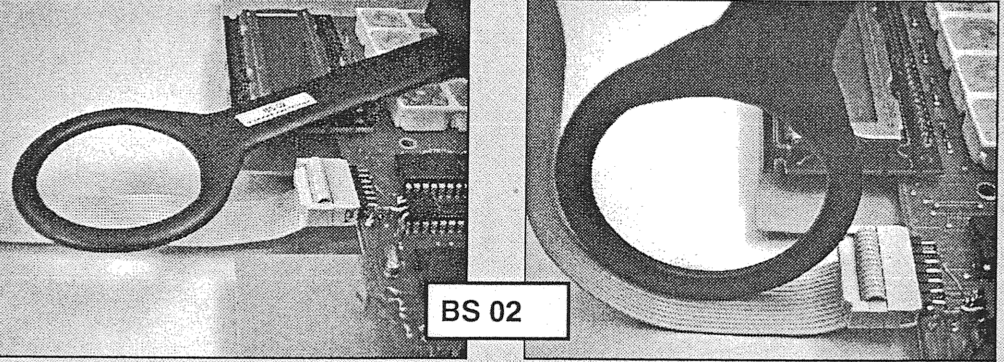
9.2 Flat ribbon cable

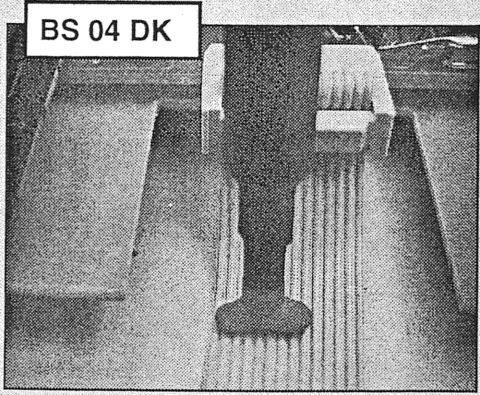
Single cores of a ribbon cable, e.g. located between two modules of an equipment, can show electric or magnetic field sensitivity.

Magnetic pulse field



Global evaluation

A global evaluation of magnetic weak spots is possible through coupling in a B field with the BS 02 field source. The entire ribbon cable can be radiated with the probe's field bundle. Furthermore, the edge of the probe can be placed on the cable so that areas are encompassed by the field (see photo). A response definitely confirms a magnetic field sensitivity.



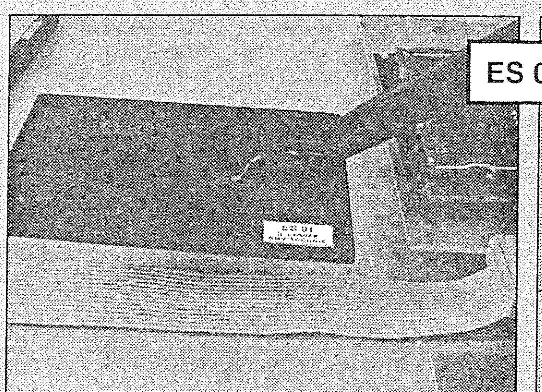
Local evaluation

Higher resolutions can be obtained with the BS 04 DK and BS 05 DU probe.

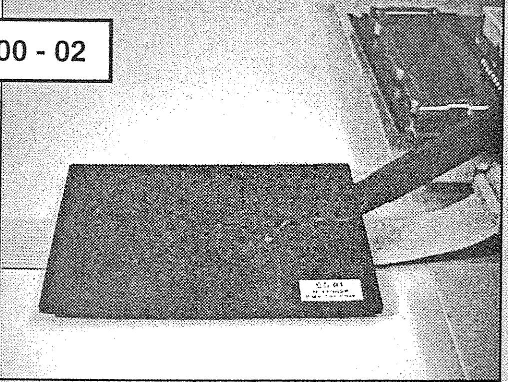
Single cores can be selectively pulsed with the BS 05 DU probe. It will be possible to identify critical signal paths.

The BS 04 DK probe can be used when a fault combination on several cores leads to the function failure.

Electric pulse field



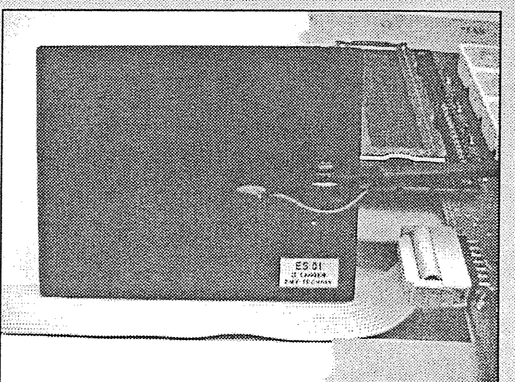
ES 00 - 02



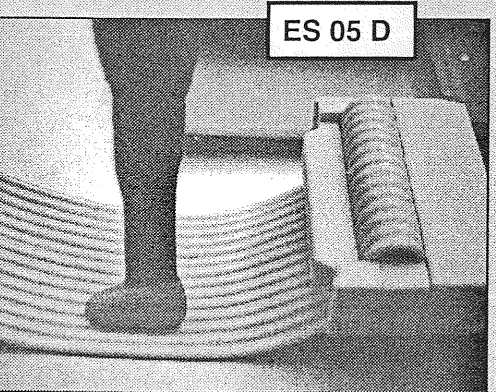
Global evaluation

With the ES 00 to ES 02 probes, different size surface areas of a ribbon cable can be pulsed. The chosen probe is brought closer to the cable. The maximum electric field strength and the maximum interference current coupling is obtained when the flat of the probe is laid on the cable.

The effect is increased when module GND system is connected to burst generator earth. Both of the modules connected with the ribbon cable may, one after the other, be connected to the burst generator earth.



ES 05 D



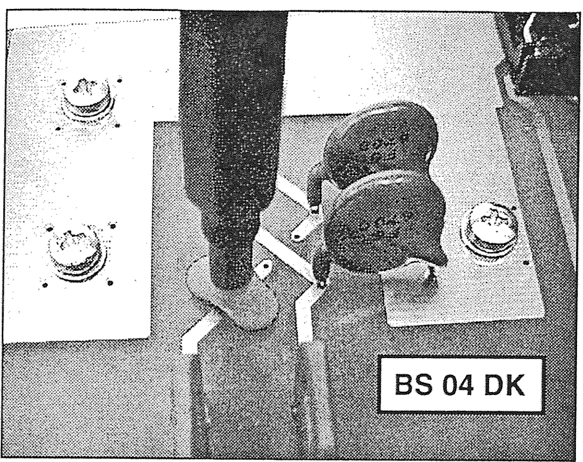
Local evaluation

The full-surface contact allows a global evaluation of the E-field sensitivity. Areas with sensitive cores (if present) may be localized by making contact with the edge of the probe.

Higher resolutions can be obtained with the ES 05 D probe. However, the probe has a lower intensity because of its smaller couple surface.

9.3 Bypass capacitors

Inserted in a 24 V auxiliary supply feed are, for example, bypass capacitors.



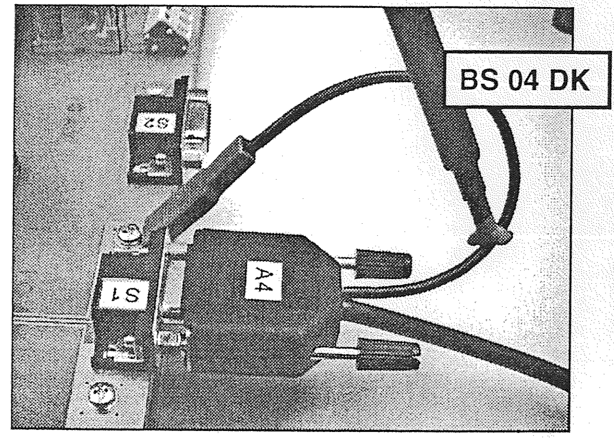
The BS 04 DK magnetic field probe is used as a current coupling clamp for selective coupling. The probe is placed on the conductor. The magnetic field encompassing the conductor drives the interference current.

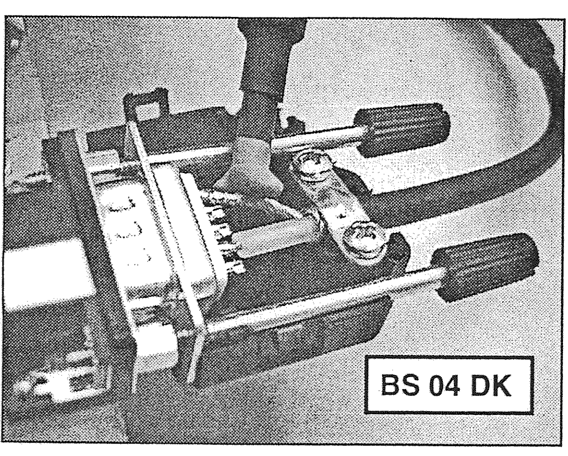
For coupling at the external feed side, the bypass capacitor meets its protective function when no function failure occurs. A condition is that the circuit is made with little inductance. This can be achieved with an additional capacitor against bypass potential.

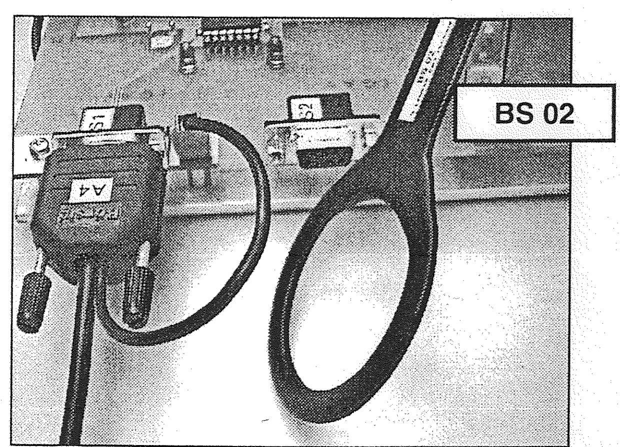
For coupling in the 24 V supply beyond the bypass, function failures indicates a weak spot inside the module when the bypass capacitor meets its function.

9.4 Screen connections

Screen bypass paths can be interference-sensitive. These paths can be selectively tested with the BS 04 DK probe. The negative effect of the pigtail connection is ignored. The BS 02 probe is to be used to check the negative effect of the pigtail connection.





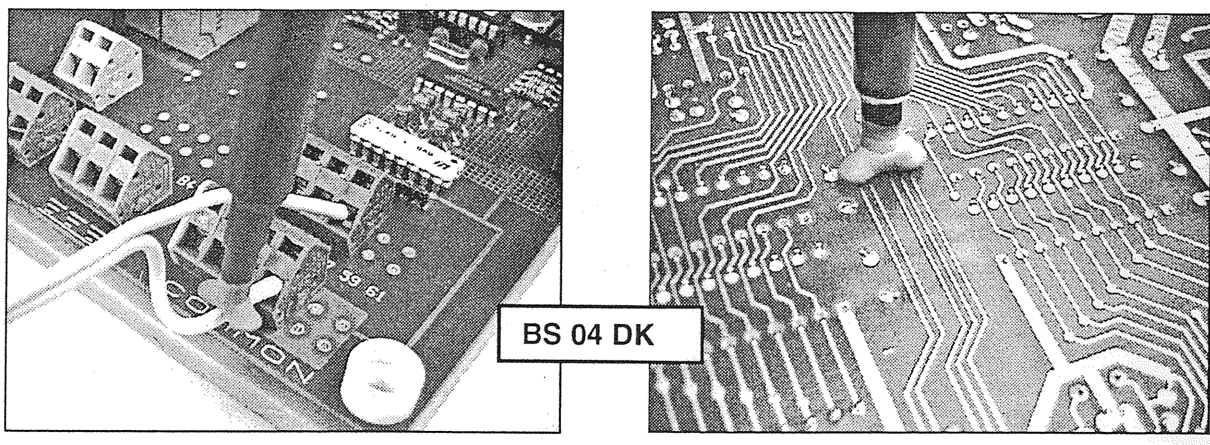


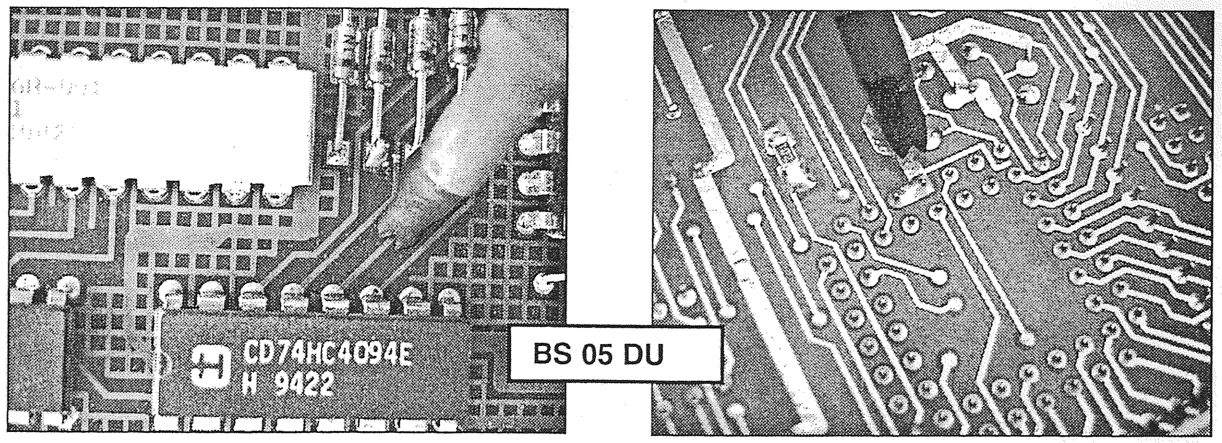
9.5 Investigating magnetic-sensitive conductors

Signal and supply conductors possess different sensitivities to magnetic pulse fields. Particularly sensitive conductors can be preventively protected in the layout.

The sensitivity of conductors can be ascertained with the magnetic field probes BS 04 DK and BS 05 DU. Larger conductors or conductor bunches can be encompassed with the BS 04 DK probe.

The BS 05 DU field source is suited for thin conductors.





10. Packing list

Set H1

Pos.	Designation	Typ		Units
01	B-field probe	BS 02	(h)	1
02	B-field probe	BS 04 DB	(h)	1
03	E-field probe	ES 02	(h)	1
05	High-voltage cable			1
06	Case with short information			1
07	Operating instruction			1

Set H2

Pos.	Designation	Typ		Units
01	B-field probe	BS 02	(h)	1
02	B-field probe	BS 04 DB	(h)	1
03	B-field probe	BS 05 DB	(h)	1
04	E-field probe	ES 00	(h)	1
05	E-field probe	ES 02	(h)	1
06	E-field probe	ES 05 D	(h)	1
07	High-voltage cable			1
08	Case with short information			1
09	Operating instruction			1

Set H3

Pos.	Designation	Typ		Units
01	B-field probe	BS 02	(h)	1
02	B-field probe	BS 04 DB	(h)	1
03	B-field probe	BS 05 DB	(h)	1
04	B-field probe	BS 05 DU	(h)	1
05	B-field probe	BS 04 DK	(h)	1
06	E-field probe	ES 00	(h)	1
07	E-field probe	ES 01	(h)	1
08	E-field probe	ES 02	(h)	1
09	E-field probe	ES 05 D	(h)	1
10	High-voltage cable			1
11	Case with short information			1
12	Operating instruction			1

No responsibility can be accepted for consequentail damages.

IMPORTANT NOTICE

Originally all probes in this H2-B EMS probe kit are specifically designed to be used with IEC61000-4-4 compliant EFT/B generator.

When using the probes with NoiseKen INS series Impulse Noise Simulator, the following conditions shall be met.

-The INS simulator output shall be terminated by the built-in or external 50-ohm terminator and then the probe shall be connected to the 50 ohm TERM OUT port. (Some INS models require a conversion cable for coaxial connector mating)

-Pulse width shall not exceed 50ns.

-The maximum voltage setting on the INS is 1.0kV.

If either of the above restrictions is violated, the probe may be damaged due to the internal heat effects.