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NSTISSAM TEMPEST/1-92
15 December 1992

NSTISS
NATIONAL
SECURITY
TELECOMMUNICATIONS
AND
INFORMATION
SYSTEMS
SECURITY

COMPROMISING EMANATIONS

LABORATORY TEST REQUIREMENTS,

ELECTROMAGNETICS (U)

CLASSIFIED BY DIRNSA (NATIONAL MANAGER, NSTISS)
DECLASSIFY ON: ORIGINATING AGENCY'S DETERMINATION REQUIRED

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NSTISS
NATIONAL SECURITY TELECOMMUNICATIONS AND INFORMATION SYSTEMS SECURITY

NATIONAL MANAGER

15 December 1992

FOREWORD

1. (U) National Security Telecommunications and Information Systems Security Advisory Memorandum (NSTISSAM) TEMPEST/1-92, "Compromising Emanations Laboratory Test Requirements, Electromagnetics" specifies test procedures for identifying the conducted and electromagnetic radiation emanations characteristics of individual equipment in a laboratory environment. This NSTISSAM supersedes NSTISSAM TEMPEST/1-91, dated 21 March 1991.

2. (U) This document contains communications security material. Access by contractor personnel is restricted to U.S. citizens holding final U.S. Government clearances. This document is not releasable to the Defense Technical Information Center per DoD Instruction 5100.38.

3. (U) Representatives of the National Security Telecommunications and Information Systems Security Committee (NSTISSC) may obtain additional copies of this advisory memorandum from:

Executive Secretariat
National Security Telecommunications and
Information Systems Security Committee
National Security Agency
Fort George G. Meade, MD 20755-6000

4. (U) U.S. Government contractors are to contact their appropriate government agency or Contracting Officer Representative regarding distribution of this document.

J M McConnell

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Vice Admiral, U.S. Navy

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SECTION 1—PURPOSE AND SCOPE

1.1. (U) Purpose.—This document specifies test procedures for identifying the conducted emanation and electromagnetic radiation emanation characteristics of individual equipment in a laboratory environment.

1.1.1 (U) The emanation limits constitute a set of reference curves which are intended for use:

a. (U) As a guide for determining a contractual measure for acceptability, or as a performance objective in preparing specifications for newly developed equipment, and

b. (U) As a standard for comparing the TEMPEST profiles of different equipment.

1.1.2 (U) Equipment meeting the Level I limits of this document provide an acceptable degree of conducted and radiated TEMPEST security at the equipment level. Those complying with the Level II and Level III limits of this document provide an acceptable degree of radiated TEMPEST security at the equipment level when installed in an appropriate protected environment. Measurements of electromagnetic radiated emanations are made at a standard measurement point of one meter from the equipment under test (EUT). However, this does not imply that equipment meeting the requirements of this document does not radiate compromising emanations beyond one meter. Specific installation and environmental considerations may have a significant effect on TEMPEST security when judged at the system or field-site level. Such considerations are beyond the scope of this document.

1.1.3 (U) Test instrumentation, used to determine whether equipment meets the limits, is generally available.

1.1.4 (U) Throughout this document, various options are presented which the sponsoring organization may exercise. Unexercised options shall not apply. These options are summarized in Paragraph 5.11.

1.2. (U) Scope.—This document is applicable to electronic, electrical, and electromechanical equipment which generates, processes, or transfers classified information or sensitive information as set forth in 10 U.S.C. Section 2315 (Warner Amendment) internally or at external interfaces in either digital or analog form. This document does not apply to facilities.

1.2.1 (U) [redacted]

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1.2.2 ~~(C)~~ The maximum digital data signaling rates and the maximum analog data bandwidth at which this document applies are:

~~(C)~~ [redacted]
~~(C)~~
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1.2.3 (U) This document specifies three levels of TEMPEST compliance.

1.2.4 (U) This document is intended for use by U.S. Government departments and agencies, and their authorized contractors. This document is applicable to equipment in the developmental stage, during and subsequent to production, and after any modification. This document is not intended for use in qualification testing of individual component parts of a complete equipment (e.g., a power supply, a resistor, etc.), since such a test is meaningless from a TEMPEST standpoint.

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SECTION 2—REFERENCE DOCUMENTS

2.1. (U) Documents.—The following listed documents supplement the information included in this document. U.S. Government personnel may request copies through their NSTISS representative. Contractors should contact their contracting officer. Complete or essentially complete lists of TEMPEST documents are UNCLASSIFIED.

2.1.1 (U) Specifications.—Military.

(U) MIL-STD-45662, Calibration System Requirements (UNCLASSIFIED)

2.1.2 (U) General.

NACSIM 5000 — TEMPEST Fundamentals (title UNCLASSIFIED; document CONFIDENTIAL).

NSTISSAM TEMPEST/2-91 — Compromising Emanations Analysis Handbook (title UNCLASSIFIED; document CONFIDENTIAL).

NACSEM 5108 — Receiver and Amplifier Characteristics Measurement Procedures (title UNCLASSIFIED; document FOR OFFICIAL USE ONLY).

NACSIM 5203 — Guidelines for Facility Design and RED/BLACK Installation (title UNCLASSIFIED; document CONFIDENTIAL).

NACSEM 5204 — Shielded Enclosures (title UNCLASSIFIED; document CONFIDENTIAL).

NCSC 3 — TEMPEST Glossary (title UNCLASSIFIED; document SECRET).

NTISSI 4002 — Classification Guide for COMSEC Information (title UNCLASSIFIED; document SECRET).

NACSEM 5002 — Technical Rational: Basis for Electromagnetic Compromising Emanations limits (title UNCLASSIFIED; document CONFIDENTIAL).

2.2. (U) Comments and Recommendations.—Revisions to this document will be made as appropriate. Comments, corrections, and recommendations on its contents are encouraged. U.S. Government organizations should submit their comments through their respective department or agency authority to:

Director, National Security Agency
ATTN: C9
Fort George G. Meade, Maryland 20755-6000

Contractors should submit their comments regarding this standard to their sponsoring organization.

A comment sheet is provided in the back of this document for this purpose. When submitting comments, it is suggested that this form be reproduced or that a format similar to that on the form be used.

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SECTION 3—DEFINITIONS AND ABBREVIATIONS

3.1. (U) Definitions.—The definitions of terms given in this glossary are specifically for use in this document. Many TEMPEST-related terms used in this document are not included in this glossary, but can be found in NACSIM 5000 Appendix A and NCSC 3, TEMPEST Glossary.

3.1.1 (U) Automated Detection System.—An automated TEMPEST detection system must detect and record EUT emanation levels, and may also identify those emanations which are correlated to RED signals. The system includes the detection system, internal/external controller, and calibration source(s). The sensitivity, bandwidth, and tuning range of automated systems must meet the specified requirements for manual systems.

3.1.2 (U) Bit Density.—The total number of "1's" in the particular byte or word.

3.1.3 ~~(C)~~ Bit Density Information.— [redacted]

3.1.4 (U) Bit Rate.—A general term used to express the data transfer rate of binary digital signals. For purposes of this document, it is defined as being numerically equivalent to the reciprocal of the duration in seconds of the shortest unit interval (the interval between the beginning of adjacent bits). The units are bits per second (b/s) for serial transfer, parallel information units per second (PIU) for parallel transfer. For telegraphic signal codes, the term "baud" is synonymous with "bits per second."

3.1.5 (U) Bus.—A group of wires used for transferring parallel data one byte or one word at a time.

3.1.6 (U) Byte.—A group of adjacent binary digits associated with one character or unit of information operated upon as a unit and usually shorter than a word; usually connotes a group of eight bits where the digits are operated upon simultaneously as a unit. (A byte usually connotes a group of eight bits.)

3.1.7 (U) Character Time.—Period of a data character transfer cycle. Character time is the reciprocal of the repetition rate of the data characters.

3.1.8 (U) [redacted] (b)(3)-P.L. 86-36

3.1.9 (U) Conversion Factor.—A general term that refers to adjustments which must be made to the results of a physical measurement to express the results in desired units. A conversion factor always involves a change of units. Some specific conversion factors are: antenna factor (dBμV to dBμV/m or dBμV to dBμA/m); current probe factor (dBμV to dBμA); and bandwidth conversion factor (dBμV/kHz to dBμV/MHz).

3.1.10 (U) Correction Factor.—A general term that refers to adjustments which must be made to the results of a physical measurement to express the results in an accurate relation to a desired reference. A correction factor accounts for gains or losses in the measuring system and does not involve a change of units. Some specific correction factors are: cable losses, mismatch losses, and attenuator losses.

3.1.11 (U) Demodulator.—A device that operates on a modulated carrier wave in such a way that the wave with which the carrier was originally modulated is recovered.

3.1.12 (U) Detection System.—The equipment used in performing a TEMPEST test which includes transducers, detectors, and display devices. Recording devices are also included if they are the only means of displaying the emanations during the test.

3.1.13 (U) Detection System Sensitivity (DSS).—The input signal level (in dBμV rms, dBμV/m rms or dBμA/m rms) which produces a zero dB peak signal to rms noise voltage ratio at the detection system output.

3.1.14 (C) [redacted]

3.1.15 (U) Gate Time.—The hardware-selected time period during which the detection system output level is sampled for a peak by the digital voltmeter.

3.1.16 (U) Ground Plane.—A metal sheet or plate used for circuit returns and a common reference point for electrical signal potentials.

3.1.17 (U) Impulse Bandwidth.—The effective bandwidth of a device or detection system, which when multiplied by the impulse single-sided spectral density (volts/Hz) and mid-band gain of the device or detection system, yields the peak magnitude (volts) of the time domain response of the device or detection system to an impulse.

3.1.18 (U) Impulse Strength.—A measure of the amplitude-density spectrum of an impulse, expressed in amplitude per unit bandwidth. *Note:* In this document, impulse strength is measured in units of microvolts per MHz (equivalent rms sine wave). This means that impulse strength is .707 times the magnitude of the single-sided voltage density spectrum, which is also specified in microvolts per MHz (peak).

3.1.19 (U) Instantaneous Dynamic Range (IDR)—Range of signal levels which can be measured to the required accuracy without changing detection system amplifier gains or RF attenuation. This is a function of bandwidth, frequency, and gate time.

3.1.20 (U) Low Byte, High Byte.—Terms used to distinguish between two bytes which have been combined to form a word. Low bytes (and two-byte words) are often stored at even numbered memory locations (0, 2, 4, . . .) and high bytes are often stored at odd numbered memory locations (1, 3, 5, . . .).

3.1.21 (U) Maximum Measurable Signal (MMS).—Largest signal level which can be measured to the required measurement accuracy. This is peak measurement sensitivity plus IDR plus all available attenuation.

3.1.22 (U) Measurement Window.—The measurement time required to achieve measurement accuracy (as refers to automated detection systems).

3.1.23 (U) Microvolts Per Megahertz.—A unit of measurement for impulsive signals. The impulsive signal level in microvolts per megahertz (μV/MHz) rms is equal to the rms sine wave microvolts (unmodulated, applied to the input of the measuring circuit at its center frequency and resulting in a peak response in the circuit equal to that produced by the signal being measured) divided by the impulse bandwidth, in megahertz, of the measuring circuit. A more commonly used unit of impulsive signal measurements is decibels above one microvolt per megahertz (dBμV/MHz (equivalent rms sine wave)).

3.1.24 (U) Noise Floor.—Measurement of the noise which appears at the detection system digital voltmeter (DVM) with no signal input. Noise floor is the lowest level that can be displayed by the detection system and may be lower than peak measurement sensitivity.

3.1.25 (U) Nonreturn-to-Zero (NRZ).—A method of transferring information in which the signal level representing a binary 1 is held for as many units of time as there are consecutive "1's."

3.1.26 (U) Overall Detection System Bandwidth.—The 6 dB bandwidth of the detection system. The overall bandwidth includes the combined influence of all the bandwidth—determining circuits between the detection system input and output used.

3.1.27 (U) Overall System Bandwidth.—The effective 6 dB bandwidth of the automated detection system measured at the DVM output. This bandwidth is the smallest of the following: DVM bandwidth, video bandwidth, and predetection bandwidth.

3.1.28 (U) Parity Bit.—The bit whose value is determined by the number of "1's" in the associated group of bits, such that the total number of "1's" is always odd (odd parity) or always even (even parity). The parity bit is usually located in the most-significant-bit (MSB) position.

3.1.29 (U) Peak Measurement Sensitivity (PMS).—Lowest signal level which can be measured to the required measurement accuracy. This is a function of bandwidth, frequency, and gate time. For automated testing, this replaces DSS.

3.1.30 (U) Plain Text.—Intelligible text or signals which have meaning and which can be read or acted upon without the application of any decryption.

3.1.31 (U)

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3.1.32 (U) Receiver Band.—Range of frequencies in which the signal path remains constant through the detection system. The mechanical RF attenuators are not included in this definition.

3.1.33 (U) RED Analog Signaling Rate (Rd).—The signaling rate for RED analog signals is equal to the required bandwidth of the signal conveying the national security information and is expressed in hertz.

3.1.34 (U)

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3.1.34.1 (U)

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3.1.34.2 (U)

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3.1.35 (U) RED Signal Source.—Any circuit or circuit element, through which a RED signal is fed, which causes a change in signal current with respect to time (di/dt).

3.1.36 (U) RED Signal Type.—The characterization of a RED signal by the following features: code, format, parity, whether synchronous or asynchronous, whether serial or parallel, whether repetitive or non-repetitive, the number of bytes simultaneously processed, and whether baseband or a form of modulation or multiplexing.

3.1.37 (U) Return-to-Zero (RZ).—A method of transferring information in which a 1 is represented by a short pulse, so that the signal returns to zero between consecutive "1's."

3.1.38 (U) Scan.—A frequency sweep measurement process consisting of one or more scan segments performed sequentially.

3.1.39 (U) Scan Segment.—Procedure for tuning a detection system between two frequencies with fixed bandwidth and gate time while recording amplitude data.

3.1.40 (U) Settling Time.—Period of time required for the detection system to stabilize following a change of the signal path and period of time required for an external signal source to stabilize following a change. Settling times are typically associated with changes to the following system parameters: frequency, receiver band, bandwidth, attenuator, RF/IF/video gain, input port, and frequency and level of the calibration source.

3.1.41 (U) Shape Factor.—The ratio of the 60 dB bandwidth to the 6 dB bandwidth of the gain versus frequency response of a tunable detection system.

3.1.42 (U) TEMPEST Limited Ambient Emanations.—Ambient emanations at each test frequency below which compromising emanations, if present, could not be detected. Such ambient emanations are often below the peak ambient signals found at the test frequency.

3.1.43 (U) Transition Density (total).—The number of transitions from 1 to 0 plus the number of transitions from 0 to 1 which occur between consecutive bytes or words when the transfer occurs in an NRZ parallel format.

3.1.44 ~~(C)~~ T [redacted]

3.1.45 (U) Wobbulate.—A term used to describe the continual shifting of a cw tone from one frequency to another either in a discrete step or by slewing between the two frequency extremes.

3.1.46 (U) Word.—A group of bytes, stored or transferred together as a unit.

3.2. (U) Abbreviations

(U) A	– ampere
(U) a.c.	– alternating current
(U) ADCS	– average depth of correct symbol
(U) AGC	– automatic gain control
(U) AM	– amplitude modulation or amplitude modulated (Signal)
(U) BFO	– beat frequency oscillator
(U) BLC	– black line conduction
(U) b/s	– bits per second
(U) BW	– bandwidth
(U) CALCS	– calculated controlled space
(U) CE	– compromising emanations
(U) cm	– centimeter
(U) CORR E	– correlated emanations
(U) CRO	– cathode-ray oscilloscope
(U) CRT	– cathode-ray tube
(U) CS	– controlled space
(U) cw	– continuous wave
(U) dB	– decibel
(U) d.c.	– direct current
(U) DRE	– data related emanations
(U) DSN	– detection system noise
(U) DSS	– detection system sensitivity
(U) EMI	– electromagnetic interference
(U) EMR	– electromagnetic radiation
(U) ENVA	– environmental ambient
(U) ER	– electrical radiation
(U) EUT	– equipment under test
(U) EUTA	– equipment under test ambient
(U) fc	– center frequency (synonymous with tuned frequency when referring to tunable devices)
(U) FC	– fortuitous conduction
(U) FM	– frequency modulation or frequency modulated (signal)
(U) G	– giga-prefix for 10^9 multiplier
(U) Hz	– hertz
(U) IBW	– impulse bandwidth
(U) IDR	– impulsive dynamic response
(U) IF	– intermediate frequency
(U) IG	– impulse generator
(U) k	– kilo-prefix for 10^3 multiplier

(U) LC	- line conduction
(U) M	- mega-prefix for 10^6 multiplier
(U) m	- meter (linear measurement) or milli-prefix for 10^{-3} multiplier
(U) μ	- micro-prefix for 10^{-6} multiplier
(U) mm	- millimeter
(U) mms	- maximum measurable signal
(U) MR	- magnetic radiation
(U) n	- nano-prefix for 10^{-9} multiplier
(U) NRZ	- nonreturn-to-zero
(U) NTIC	- National TEMPEST Information Center
(U) OE	- other emanations
(U) p	- pico-prefix for 10^{-12} multiplier
(U) PIU	- parallel information unit per second
~~(C)~~ [redacted]	- [redacted]
(U) PLC	- powerline conduction
~~(C)~~ [redacted]	- [redacted]
(U) PLISN	- powerline impedance stabilization network
~~(C)~~ ~~(C)~~ [redacted]	- - [redacted]
(U) PMS	- peak measurement sensitivity
(U) Rd	- RED analog signaling rate or RED pulse width signaling rate or RED digital signaling rate
(U) RECCS	- recommended controlled space
(U) RF	- radio frequency
(U) RLC	- RED line conduction
(U) rms	- root-mean-square
(U) Rt	- RED transition time signaling rate
(U) RZ	- return-to-zero
(U) SNR	- signal-to-noise ratio
(U) T	- tesla (1 weber/m^2)
(U) TEP	- TEMPEST Endorsement Program
(U) Tt	- transition time
(U) V	- volt
(U) VSWR	- voltage standing wave ratio

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SECTION 4—BASIC REQUIREMENT

4.1. (U) Requirement and Definition of Compromising Emanations.

4.1.1 (U) Compromising emanations are unintentional intelligence-bearing signals which, if intercepted and analyzed, disclose the national security information transmitted, received, handled, or otherwise processed by any information-processing equipment.

4.1.2 (U) Equipment and systems to which the requirements of this document are levied shall not emit compromising emanations that exceed the applicable limits specified herein.

4.2. ~~(C)~~ Requirement Levels.—[redacted]

4.3. (U) Use of Alternative Testing Approaches.—The testing approaches and procedures specified in this document are derived from the best body of pure technical knowledge on TEMPEST testing known to the U.S. Government. Added to this are several moderating factors such as time to perform testing, cost of testing and availability of test instrumentation. Outside the scope of this document there may be other acceptable TEMPEST testing procedures that satisfy the criterion of an equipment under test meeting these limits. The sponsoring organization may approve alternative TEMPEST testing procedures not contained in this document, provided sufficient evidence is available to show that the limits defined in Chapter 12 can be met. Similarly, if a testing organization finds that the procedures defined in their TEMPEST testing plan are inadequate to perform a satisfactory TEMPEST test, they are obligated to provide an addendum to the test plan, as part of the TEMPEST test report, detailing any changes required to satisfactorily perform the tests. This modification can entail a change in test category, bandwidth selection, limits, etc.

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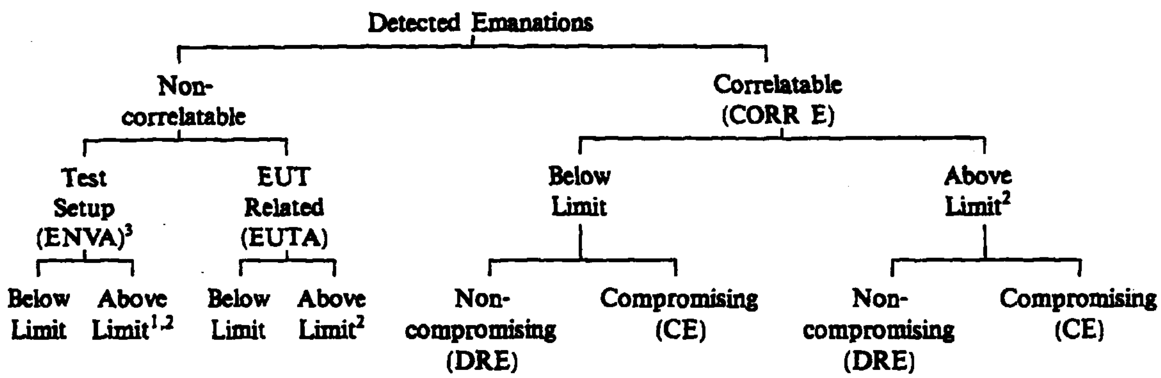
SECTION 5—GENERAL APPROACH

5.1. (U) Introduction.—This section presents general information, test requirements, and procedures for conducting a TEMPEST evaluation of an equipment, referred to herein as the equipment under test (EUT). Specific procedures and test requirements are presented in Chapters 7 through 12 and in the Appendices.

5.2. (U) Emanations Classification and Identification.—Figure 5-1 illustrates the classification and identification of the various types of detected emanations.



Notes:

1. Test setup ambient emanations shall not exceed limits applicable to tests of the EUT (except low frequency powerline noise, see 8.4).
2. The government reserves the right to make the final decision as to whether above-limit emanations have been properly identified.
3. Emanation designators (ENVA, etc.) are listed in paragraph 3.2.

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Figure 5-1.—Sequence of Emanations Identification, Manual Testing (U) (U)

5.3. (U) Extension of Specified Requirements.—If, in the course of testing or subsequent evaluation or analysis, a phenomenon or emanation is encountered which lies outside the specified requirements of this document, and this phenomenon or emanation could conceivably compromise the national security information being generated, processed, or transferred by the EUT, the tester shall be responsible for bringing this discovery to the attention of the sponsoring organization.

5.4. (U) RED Signaling Rate Determination.

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5.4.2 (U) (b)(3)-P.L. 86-36

5.4.2.1 (U) (b)(3)-P.L. 86-36

5.4.2.2 (U) [redacted]

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a. ~~(C)~~ [redacted]

b. ~~(C)~~ [redacted]

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Figure 5-2. (b)(3)-P.L. 86-36 **(U)**

5.5. (C) [redacted]

5.5.1 (C) [redacted]

5.5.2 (C) [redacted]

5.6. (U) Tunable and Non-Tunable Detection Systems.—Searches for emanations correlative to RED digital and RED analog signals shall be made using appropriate tunable and non-tunable detection systems. Refer to Chapter 7 for instrumentation requirements.

5.7. (U) EUT Operation During Testing.—During TEMPEST testing, exercise the EUT in all of its operational modes. All circuits which are active during a given mode of operation, shall be in operation when that mode is tested. As required by the EUT specification, adjust controls for optimum design performance. Unless otherwise specified by the sponsoring organization, interface lines shall be terminated in their normal load impedances (may be simulated if actual termination device is not required for the tests). Use normal interface signaling voltages and frequencies (i.e., waveforms). The EUT shall be operated at the signaling rates used to determine test category and instrumentation requirements. All doors, panels, etc. shall be opened or closed, as in normal operating condition. Refer to Chapter 9 for details.

5.8. (U) Test Environment.

5.8.1 (U) Test Chamber.—Perform all tests in a test environment wherein all ambient emanations are below the specified TEMPEST limit, except for powerline ambient emanations as discussed in Paragraph 8.4. This normally requires a shielded enclosure with the test instrumentation located outside the test environment.

5.8.2 (U) Ground Plane.—The shielded enclosures shall contain a solid copper or brass plate for use as a ground plane. Bond one side to the shielded enclosure.

5.8.3 (U) Ambient Signal Control, Test Setup.—Prior to commencement of formal TEMPEST testing of the EUT, evaluate the ambient emanations originating from the test setup with only the EUT turned off. Reduce signals above the appropriate TEMPEST limits to a level equal to, or below, the limits except for powerline conducted ambients as discussed in Paragraph 8.4.

5.9. ~~(C)~~ Emanations Search and Measurement.—[redacted] Tests may be made for either peak or correlated EUT emanations. [redacted] Emanation measurement procedures shall be conducted in accordance with Chapter 11.

5.10. ~~(C)~~ Signal Classes and Signal/Noise Measurements.

5.10.1 ~~(C)~~ Signal Classes/Denormalizing Factors.—[redacted]

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5.10.2 (U) Signal/Noise Measurements.—To provide data for analysis of correlated emanations, signal and noise measurements must be accomplished during the course of testing. Procedures for performing signal and noise measurements are given in Paragraph 11.5.

5.11. (U) Summary of Options.—The following list is a summary of the various options which may be exercised by the sponsoring organization to modify the requirements stated in this document. Only those options exercised shall apply; otherwise, the requirements shall remain as stated herein. The options are:

a. (U) If other than three years, the length of time detection system and facility certification approvals are valid (see Paragraphs 6.4 and 6.5).

b. (U) If correlated emanations, when measured below the limit, are to be analyzed (see Paragraph 6.3).

c. (U) If footnote 2 on Table G-4 shall apply. This reduces the maximum test frequencies from those specified in the table.

d. (U) If identification is required of peak emanations measured below the limit (see Paragraph 6.3.2).

e. (U) If submission of test setup ambient certification report is required prior to testing (see Paragraph 6.6).

f. (U) If data sheets are required in test reports (see Paragraph 6.7).

g. (U) If 6 dB bandwidth measurements are required (see Paragraph 7.4).

h. (U) If impulse bandwidth measurements are required (see Paragraph 7.4).

i. (U) If shape factor measurements are required (see Paragraph 7.4).

j. (U) If any test media are to be completely eliminated from testing requirements (see Paragraph 10.3).

k. (U) If analysis performed by the testing organization is not required (see Paragraph 10.2.5).

SECTION 6—DOCUMENTATION AND CERTIFICATION REQUIREMENTS

6.1. (U) Introduction.— This section details the documentation and certification requirements for verifying compliance with various levels of this standard. Sections 6.2 through 6.7 detail the requirements for Levels I and II and Section 6.8 for Level III.

6.2. (U) Test Plan Requirements/Contents.—Prepare a test plan that details the means of implementing and applying the test procedures to be performed in order to verify compliance with the applicable TEMPEST requirements of this document. The test plan, when executed, shall demonstrate and delineate wherein the equipment meets or fails to meet the requirements herein. The test plan shall include, but not necessarily be limited to, the items listed in the TEMPEST test plan outline in Appendix L.

6.3. (U) Data Recording.

6.3.1 (U) Correlated Emanations.—When correlated emanations are detected, they shall be measured and recorded regardless of whether the level is less than or in excess of the limit. When the level of the correlated emanation is less than the limit, it is not required to make any further determination as to whether the signal is CE or DRE, unless otherwise specified by the sponsoring organization. Where correlated emanations are not detected, sufficient measurements shall be made to ascertain the spectrum of TEMPEST-limited ambient emanations from the EUT and test environment.

6.3.2 (U) Peak Emanations.—When searches are made for peak emanations, record all emanations regardless of whether above or below the limit. When the level of the peak emanation is less than the limit, further identification is not required (e.g., whether ENVA, EUTA, etc.), unless otherwise specified by the sponsoring organization. For automated testing (Appendix E), the use of peak ambient emanation levels is acceptable, provided such emanation levels are below the applicable limits.

6.3.3 (U) Number of Measurements.—It is the intent of this document that sufficient measurements be made to ascertain the levels of the detected emanations and the frequency range over which the emanations are to be found. To achieve this, measurements should be made at definitive peaks and valleys over the test frequency range. The total number of emanation and noise measurements recorded and plotted shall be a minimum of three per decade of test frequency or three per detection system frequency band (near the beginning, center, and end of the decade or band), whichever is the greater number of measurements. Record all signal measurements in the units of the limit to which the measurements are to be compared.

6.3.4 (U) Data Sheets.—All data taken during testing of the EUT shall be recorded on data sheets. The data sheets shall include, but not necessarily be limited to, the following items:

a. (U) Date data was taken.

b. (U) Nomenclature of EUT, including model number, manufacturer, serial number and any other designation needed to identify it.

c. (U) Test performed (test reference number, if applicable), including line tested (designation, pin number, etc.) and function of line for conduction tests.

d. (U) Reference to approved test plan, applicable test plan items, EUT and detection system test setup.

e. (U) EUT operational mode or any other test conditions describing operation of EUT.

f. (U) Name(s) of person(s) performing tests, if different from test plan.

g. (U) Monitor, i.e., RED signal.

h. (U) Signal processing mode (serial or parallel, nonrepetitive or repetitive).

i. (U) For each measurement, record the following data.

(1) (U) Test frequency.
(2) (U) Overall detection system bandwidth. (Also, record predetection bandwidth used when employing a Demodulator.).
(3) (U) Calibrated source (signal generator, impulse generator) reading in appropriate units.
(4) (U) Conversion and correction factors listed separately and identified.
(5) (U) Adjusted reading (absolute emanation level) in appropriate units.
(6) (U) Specified TEMPEST limit at the particular test frequency.
(7) (U) Identification of emanation (see Paragraph 6.3.7).
(8) (U) Description of detected emanation (timing, 60 Hz, etc.).
(9) (U) Comments, e.g., any observations considered helpful in identifying or describing detected emanations or special test conditions.

6.3.5 (U) Emanation Recordings.—Provide recordings (photographs and/or strip charts or other data formats specified by the sponsoring organization) for EUT emanations that exceed the applicable limits herein. Recordings, representative of correlated emanations, shall be provided, whether above or below the applicable limits. Sufficient recordings shall be made to substantiate conclusions by the tester as to compliance or noncompliance of the EUT with this document or, when applicable, to provide adequate description of EUT emanations to allow the U.S. Government to determine compliance via signal analysis. The recordings shall be captioned and be accompanied by a brief description of what is being presented. Denote applicable timing, amplitude, and other relevant data (e.g., information ratio (IR) when calculated). The recordings shall clearly show the emanations.

6.3.6 (U) Graphs of Test Results.—Present all measured EUT emanations on graphs, together with ambient noise and applicable limits. Graphs shall be plotted in dB on a linear scale versus. frequency on a logarithmic scale. Graphs shall be scaled horizontally and vertically to show effectively the required test frequency range and the recorded levels. Units of measurement shall be included and shall be the same as those provided on the limits.

6.3.7 (U) Emanation Designators.—When performing searches for correlated emanations the following emanation designators[1] shall be used for identifying detected emanations and ambient signals (see Figure 5-1) on data sheets and graphs and for other results presented in the EUT test report:

CORR E — correlated emanations which consist of either:
CE — compromising emanations; specify whether above or below limit; or
DRE — data related emanations; correlated emanations which are not compromising.
OE — other emanations which consist of either:
EUTA — EUT TEMPEST-limited ambient (noncorrelated EUT emanations); or
ENVA — environmental TEMPEST-limited ambient.
DSN — detection system noise.

Note: DSN normally does not represent an emanation as such; however, the designator is included here for completeness.

6.4. (U) Test Instrumentation Certification Report.—All instrumentation (i.e., detection system and signal generators) used for TEMPEST testing must be certified and approved prior to performing laboratory TEMPEST evaluations. To obtain certification approval, the testing organization must provide descriptions and detection system sensitivity measurements of the test instrumentation and submit this data in a certification report to the sponsoring organization. The certification approval will be valid for a period of three years from the date of approval, unless otherwise specified by the sponsoring organization. (This does not alleviate the requirement that test instrumentation operation and calibration be verified at six-month

[1]Emanation designators are normally not applied to peak emanation searches.

intervals.) The test instrumentation certification report shall include, but not necessarily be limited to, the following items:

a. (U) Name of organization or firm conducting the test, contracting agency, and contract number.

b. (U) Date(s) of tests.

c. (U) List of the entire complement of TEMPEST test instrumentation, including the nomenclature, identification number, bandwidths,[2] frequency ranges, and manufacturer of receivers, antennas, probes, signal generators, oscilloscopes, etc.

d. (U) Sensitivities for each bandwidth used for both tunable and non-tunable detection system test configurations. For each media searched, the sensitivity data and bandwidths[3] used shall be presented in graphic form which compares the measured detection system sensitivity with the appropriate TEMPEST limits.

e. (U) Pertinent control settings of the test devices and instruments.

f. (U) All conversion and correction factors used for the applicable test frequency ranges.

g. (U) Block diagrams of the detection systems and calibration signal sources used.

h. (U) An explanation and justification of noncompliance with the sensitivity, bandwidth and frequency requirements. Specify the steps that were taken in an effort to comply with these requirements.

6.5. (U) Facility Certification Requirements.—The test facility must be certified and approved prior to performing laboratory TEMPEST evaluations. To obtain facility certification approval, the testing organization must provide descriptions and ambient measurements of its test facilities and submit this data in a facility certification report to the sponsoring organization. Facility certification approval will be valid for a period of three years from the date of approval, unless otherwise specified by the sponsoring organization. The facility certification report shall include, but not necessarily be limited to, the following items:

a. (U) Name of organization or firm conducting the certification tests, sponsoring organization and contract number (if applicable).

b. (U) Address of the organization or firm where test is to be conducted.

c. (U) Location of test facility within plant.

d. (U) Description of facility, e.g., manufacturer and construction of shielded enclosure, description of cable entrances, lighting, available electrical power, etc.

e. (U) Date(s) of certification tests.

f. (U) Levels versus frequency plot compared with the appropriate TEMPEST limits of radiated ambient signals in the test environment measured with tunable and non-tunable detection systems for the highest and lowest applicable test categories.

g. (U) Levels versus frequency plot compared with the appropriate TEMPEST limits of ambient levels on d.c. and a.c. main electrical powerlines under load when measured with tunable and non-tunable detection systems for the highest and lowest applicable test categories, if such lines will be used to power the EUT during tests.

Note: (U) The test chamber powerlines shall be filtered such that the ambient levels are equal to or less than the tunable BLACK line conduction (BLC) limits (Figure H-3 and Table H-3) at test frequencies above 150 times the powerline frequency when measured with a tunable detection system. This measurement shall be taken using a line impedance stabilization network (LISN) with the load side terminated in a resistive load drawing the same current (±25%) as the EUT.

[2]Include the overall detection system bandwidths at both the pre-detection and post-detection outputs.
[3]Include both pre-detection and overall detection system bandwidths when the post-detection output is to be used.

h. (U) Description of any unusual or potentially bothersome signal conditions, not evident from graphic data, which might cause masking.

i. (U) List of instrumentation, including serial numbers.

j. (U) An explanation and justification of noncompliance with facility requirements. Specify the steps which were taken in an effort to comply with these requirements.

6.6. (U) Test Setup Ambient Certification.—After the test setup has been determined, and before formal TEMPEST testing of the EUT has begun, the ambient signals originating from the test setup must be evaluated by the testing organization. The ambient signal levels must be documented in a test setup ambient certification report, which shall be submitted as an appendix to the test report. Submission and approval of the test setup ambient certification report is not required prior to testing, unless otherwise specified by the sponsoring organization. This certification report shall include, but not necessarily be limited to, the following items:

Note: Items *a.*, *f.*, and *g.* are required only when the sponsoring organization requires submission and approval of this report prior to testing.

a. (U) Name of organization or firm conducting certification tests, sponsoring organizations, and contract number, if applicable.

b. (U) Date(s) of tests.

c. (U) Functional description of EUT exerciser equipment, if different from that used for tests of the EUT.

d. (U) Levels versus frequency plot of radiated and conducted TEMPEST-limited or peak ambient signals in the test environment for the highest and lowest Rd or Rt data rates, (measured with the tunable and non-tunable detection systems and with the test setup installed). (Refer to Paragraph 8.4.)

Note: (U) Present the data obtained above in graphic form which compares the ambient levels with the applicable TEMPEST limits.

e. (U) Description of any unusual or potentially bothersome ambient conditions, not evident from graphic data, which might cause masking.

f. (U) List of instrumentation, including serial numbers, used during ambient-level survey.

g. (U) Block diagrams of EUT and detection system setups used during ambient-level survey.

h. (U) An explanation and justification of noncompliance with the ambient-level requirements. Specify the steps that were taken in an effort to comply with these requirements.

Note: (U) If the requirements of this paragraph are met, it follows that those of 6.5 are also met.

6.7. (U) Test Report.—At the completion of the TEMPEST tests, a report shall be written which contains, at a minimum, the following information:

a. (U) Abstract.

b. (U) Name of organization or firm conducting the tests, the sponsoring organization, and the contract number.

c. (U) Date(s) of tests.

d. (U) Test plan (Paragraph 6.2) and test setup ambient certification report (Paragraph 6.6) as appendices.

e. (U) Date of most recent calibration of test instrumentation prior to TEMPEST tests.

f. (U) Descriptions of any deviations from the test plan.

g. (U) Photographs or pictorial diagrams of detection system and EUT test setups with proper identification.

h. (U) Critical installation details determined as a result of either preliminary or formal testing, which are necessary in order that the EUT meets the limits of this document.

i. (U) Description of supplementary theoretical and empirical work that was accomplished.

j. (U) Identification and description of suppression devices using schematics, performance characteristics, and drawings, except where these data are required of the tester in other documents. If required of the tester in other documents, the appropriate document(s) shall be referenced.

k. (U) Test results, including the following items:

(1) (U) Data, including all emanation levels and noise graphed with the appropriate TEMPEST limit. An easily interpreted legend shall be used to identify the various emanation designators. (See Paragraph 6.3.7.)

(2) (U) A concise narrative description of the emanations detected in each test media and the frequency range in which these emanations were detected.

(3) (U) Visual recordings, with appropriate reference to test plan items, illustrating each type of detected correlated emanation.

(4) (U) Description of any phenomenon or emanation, encountered during testing, that lies outside of the specific requirements of this document, and which may conceivably compromise the national security information being processed by the EUT.

(5) (U) Data sheets, when requested by the sponsoring organization.

l. (U) Tabular summary of compromising emanation (CE) levels exceeding limits that shall include, but not necessarily be limited to, the following items:

(1) (U) Identification of line or test medium (i.e., electric radiation (ER) or magnetic radiation (MR)) with reference to appropriate test plan item.

(2) (U) Identification of RED signal to which above-limit CE is correlated.

(3) (U) Frequency ranges of above-limit CE.

(4) (U) Maximum level of above-limit CE normalized to (i.e., how much above) the appropriate limit. Indicate referenced limit.

(5) (U) Reference sections of TEMPEST test report or test results that further explain the extent of CE on that particular line or in that test medium.

m. (U) Description of signal analysis procedures and techniques used.

n. (U) Conclusions.

o. (U) Recommendations.

p. (U) Names of test personnel.

q. (U) Completed TEMPEST profile. (See Appendix M.)

6.8. (U) Abbreviated Documentation and Certification Requirements.—When permitted, the following reduced formats can be used to satisfy the documentation and certification requirements of this document.

6.8.1 (U) Test Plan/Report Requirements and Contents.—A test plan/report which contains, at a minimum, the following information:

a. (U) Title page including equipment nomenclature, equipment file number (if applicable), name of organization or firm conducting the tests, sponsoring organization, contract number, names and original signatures of TEMPEST personnel, date(s) of test.

b. (U) Description of EUT.

c. (U) Operating modes.

d. (U) RED signal description.

e. (U) Test matrix.

f. (U) Test messages.

g. (U) Critical installation details determined as a result of either preliminary or formal testing which are necessary in order that the EUT meets the limits of this document.

h. (U) Test results including the following items:

(1) (U) A concise narrative description of all above-limit emanations and the frequency range in which these emanations where detected.

(2) (U) Description of any phenomenon or emanation encountered during testing, that lies outside of the specific requirements of this document.

i. (U) Description of signal analysis procedures and techniques used.

j. (U) Conclusions.

k. (U) Completed page one of TEMPEST profile. (See Appendix M).

6.8.2 (U) Data Recording—All recorded data shall be maintained for on-call U.S. Government inspection.

SECTION 7—INSTRUMENTATION REQUIREMENTS

7.1. (U) Introduction.—The TEMPEST test instrumentation consists of detection systems and signal measurement standards which shall meet the performance requirements and operating characteristics specified herein. Measurements of sensitivity and bandwidth shall be performed as specified.

7.2. (U) Detection Systems: General Requirements.—Two basic types of detection systems are required: tunable and non-tunable. All systems shall have a 50 ohm input impedance, with the exception of conducted signal probes and electric radiation antenna interface amplifiers, which may be high impedance. Systems shall be selected that meet the frequency range and bandwidths required by the EUT internal RED signaling rate(s) of the equipment being evaluated. Systems selected shall meet the appropriate sensitivity requirements. Pulse-stretching circuits may be used on the output of any tunable detection system, provided the following requirements are met:

- Charge time constant $\leq$ 1/BW
- Discharge time constant $\leq$ 10/BW
- Signal level as observed on the oscilloscope is not reduced by more than 20 percent.

BW is the pre-detection bandwidth of the detection system. Pulse-stretching circuits shall not be used when measuring the sensitivity or bandwidth of the detection systems, even if the circuit is used during TEMPEST testing.

7.3. (U) Detection System Sensitivity (DSS) Measurements, General.

7.3.1 (U) Introduction.

7.3.1.1 (U) The detection system sensitivity (DSS), as defined in Paragraph 3.1.13, shall be measured for both tunable and non-tunable detection systems and shall apply to all signal classes. All DSS measurements shall use acceptable calibration sources (see Paragraph 7.5).

7.3.1.2 (U) Three methods are specified using sine wave substitution sources. One optional method using impulse generator substitution sources is presented as an alternative.[1] Method A requires a calibrated unmodulated carrier as the substitution signal, and is applicable when measuring the DSS at the pre-detection (e.g., IF) output of tunable detection systems and at the output of non-tunable detection systems. Method B requires a calibrated sine wave carrier, modulated at 30 percent by a sine wave at any suitable frequency less than, or equal to, the repetition rate as the substitution signal, and is applicable when measuring the DSS at the a.c.- or d.c.-coupled post-detection output. Method C is applicable when measuring the DSS at the d.c.-coupled post-detection output, where technical limitations prevent the use of a modulated sine wave carrier as the substitution signal. The required substitution signal for method C is a calibrated unmodulated carrier. Method D is an optional method to be used with impulse generator substitution sources. Method A, B, or C is recommended when sine wave substitution sources are available.

7.3.2 (U) DSS Measurements, Method A: Tunable Detection System Without Demodulator and Non-Tunable Detection System.—Measurements shall be made using a calibrated, unmodulated sine wave substitution source. A true rms a.c. voltmeter of adequate bandwidth (frequency range extending both below and above the detection system bandpass) shall be connected at the pre-detection output of the tunable detection system or output of the non-tunable detection system. The controls on the detection system shall be adjusted to establish a convenient reading of detection system noise on the output voltmeter. The calibrated source, with the cw frequency equivalent to the center frequency of the detection system, shall be adjusted to produce a reading on the output true rms a.c. voltmeter 3 dB higher than the reading of detection system noise (signal

[1] Other alternate DSS measurement methods are allowed if justified and approved by the sponsoring organizations.

plus noise-to-noise ratio of 3 dB). The level of the sine wave source output (expressed in dBμV rms), plus any appropriate conversion and correction factors, minus 3 dB, is the detection system sensitivity.

7.3.3 (U) DSS Measurements, Method B: Tunable Detection System With Demodulator.—Measurements shall use a calibrated sine wave carrier modulated 30 percent. A true rms a.c. voltmeter (not necessarily the same voltmeter as used for Method A) of adequate bandwidth (larger than the detection system bandwidth) shall be connected at the post-detection output (a.c.- or d.c.-coupled) of the detection system. The controls on the detection system shall be adjusted to establish a convenient reading of detection system noise on the output voltmeter. The calibrated source, with the carrier frequency equivalent to the center frequency of the tuned detection system, shall then be applied to the detection system input. The carrier amplitude of the signal substitution source shall be adjusted to produce a reading on a true rms a.c. voltmeter that is 3 dB higher, with the carrier modulated 30 percent, than with the carrier unmodulated (modulation turned off and on). The level of the sine wave source output (expressed in dBμV rms), plus any appropriate conversion and correction factors, minus 13 dB, is the detection system sensitivity.

7.3.4 (U) DSS Measurements, Method C: Tunable Detection System With Demodulator (d.c.-coupled output).—This method is used when technical limitations prevent the use of a modulated sine wave carrier as a substitution signal. Measurements shall be made using a calibrated, unmodulated sine wave substitution source. A true rms a.c. voltmeter of sufficient bandwidth (larger than the detection system bandwidth) and a d.c. millivoltmeter shall be connected at the post-detection output (d.c.-coupled) of the detection system. The calibrated source, with the cw frequency equivalent to the center frequency of the tuned detection system, shall then be applied to the detection system input. The substitution source amplitude controls shall be adjusted to produce a reading on the d.c. millivoltmeter approximately equal to five times the reading on the true rms a.c. voltmeter at the post-detection output (i.e., output signal- (d.c.) to-noise (a.c.) ratio approximately equal to five). Compute the actual output signal- (d.c.) to-noise (a.c.) ratio in dB. The level of the sine wave source output (expressed in dBμV rms), plus any appropriate conversion and correction factors, minus the above computed output signal- (d.c.) to-noise (a.c.) ratio in dB, is the detection system sensitivity.

Note: This method assumes a d.c.-coupled output from post-detection to d.c. meter. In some detection systems there may be an associated d.c. offset. Under these circumstances, the offset must be nulled out electronically or taken into account in ensuing calculations. If it is not, significant error can result because the static d.c. offset can be large in relation to the small change produced during the sensitivity measurements. Linear operation is assumed over the range being used.

7.3.5 (U) DSS Measurements, Optional Method D (IG): Tunable Detection Systems Without Demodulator and Non-Tunable Detection System.—Measurements shall be made using a calibrated IG and converting this measurement to dB ref 1μV rms using the impulse bandwidth (refer to Paragraph 7.4 for impulse bandwidth). A true rms a.c. voltmeter and a calibrated CRO of sufficient bandwidth frequency range, extending both below and above the detection system bandpass, shall be connected to the output of the detection system. With the IG connected to the input of the detection system and the IG level controls adjusted so that the detection system output impulsive signal is well below the noise, note the reading on the true rms voltmeter. Without disturbing the detection system settings, the IG level controls shall be adjusted to produce an impulsive signal on the CRO with a peak amplitude equal to five times the rms noise reading previously noted (14 dB peak signal-to-rms noise ratio). The level of the IG substitution source (expressed in dB ref μV/MHz, equivalent rms sine wave), plus the impulse bandwidth factor {$20 \log_{10}$ [IBW(MHz)]}, minus 14 dB, plus any appropriate conversion and correction factors, is the detection system sensitivity.

Note: Method D is not recommended when sine wave substitution generators are available or when the impulsive input/output characteristics of the detection system are not sufficiently linear over the initial 14 dB range.

7.4. (U) 6 dB and Impulse Bandwidth Requirements, Tunable and Non-Tunable Detection Systems.

7.4.1 (U) Refer to Appendix G for tables and figures. The detection system bandwidth requirements specified in this paragraph shall apply to the entire detection system, including the transducer[2] (antenna, voltage or current probe, etc.) and display device (CRO, strip chart recorder, etc.), unless it can be shown that the bandwidth of these devices will not restrict the bandwidth of the remainder of the detection system. The 6 dB bandwidth of the tunable or non-tunable detection system shall be measured in accordance with Appendix F if:

a. (U) The 6 dB bandwidth of the detection system is not known or cannot be calculated within an accuracy of ±20 percent.

b. (U) There is reason to doubt the manufacturer's published 6 dB bandwidth figures for any of the devices in the detection system (the most band-limited device being the most critical).

c. (U) Requested by the authority sponsoring the tests.

7.4.2 (U) The impulse bandwidth of the tunable or non-tunable detection system shall be measured in accordance with Appendix F if:

a. (U) There is reason to doubt the manufacturer's published impulse bandwidth figures.

b. (U) There is reason to believe that the impulse bandwidth of the detection system cannot be approximated by the 6 dB bandwidth of the detection system within an accuracy of ±20 percent.

c. (U) Requested by the authority sponsoring the tests.

7.4.3 (U) The 6 dB bandwidth requirements for all tunable and non-tunable detection systems shall be based on the EUT internal RED signaling rates determined in Paragraph 5.4. Bandwidths for tunable detection systems shall comply with the requirements specified in Figure G-2. For tunable detection systems which employ a Demodulator, the pre-detection bandwidth shall not be greater than three times the overall detection system bandwidth, as measured in accordance with Appendix F. The pre-detection bandwidth requirement applies to the intermediate frequency (IF) bandwidth for detection systems employing the heterodyne principle. The bandpass of non-tunable detection systems shall conform to the requirements presented in Table G-3. Tunable detection systems used for TEMPEST testing equipment may be comprised of non-tunable fixed-bandwidth amplifiers, provided the applicable bandwidth, sensitivity, and test frequency requirements of this document are met. The shape factor (see glossary) of the tunable detection systems shall not exceed 10:1[3], when measured at the center of each decade of frequency or the center of each tuning band, whichever is the greater number of measurements. The shape factor shall be measured if:

a. (U) The shape factor of the detection system is not known.

b. (U) There is reason to doubt the manufacturer's published shape factor figures for any of the devices in the detection system (the most band-limiting device being the most critical).

c. (U) Requested by the authority sponsoring the tests.

7.4.4 (U) The roll off of the non-tunable detection system gain-frequency response (each side or "skirt") shall be no less than 40 dB/decade.

7.5. (U) Signal Measurement Standards.—The acceptable calibration standards, for the purpose of this document, are impulse generators and sine wave generators.

7.5.1 (U) Impulse Generators.—Impulse generators (IGs) shall conform to the following requirements:

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[2] The bandwidths of some transducers (e.g., antennas, current probes) are very difficult or impractical to measure. In these cases, bandwidth measurements need not be made on the device, but precautions shall be taken to assure that the device does not limit the overall detection system bandwidth.

[3] An exception to the 10:1 shape factor, defined at the 60 dB and 6 dB points, shall be made only when the response of the detection system or device does not have sufficient dynamic range to allow a frequency measurement at the 60 dB point. In this event, the frequencies at the 40 dB point shall be measured; the ratio of the 40 dB bandwidth to the 6 dB bandwidth shall not exceed 6.5:1.

a. (U) Calibrated in dBμV/MHz (equivalent rms sine wave) (peak minus 3 dB) to a 50 ohm resistive load.

b. (U) Flat spectrum (±1 dB) over the detection system bandwidth at all test frequencies applicable to the bandwidth.

c. (U) Amplitude accuracy (±2 dB) calibrated at a minimum of three frequencies including the maximum, minimum, and center frequencies of the range over which they are to be used. Calibration of impulse generators shall be accomplished in accordance with the procedures in Appendix K.

7.5.2 (U) Sine Wave Generators.—Sine wave generators shall conform to the following requirements:

a. (U) Frequency accuracy: ±2 percent.

b. (U) Harmonic and spurious outputs 30 dB or more down from power level of the fundamental signal frequency. RF coupling which bypasses the signal generator attenuator should not induce errors in any measurements.

c. (U) Amplitude accuracy: ±1 dB for $fc \leq 1$ GHz
±3 dB for $fc > 1$ GHz

7.6. (U) Calibration Requirements and Operational Check.—Prior to the beginning of EUT evaluation, at the beginning of each working day, or at the request of the sponsoring organization, all test instrumentation shall be checked to assure proper operation. The operation and calibration of the instrumentation shall be verified at six-month intervals or immediately after exposure to conditions that might affect the calibration. All instrumentation (detection system, signal measurement standards, etc.) shall be calibrated in accordance with a recognized calibration procedure e.g., MIL-STD-45662. If, during any of the above tests, an equipment is found to be out of calibration or a departure from the requirements of this document is noted, the tester shall:

a. (U) Determine the cause(s) of deviations.

b. (U) Make necessary repairs and adjustments.

c. (U) Request the sponsoring organization to determine the necessity for rerunning affected tests.

SECTION 8—TEST ENVIRONMENT

8.1. (U) Introduction.—The electromagnetic environment in which TEMPEST tests are performed influences the ability to detect emanations from the EUT. Therefore, tests must be performed in a test environment wherein ambients are not above the applicable TEMPEST limits. This normally requires that the EUT be installed within a shielded test enclosure with the test instrumentation and exercising equipment located externally. Strict attention must be paid to grounding and the test setup to eliminate extraneous coupling paths which could produce erroneous test results.

8.2. (U) Test Chamber.—The test chamber shall provide a test environment where the internal spatial ambient signal is below the applicable TEMPEST limits. This normally requires an electromagnetically shielded enclosure. The test chamber shall provide a means of isolating the EUT from the EUT-exercising equipment and the test detection system (except the transducer). The test chamber shall be large enough to permit the test antenna being used to meet the requirements of Paragraph 10.3.1 and Figure 10.2. RF absorption material may be positioned within the test chamber to minimize measurement anomalies caused by standing waves and/or reflections. If absorption material is used, the certification report shall contain details on the type of material used and location relative to the EUT and enclosure walls in three dimensions.

8.3. (U) Test Configuration.

8.3.1 (U) Equipment Under Test Grounding/Configuration.

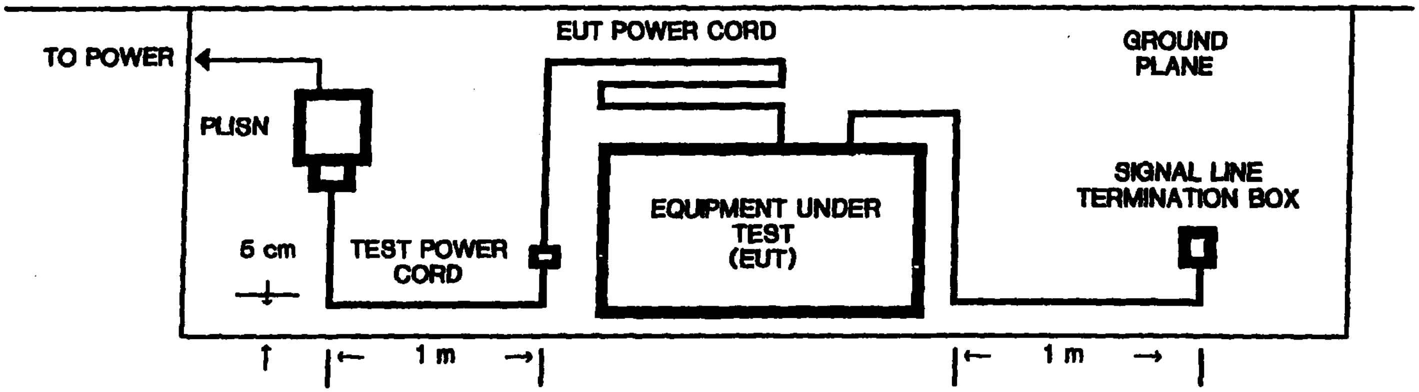
8.3.1.1 (U) The EUT shall be grounded, as in a normal installation, and shall be placed on a ground plane when tests are performed in a shielded enclosure. When tests are not performed in a shielded enclosure, a ground plane is not required. The ground plane shall consist of a table with a copper or brass top surface, unless the weight and/or size of the EUT makes this impractical; in this case, the ground plane shall be located on the floor of the test chamber. This ground plane shall meet the requirements of Paragraph 8.3.2. When bonding straps are required to complete the test setup (exclusive of bonding straps from the ground plane to the shielded enclosure), they shall be identical to those specified for normal installation. When an external lug or connector pin is available on the EUT for a ground connection and when in the normal operational installation the lug or pin is grounded, the lug or pin shall be bonded to the ground plane. If the installation requirements specify that the EUT not be grounded, or if the installation conditions are unknown, the EUT shall not be grounded. In the latter case, the EUT and ancilliary cables shall be placed on, but isolated from, the ground plane with nonconductive materials or standoff insulators 4 to 6 centimeters in height.

8.3.1.2.a (U) Level I.

(U) The type and installation of conduits and cables used in the EUT setup shall be the same as that specified for the operational installation. Otherwise, justification must be provided in the TEMPEST test plan (See Paragraph 6.2) as to why this will not be done.

8.3.1.2.b (U) Levels II and III.

(U) The type and installation of conduits and cables used in the EUT test setup shall be the same as that specified for the operational installation. When conduit is not required the EUT shall be installed as shown in Figure 8-1 to provide a standard test configuration. An appropriate two meter long unshielded power cord extension shall be connected between the end of the provided power cord and the PLISN. The PLISN is used to provide a standard termination for the power line. A signal line cable shall be at least two meters long. The signal line shall be installed as described in the notes on Figure 8-1. Additional signal lines may be connected, as required, between the shielded enclosure and the termination box shown in Figure 8-1. Provide justification in the test plan if the EUT test configuration cannot conform to that specified in this paragraph.



Note 1: Unshielded test power cord extension connecting PLISN to EUT power cord shall be two meters long with one meter section located as shown on edge of test ground plane (see Note 2).

2: All power and signal cables shall be 5 cm above the ground plane. Excess EUT power cord to be coiled behind equipment.

3: EUT shall be a minimum of 20 cm from the shielded enclosure wall.

4: The one meter segments of power and signal cable shall start no further than 10 cm from the EUT.

5: Signal line termination box shall be grounded using the shield of a shielded cable or the ground wire of an unshielded cable.

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Figure 8-1.—Standard Test Configuration (U)

8.3.1.3 (U) If either preliminary or formal tests reveal that certain installation details (reference grounding and shielding) are necessary in order that the EUT meet specification limits, then such details must be documented in the test report (see Paragraph 6.7). Likewise, any EUT test installation details which differ from that provided in the TEMPEST test plan shall also be documented in the test report.

8.3.2 (U) EUT Ground Plane.—The EUT ground plane (required for tests performed in a shielded enclosure) shall consist of a solid copper or brass plate that has a minimum thickness of 0.25 mm for copper, or 0.63 mm for brass, and is 1 square meter or larger in area, with the small side no less than 75 cm in length. At least one side of the ground plane shall be bonded to the shielded enclosure. If bonding straps are used, they shall consist of solid copper 0.25 mm minimum thickness, having a maximum length-to-width ratio of 5:1 and placed at distances no greater than 1 meter apart. The d.c. bonding resistance between the ground plane and the shielded enclosure shall not exceed 2.5 milliohms.

8.3.3 (U) Test Detection System.—The detection system shall be installed and configured so as to minimize undesired signal coupling from the EUT or EUT exerciser, and to minimize sensitivity degradation resulting from high-level environmental ambients. Sensitivity degradation can be minimized by using equipment case shields, interconnection wiring, and shielded terminations. If high-level ambient signals outside the test chamber persist in causing degradation to the detection system sensitivity, the detection system should be housed in a shielded enclosure separate from the EUT test chamber.

8.3.4 (U) EUT Exercising Equipment.

8.3.4.1 (U) Stimulus equipment used to exercise the EUT shall be located and connected so as to maintain the test ambient equal to or below the applicable limit. This equipment processes signals similar, or identical, to those processed by the EUT. Such signals could become inadvertently coupled into the detection system and be misinterpreted as EUT compromising emanations.

8.3.4.2 (U) The following steps can aid in reducing coupling effects from the stimulus equipment:

a. (U) Place stimulus equipment outside the test chamber.

b. (U) Shield and/or isolate stimulus equipment and detection systems.

c. (U) Use double-shielded cable (e.g., RG-223) whenever possible, and minimize cable length.

d. (U) Use filters or line isolators, whenever possible, on lines entering or leaving the chamber; filter passbands should be no greater than those required to pass stimulus signals.

8.4. (U) Test Setup Ambient Signal Control.—Test setup TEMPEST-limited ambient emanation levels, from the completed test setup and with only the EUT de-energized, shall be equal to or below TEMPEST limits for all applicable test categories. [redacted] (b)(3)-P.L. 86-36 The tests shall be performed with the EUT de-energized (power OFF) and with all other test setup equipment energized (power ON). All necessary test instrumentation and associated EUT exerciser equipment shall be connected and operated normally. ER and MR measurements shall be made in one of the planes or polarizations of the antenna that will be used during EUT TEMPEST tests and that results in the highest test environment ambient level readings. A minimum of one signal and one control line for each EUT connector or cable shall be selected for ambient certification from among those lines selected for the formal tests. Conducted signal measurement shall be made with reference to the test setup ground plane. Test setup ambient level measurements shall be performed and documented in accordance with Paragraph 6.6. If the TEMPEST-limited ambient levels cannot be determined (e.g., because sync or monitor signals are not available with the EUT de-energized), then the peak test ambient emanation levels found at each test frequency shall be required to be equal to or below the applicable test limits. For automated detection systems which do not provide the capability of measuring TEMPEST-limited ambient levels, the peak test ambient emanation levels found at each test frequency shall be required to be equal to or below the applicable test limits (except for powerline-conducted ambients as discussed above).

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SECTION 9—EQUIPMENT UNDER TEST OPERATION

9.1. ~~(C)~~ Operation.—[redacted]

9.1.1 ~~(C)~~ EUT Signaling Rate, Digital Signals. [redacted]

9.1.2 (U) EUT Signaling Rate, Analog Signals.—EUT RED analog test signals shall contain some form of amplitude or frequency variations. If a simulated RED data input signal is used, it shall take one, or a combination, of the following forms:

a. (U) A wobbulated cw signal centered near the signaling rate of the EUT that was used to determine the test category. The maximum frequency extremes (highest, minus lowest, frequency) shall be 10 percent of the center frequency and a maximum slew-cycle rate between 0.1 percent and 1 percent of the center frequency.

b. (U) An on-off cw signal that is centered near the signaling rate of the EUT that was used to determine the test category. The maximum keying rate shall be between 0.1 percent and 1 percent of the cw frequency.

9.1.3 (U) For Tunable Analog Voice Tests.—If a simulated RED data input signal is used, it shall take one, or a combination, of the following forms:

a. (U) [redacted]

b. (U) [redacted]

(b)(3)-P.L. 86-36

c. (U) [redacted]

9.1.4 (U) For Non-Tunable Analog Voice Tests.— If a simulated RED data input signal is used, it shall be a swept cw signal which covers the entire non-tunable bandpass test frequency range.

9.2. ~~(C)~~ [redacted]

[redacted]. Additional guidance is provided in Appendices C and D.

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SECTION 10—EMANATIONS SEARCH

10.1. (U) Introduction.—Adequate TEMPEST testing must be accomplished to establish whether an EUT emits CE above applicable limits. Emanations search requires that RED signals and sync/monitor signals are properly addressed, that correct bandwidths are selected, and that specified frequency ranges are covered. These searches shall be performed using both tunable and non-tunable detection systems. Searches shall be performed in all test media, unless otherwise specified by the sponsoring organization (see Paragraph 10.3 for guidance).

10.2. (U) RED Signal Identification/Selection and General Search Requirements.

10.2.1 ~~(C)~~ General.—[redacted]

10.2.2 ~~(C)~~ RED Signal Type and Signal Source, Definition of.—[redacted]

10.2.3 (U) RED Signal Identification/Selection.

10.2.3.1 ~~(C)~~ RED Signal Type Identification/Selection.—[redacted]

10.2.3.2 ~~(C)~~ RED Signal Source Identification/Selection.—[redacted]

10.2.3.3 ~~(C)~~ Selection of Signaling Rates for Testing.—[redacted]

[redacted]

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(b)(3)-P.L. 86-36

10.2.3.4 (U) RED Signal Flow Description/Diagram.—A RED signal flow description and diagram shall be used to ensure all RED signal types and major potential sources are identified, to show the relationship between signals identified, and to show the RED signaling rates. (See Figure L-1 for an example of a flow diagram.)

10.2.4 ~~(C)~~ Test Categories/Criteria.

10.2.4.1 ~~(C)~~ [redacted]

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[redacted]

10.2.6 (C) Procedure 2: Search for Peak EUT Emanations.—[redacted]

10.2.7 (U) Search Optimization.—If during the search for emanations described in Paragraphs 10.2.5 and 10.2.6 using the test categories and criteria described in Paragraph 10.2.4 CORR E is detected, the following procedures shall be used to optimize the detection system. The bandwidth of the detection system shall be increased and decreased to determine if the signal to noise ratio improves. If improvement occurs while the bandwidth is changed in one direction, continue to change the bandwidth in that direction until the maximum signal-to-noise ratio occurs without loss of intelligibility. The appropriate procedure described in Chapter 11 [redacted]

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optimization procedure is not to be interpreted to mean that a significant increase in test time be incurred, but rather it should be obvious to the tester that an improvement in the signal-to-noise ratio can be obtained with minimum effort.

10.3. (U) Test Media Examinations.—[redacted]

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[3] In some cases, the sponsoring organization may decide to not allow tests to be combined or eliminated.

[redacted]

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Table 10-1.—Test Media Requirements (U)

[redacted]

10.3.1 (U) Electromagnetic Radiation.—During radiation tests, all cables interconnecting the devices and components within the EUT shall be configured as in a normal installation. The test chamber shall be kept free of unnecessary equipment, cable, racks, personnel, and desks. Only the equipment and personnel essential to the test being performed shall be in the chamber.

10.3.1.1 (U) Antenna Position for Maximum Radiation.—A probing technique shall be used initially to locate the position of maximum radiation from the EUT. These checks shall be made at least every decade of frequency with the position of the antenna being adjusted for maximum pickup. For dipole, planar log periodic, horn and similar antennas, the antenna shall also be oriented (i.e., rotated and directed) for maximum pickup. (*Note:* This in effect adjusts the antenna for optimum polarization and pointed direction.) During formal measurements, the antenna shall be located at the position (and orientation) of maximum radiation determined by the probing technique. If no well-defined position of maximum radiation is found by the probing technique, the antenna shall be placed in a position judged by the test personnel to offer the greatest possibility for detecting radiation, e.g., positioned near or facing cable entrances, control panels, air intakes and exhausts, covers, doors and openings.

10.3.1.2 (U) Electric Radiation.—See Figure 10-1 for a typical electric radiated (ER) test setup.

a. ~~(C)~~ [redacted]

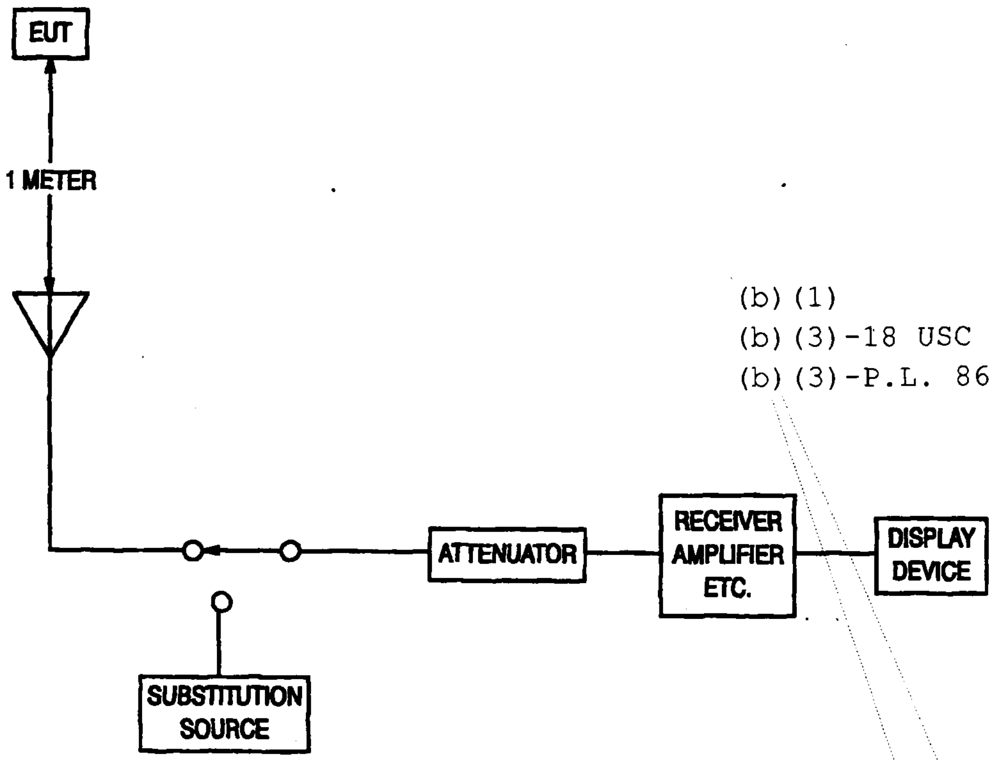

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Figure 10-1.—Typical Test Instrumentation for ER Tests (U)

b. (U) Antenna Ground Planes.—Whenever an unbalanced antenna (e.g., rod antenna) is used, the ground plane upon which the EUT is placed shall be extended to the base of the antenna and attached to the antenna base. A piece of copper or brass with the same specifications as the bonding straps specified in Paragraph 8.3 is acceptable for this purpose. Whenever a balanced antenna (e.g., dipole antenna) is used, regardless of whether a balun is employed or not, the detection system shall be grounded to the ground plane

c. ~~(C)~~ [redacted]

10.3.1.3 (U) Magnetic Radiation.

a. (U) Test Requirement.—See Figure 10-3 for a typical magnetic radiation (MR) test setup.

b. ~~(C)~~ [redacted]

10.3.2 ~~(C)~~ [redacted]

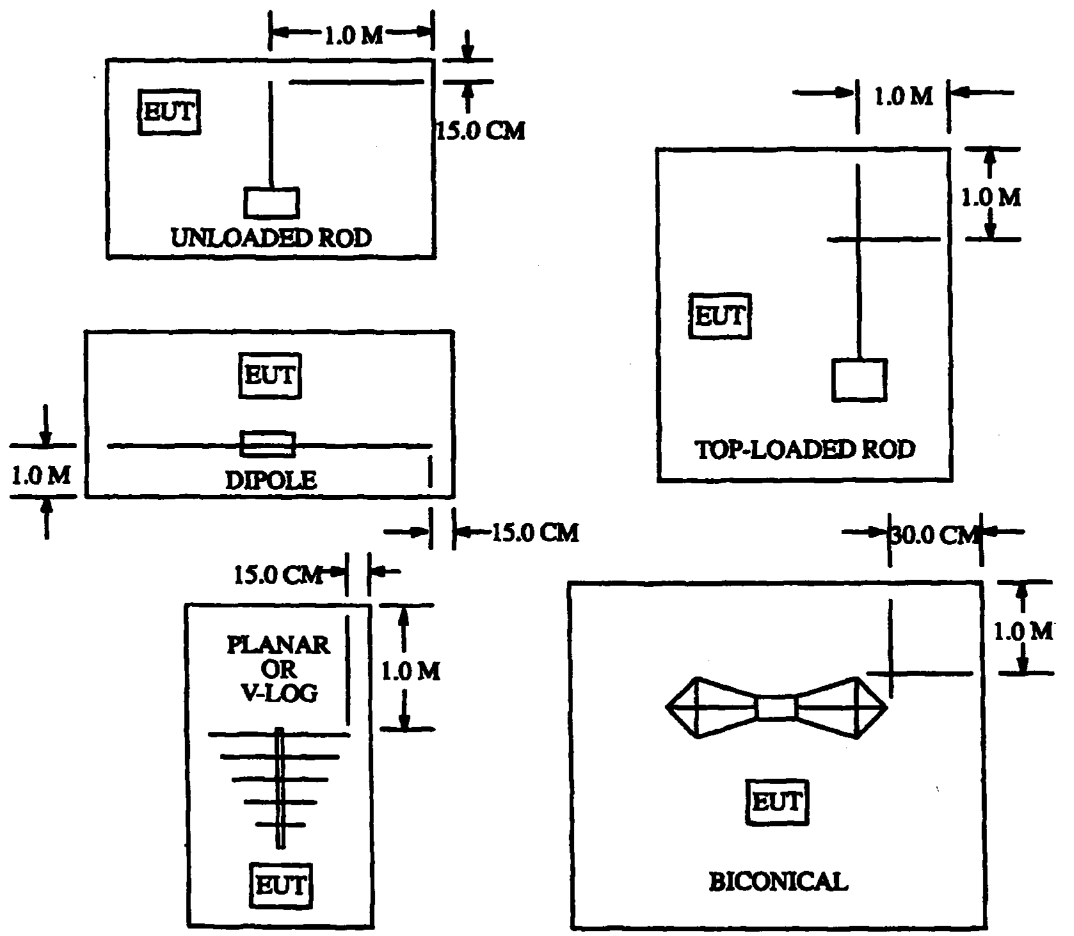

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Figure 10-2.—Required Minimum Antenna Distances From Metal Surfaces and Objects Other Than the EUT (U)

10.3.2.1 (U) Line Conduction—General Requirements (includes guidance for selection of lines to be tested).

a. ~~(C)~~ [redacted]

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b. ~~(C)~~ [redacted]

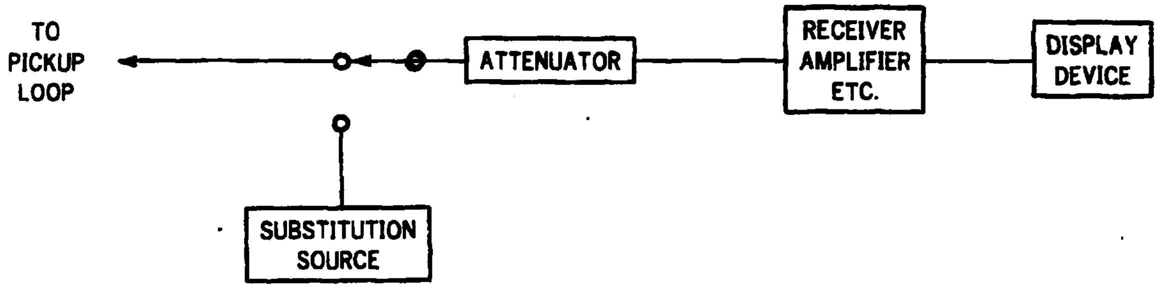

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Figure 10-3.—Typical Test Instrumentation for MR Tests (U)

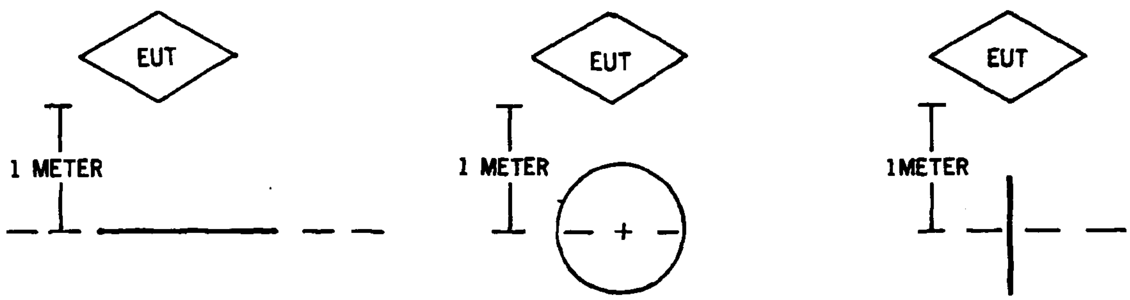

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Figure 10-4.—Orientation of MR Pickup Loop (U)

1. (U)

2. (U)

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3. (U)

c. ~~(C)~~

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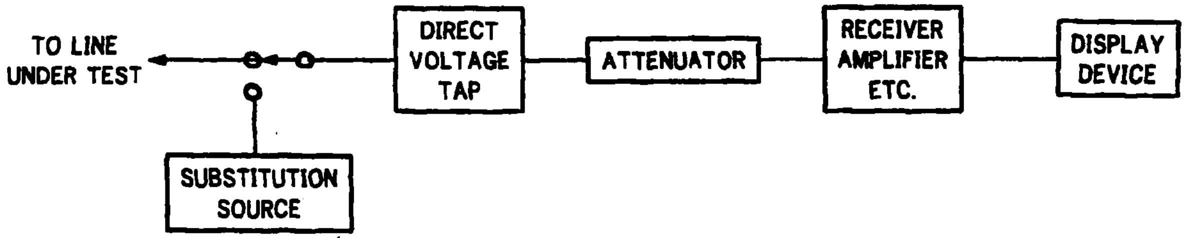

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Figure 10-5.—Typical Test Instrumentation for Line Conduction Tests (excluding powerlines) (U)

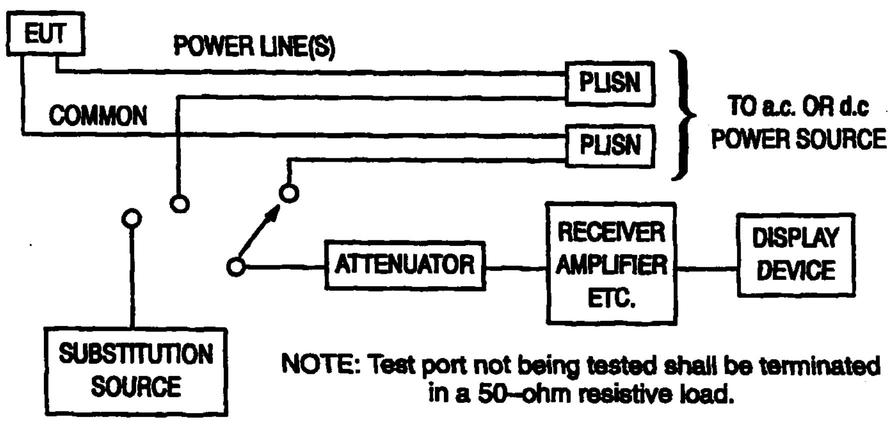

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Figure 10-6.—Typical Test Instrumentation for PLC Tests (U)

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[redacted]

10.3.2.6 (U) **Black Signal and Control Line Conduction.**—Black signal, control, indicator and clock lines shall be examined. EUT lines that are not necessarily terminated when in an actual operational setup need not be terminated when tested. All other lines shall be terminated in their normal load impedance. See Figure 10-5 for typical detection system setup.

10.3.3 (U) RED Line Emanations.

10.3.3.1 ~~(C)~~ Requirement.—[redacted]

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10.3.3.2 (C) [redacted]

b. (U) The detection system shall be connected to the line under test in such a fashion as to minimize the likelihood of producing distortion or perturbations of the waveform on the line. In the lower test frequency ranges where the 50 ohm detection system causes distortion of the waveform under surveillance, high-impedance voltage probes, current probes, resistive-matching networks, and high-pass filters may be used, provided the bandwidth and sensitivity requirements are met and the transfer characteristics of the [redacted]

probes are accurately known. Any correction or conversion factors associated with such probes or pickup devices shall be applied to the measurement in order to determine the voltage actually appearing on the line under test. See Figure 10-5 for a typical detection system setup. All other requirements specified for conduction tests are applicable.

10.3.3.7 ~~(C)~~ [redacted]

10.4. (U) Test Frequency Ranges and Bandwidths.

[redacted]

10.4.3 (U) Non-Tunable Frequency Coverage and Bandpass Requirements.—Non-Tunable test frequency coverage and bandpass requirements are specified in Table G-3. Note that for a.c. powerlines, the

[redacted]

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SECTION 11—EMANATIONS MEASUREMENTS

11.1. (U) Introduction.—The measurement procedures herein are applicable when measuring correlated emanations, peak EUT emanations, and when separate signal and noise measurements are required. Emanations measurements are required when performing emanations searches in each test media, using tunable or non-tunable detection systems.

11.2. ~~(C)~~ General.—[redacted] Deviation from this procedure is permitted only when an accurately pre-calibrated device (e.g., antenna and associated matching device or probe) precedes the point of signal substitution. When such devices are used, all appropriate conversion and correction factors shall be added to the substituted signal level to obtain the level of the detected emanation. When using a loop antenna, the series injection measurement technique (injecting a calibrated current into the loop) shall not be used. If the detection system is equipped with a beat frequency oscillator (BFO) or automatic gain control (AGC), all measurements shall be made with the BFO[1] and AGC turned off. An attenuator shall be inserted in the detection system pickup line only when the amplitude of the incoming interference signal is such that the detection system input circuits are over-driven. The attenuator shall have a characteristic impedance of 50 ohms (±3 ohms) over the test frequency range in which it is employed. Care shall be taken to ensure that accessory equipment (EUT exerciser equipment, oscilloscopes, earphones, etc.) and test setup ground loops do not affect measurement accuracy.

11.3. (U) Measurement Accuracy.—All measurements made in accordance with this document shall have the following accuracies:

a. (U) Frequency accuracy: ±5%

b. (U) Amplitude accuracy: ±2 dB for fc ≤ 1 GHz
±4 dB for fc > 1 GHz

11.4. (U) Emanations Measurement Procedures.

11.4.1 (U) Correlated and Peak EUT Emanations.

11.4.1.1 ~~(C)~~ [redacted]

11.4.1.2 ~~(C)~~ Peak EUT Emanations.—[redacted]

11.4.2 ~~(C)~~ General Measurement Methods.—[redacted]

[1]The BFO feature may be desirable when searching for narrow bandwidth CE.

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Figure 11-1.—Examples of Signals to be Measured, Method 1 (U)

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Figure 11-2.—Examples of Signals to be Measured, Method 2 (U)

11.4.2.3 ~~(C)~~ [redacted]

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11.4.3 (U) Application of Measurement Methods.—The following paragraphs address the application of the measurement methods, described in Paragraph 11.4.2, for measuring emanation and noise levels during searches performed in accordance with Chapter 10.

11.4.3.1 (U) ER, MR and BLC Measurements.—The following measurement methods apply when performing ER, MR, and BLC emanation searches.

a. ~~(C)~~ [redacted]

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Figure 11-3.—Examples of Signals to be Measured, Method 3 (U)

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[redacted]

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Figure 11-4.—Positive/Negative Signal Examples (U)

[redacted]

b. ~~(C)~~ [redacted]

[redacted]

11.4.3.2 ~~(C)~~ [redacted]

11.4.3.3 (U) RED Line Emanations Measurements.—The following procedures apply when measuring RED analog or RED digital signal energy spectrum on RED lines. The measurements are performed using a tunable detection system with or without a Demodulator.

a. (U) RED Analog Signal Energy Spectrum Measurements.

(1) (U) With demodulator.—The procedure outlined in Paragraph 11.4.3.1.a shall apply.
(2) (U) Without demodulator.—The procedure outlined in Paragraph 11.4.3.1.b shall apply.

b. (U) RED Digital Signal Energy Spectrum Measurements.

(1) (U) With Demodulator.—The recommended method is Method 3 (IG). The resultant measurement using Method 3, plus any appropriate conversion and correction factors, is equal to the level of the signal energy of the RED digital signal(s) at that particular test frequency. As an alternative, Method 1 (first choice) or Method 2 (second choice; using crest/trough method at d.c. post-detection outputs) may be used. The resultant measurement, using Method 1 or 2, minus the impulse bandwidth factor {20 $\log_{10}$ [IBW(MHz)]}, plus any appropriate conversion and correction factors, is equal to the level of the signal energy of the RED digital signal(s) at that particular test frequency.

(2) (U) Without Demodulator.—The recommended method is Method 3 (IG). The direct method is recommended in lieu of the crest/trough method. The resultant measurement, using Method 3, plus any appropriate conversion and correction factors, is equal to the level of the signal energy of the RED digital signal(s) at that particular test frequency. As an alternative, Method 2 may be used. The direct method is recommended in lieu of the crest/trough method. The resultant measurement, using Method 2, minus the impulse bandwidth factor {20 $\log_{10}$ [IBW(MHz)]}, plus any appropriate conversion and correction factors, is the level of the signal energy of the RED digital signal(s) at that particular test frequency.

11.5. (U) Signal and Noise Measurements.

11.5.1 (U) General.—When correlated emanations are detected, and analysis is required, both signal and noise measurements of the detected output shall also be performed and documented. The minimum number of signal and noise measurements required for detected CORR E is three per decade. If more than three per decade are found, the three worst-case (i.e., highest observed signal-to-noise ratio) emanations shall be measured. The intent is to measure characteristics related to the correlation component of the detected emanation. Figure 11-5 shows a correlated emanation in the presence of equipment ambient. An appropriate measurement window, W, is shown for this correlated emanation. The objective is to select W such that noise not contributing to the TEMPEST-limited ambient is ignored in proximity to the correlated emanation. All signal and noise measurements are made within W. The noise measurement made in W is the TEMPEST-limited ambient. When performing peak EUT emanation measurements (Paragraph 11.4.1.2), use the measurement window defined in Appendix E, Paragraph 3.4. Noise measurements shall be made using either a statistical signal analyzer (or equivalent measurement system) that measures the mean and variance of the sampled video voltage; or a visual "A-scope" presentation.

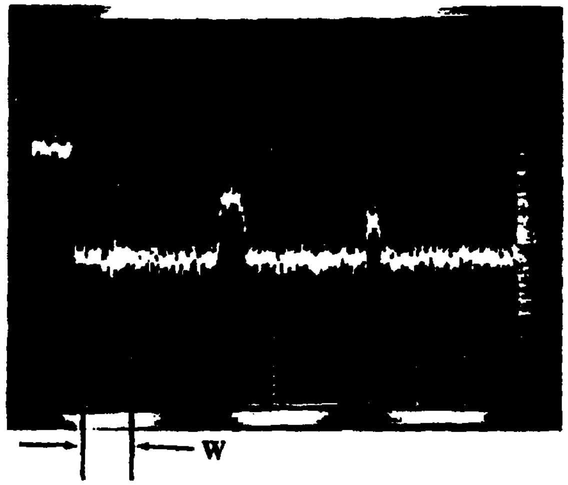

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Figure 11-5.—Example of Noise Measurement Window, W (U)

11.5.2 (U) Procedure 1: Statistical Measurements.—Using this procedure, the voltage parameters of the detected emanation to be measured and documented are the peak signal mean ($\bar{S}_p$) and the rms noise (N_e). It may be necessary to document sets of signal and noise measurements corresponding to the test pattern used (e.g., test patterns A, B, or C for parallel processed digital signals, discussed in Appendix C).

11.5.3 (U) Procedure 2: Visual "A-scope" Measurements.—Using this procedure, the voltage parameters of the detected emanation to be measured are the peak signal mean ($\bar{S}_p$) (maximum polarity for bi-polar signals) and the peak-to-peak noise (N_{pp}). All measurements shall be performed using the "A-scope" presentation. The following paragraphs discuss examples illustrating the visual "A-scope" measurements for serial (analog or digital) and parallel (digital) signal processing.

11.5.3.1 (U) Serial Signals.—Figure 11-6 illustrates an ideal emanation related to a signal serially processed. The output levels (i.e., voltage or vertical divisions) to be measured are E_1, E_2, and E_3.

a. (U) The noise measurement is equal to:

$$N = E_3 - E_1$$

Note: The intent is to measure the noise that occurs *with* the signal. A simpler method may be used when it is obvious that the baseline noise appears equal to the noise on the signal. In this case, it is acceptable to measure the baseline noise.

b. (U) The signal measurement is equal to: $\bar{S}_p = E_2$

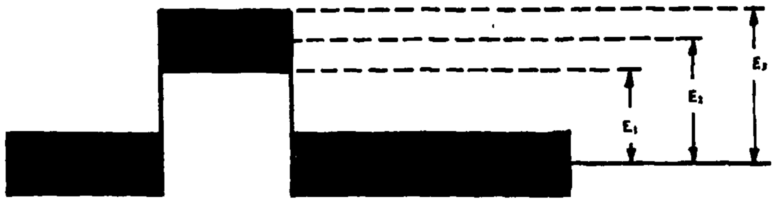

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Figure 11-6.—Signal/Noise Measurements: Serial Signal Example (U)

11.5.3.2 (U) Small Signal-to-Noise Ratios.—When correlated emanations are characterized by small signal-to-noise ratios, performing separate signal and noise measurements may be difficult. An alternate procedure may be used which requires a visual measurement representing the signal plus noise, and a visual measurement representing the noise alone. Figure 11-7 illustrates this type of emanation (ideal). The voltage levels to be measured are E_1 and E_2.

a. (U) The noise measurement is equal to:

$$N_{pp} = E_2 - E_1$$

b. (U) The signal plus noise measurement is equal to:

$$\bar{S} + N_p = E_2$$

c. (U) The signal level is computed using the following equation:

$$\bar{S} = E_2 - N_{pp}/2 = (E_2 + E_1) \div 2$$

Note: As in previous noise measurements, the baseline noise (N_{pp}) may be used when it is obvious that it appears equal to the noise on the signal. This procedure can be extended to apply to emanations related to a signal that is either serially or parallel-processed.

11.5.3.3 (U) Extensions/Precautions.—The previous examples illustrate the signal and noise measurement parameters to be measured using simplified signals. While it is recognized that many signals encountered in TEMPEST testing do not appear in this form, the concept remains the same and the measurement procedure should be easily extended. The noise voltage mesurements shall relate only to the noise that limits detectability of the signal; the limiting noise is not necessarily the maximum noise level (e.g., do *not* measure 60 Hz powerline noise that is present but does not limit detectability of the signal).

11.5.4 (U) Relating Statistical and Visual Measurements.—The statistical and visual measurements outlined in Paragraphs 11.5.2 and 11.5.3 are not precisely related because of the subjective nature of the visual measurements. However, based on simplifying assumptions[2], the statistical and visual noise measurements can be related by:

$$N_{pp}\,(db) = N_\sigma\,(db) + 14\ db$$

[2]The 14 dB factor is based on the assumption that $N_{pp} = (2)(2.58)\ N_\sigma$. This is discussed in Appendix B of NACSIM 5002.

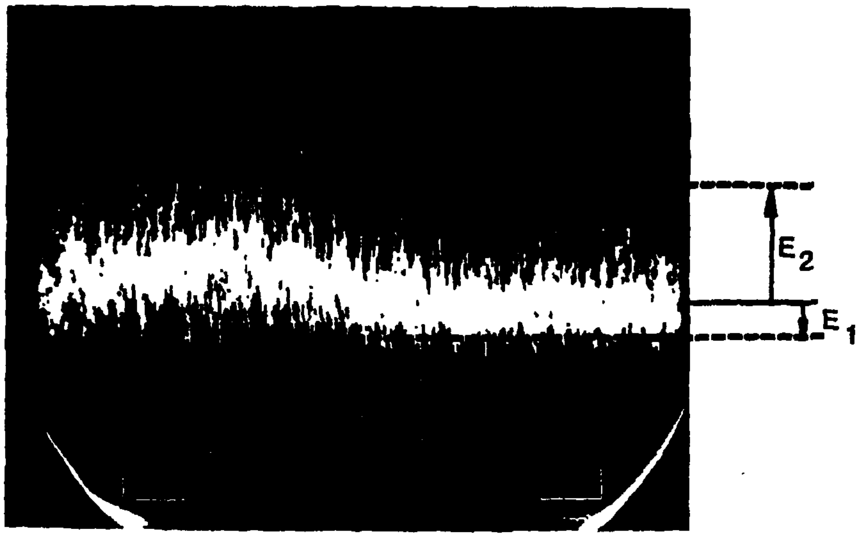

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Figure 11-7.—Small Signal-to-Noise Ratios Example (U)

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SECTION 12—LIMITS

12.1. (U) General.

12.1.1 (U) Compromising emanations limits (curves and tabulated breakpoints) are contained in Appendix H (Level I), Appendix I (Level II), and Appendix J (Level III).

[redacted]

12.2. (U) Electromagnetic Radiation Limits.

12.2.1 (U) Electric Radiation Limits.—The electric radiation limits apply to tests performed with an E-field antenna located one meter from the EUT. One meter from the EUT is the standard measurement point.

12.2.2 (U) Magnetic Radiation Limits.—The magnetic radiation limits apply to tests performed with an H-field antenna with the center of the loop located one meter from the EUT. (No MR tests are required for category I or J; therefore, there are no limits for these categories.)

12.3. (U) BLACK Line Limits.

12.3.1 ~~(C)~~ BLACK Line Conduction Limits.— [redacted]

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APPENDIX A

CLASSIFICATION OF COMPROMISING EMANATIONS INFORMATION

A.1. (U) General.—The Director, National Security Agency, has responsibility for providing guidance on security classification and control of information pertaining to compromising emanations, including the releasability of this information to foreign nationals.

A.2. (U) Scope.—These guidelines cover information relating to the control of compromising emanations and supplement those in NTISSI-4002, dated 5 June 1986.

A.3. (U) Rationale.—Compromising emanations information shall be classified based on provisions of Executive Order 12356, "National Security Information," dated 2 April 1982.

[redacted]

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b. (U) The following guidelines describe various aspects of the compromising emanations problem and provide levels of classification which shall be assigned to this information. The levels of classification indicate the minimum levels of protection which shall be afforded a particular category of compromising emanations information. (It may be necessary to assign higher levels of classification to specific categories of compromising emanations information depending on such factors as: [redacted] (b)(3)-P.L. 86-36

c (U) [redacted] (b)(3)-P.L. 86-36 No person is entitled to possess or access information concerning compromising emanations solely because of his office, position, or type of clearance. No information related to the subject of compromising emanations shall be released to the public through the press, advertising, radio, TV, or other public media without specific written approval from the Director, National Security Agency.

d. (U) The discussion of TEMPEST information on commercial telephones is discourage [redacted] (b)(3)-P.L. 86-36 (b)(3)-P.L. 86-36 Attempts to "talk around" classified TEMPEST information must be avoided.

A.4. (U) Classification Marking.—In accordance with the following guidelines, classification markings for compromising emanations information shall be reflected in each paragraph, and at the top and bottom of each page and the cover sheets:

[1]Does not apply to contractors.

a. (U) For Department of Defense contractors and bidders—
in accordance with the directives of DoD 5220.22-M and the authorization and guidelines of the contractor's/bidder's DD-254.

b. (U) For all other contractors and bidders—
in accordance with appropriate department or agency guidance.

c. (U) For U.S. Government testing agencies—
"Classified by NSA/CSSM 123-2
Declassify On: Originating Agency's Determination Required"

A.5. (U) Foreign Release.—Classified TEMPEST information may be released to foreign nationals only when authorized by the Director, National Security Agency. Address requests for authorization to Director, National Security Agency, ATTN: S1, Fort George G. Meade, MD 20755-6000. Each publication which contains classified TEMPEST information shall have the following notation placed on its letter of promulgation, handling instructions or title page.

> "This publication or the information it contains may not be released to foreign nationals without prior specific approval from the Director, National Security Agency. All approvals will identify the specific information extracted from this publication authorized for release to specific foreign holders."

A.6. (U) Specific Guidelines.—This appendix contains classification guidelines which relate only to TEMPEST information. Terms, details of testing, test data, etc., related to standard radio frequency interference (RFI), electromagnetic interference (EMI) or electromagnetic compatibility (EMC) testing are unclassified and are not addressed in these guidelines. These guidelines cover the most common occurrences; if circumstances arise which are not covered by these guidelines, the originator must determine a classification based on the rationale contained in Paragraph A.3. above.

A.7. (U) TEMPEST Classification Chart Outline.—The following is a TEMPEST classification chart to assist in specific problems. The contents of this chart are:

a. (U) Terms (when associated with TEMPEST) and definitions.

b. (U) Policy.

c. (U) General TEMPEST statements.

d. (U) Procedures, techniques, and specifications.

e. (U) Laboratory tests.

A.8. (U) TEMPEST Classification Chart.

a. (U) Terms (when associated with TEMPEST) and Definitions.—The definitions for the terms listed herein are contained in Appendix A, NACSIM 5000.

Terminology	*Classification*	
	Term	*Definition*
1. (U) Acoustic Emanation	UNCLASSIFIED	CONFIDENTIAL
2. (U) Average Depth of Correct Symbol (ADCS)	UNCLASSIFIED	CONFIDENTIAL
3. (U) Bit Density Information	UNCLASSIFIED	CONFIDENTIAL
4. (U) Compromising Emanations (CE)	UNCLASSIFIED	UNCLASSIFIED
5. (U) Controlled Space (CS)	UNCLASSIFIED	UNCLASSIFIED
6. (U) Digraphic Information	UNCLASSIFIED	CONFIDENTIAL
7. (U) Emission Security	UNCLASSIFIED	UNCLASSIFIED
8. (U) Fortuitous Conduction (FC)	UNCLASSIFIED	UNCLASSIFIED

Terminology	*Classification* Term	*Classification* Definition
9. (U) Information Ratio (IR)	UNCLASSIFIED	UNCLASSIFIED
10. (U) Line Conduction (LC)	UNCLASSIFIED	UNCLASSIFIED
11. (U) Monographic Information	UNCLASSIFIED	CONFIDENTIAL
12. (U) Polygraphic Information	UNCLASSIFIED	CONFIDENTIAL
13. (U) Powerline Conduction	UNCLASSIFIED	UNCLASSIFIED
14. (C) [redacted]		
15. (C)		
16. (C)		
17. (U) Short Cycle Operation	UNCLASSIFIED	CONFIDENTIAL
18. (U) Skewed Parallel Signal	UNCLASSIFIED	CONFIDENTIAL
19. (U) Telecommunications	UNCLASSIFIED	UNCLASSIFIED
20. (U) TEMPEST	UNCLASSIFIED	UNCLASSIFIED
21. (U) Transition Density Information	UNCLASSIFIED	CONFIDENTIAL

Statement	*Classification*
b. (U) Policy.—Information indicating the U.S. Government's national-level policies, programs, responsibilities, or resources for the control of compromising emanations.	CONFIDENTIAL
c. (U) General TEMPEST Statements.	
(1) (U) The statement, without giving details, that a specific plaintext processing equipment/system has TEMPEST deficiencies. (If any specifics are provided, see Paragraph A.8.e).	UNCLASSIFIED
(2) (U) The statement that a TEMPEST-suppressed version of a plaintext processing equipment/system is available. (If any specifics are provided, see Paragraph A.8.e).	UNCLASSIFIED
(3) (U) Schematics or information regarding the technical or performance characteristics of specific countermeasures (circuits, devices or components) which are identified as being used to control or eliminate the following types of TEMPEST problems if not associated with a specific equipment or system. (If a specific equipment or system is identified, see Paragraph A.8.e).	
(a) (U) Electromagnetic radiation or line conduction	UNCLASSIFIED
(b) (C) [redacted]	[redacted]
(4) (U) The statement that a specific equipment/system has been scheduled for a TEMPEST test.	UNCLASSIFIED
(5) (U) Complete or essentially complete listings of TEMPEST documents.	UNCLASSIFIED
d. (U) Procedures, Techniques and Specifications.	
(1) (U) Procedures, techniques, and specifications for the *detection* of compromising emanations which compromise plaintext.	CONFIDENTIAL
(2) (U) Information revealing the specific analytic methods or techniques used *to extract information* or otherwise exploit compromising emanations related to plaintext.	SECRET
(3) (U) Information revealing newly discovered, or certain special, techniques for interception, analysis, or testing.	TOP SECRET

e. (U) Laboratory Tests.—The following statements provide guidance relative to system and equipment TEMPEST evaluations.

(b)(1)
(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

Statement	*Classification*
(1) (U) Test results, or other information, including the information ratio (IR), which indicates that the following TEMPEST vulnerabilities exist with a specific equipment/system which process national security information.	
(a) (U) Emanations within a CS or below a specification limit (i.e., CE) which compromise plaintext.	CONFIDENTIAL
(b) (C) [redacted]	
(2) (U) The statement, without revealing specific details, that an equipment/system has been modified to meet TEMPEST requirements or that TEMPEST vulnerabilities have been corrected.	UNCLASSIFIED
(3) (U) Information that specific TEMPEST vulnerabilities have been corrected with a specific equipment/system.	CONFIDENTIAL
(4) (C) [redacted]	

Note: Schematics and drawings which include TEMPEST [redacted] (b)(3)-P.L. 86-36 (b)(3)-P.L. 86-36 not classified.

APPENDIX B

DESCRIPTION OF CORRELATED SIGNALS

B.1. (U) The tester has the responsibility to describe clearly and accurately any correlated signals detected during TEMPEST testing. Table B-1 depicts the relationship between displayed emanations and types of correlation. This table is not meant to be all-inclusive. Figures B-1 through B-8 illustrate some examples of correlated emanations. The upper trace(s) is the monitor signal (i.e., RED signal) and the bottom trace(s) is the detected signal. The photographs are representative of only a few of the possible types of correlation. Also, the photographs depict a high signal-to-noise ratio to facilitate reproduction and to demonstrate easily recognizable correlation. Under certain test conditions, the correlation may be far less obvious and distinct.

TABLE B-1

ILLUSTRATION OF CORRELATED EMANATIONS (U)

(b)(1)
(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

[redacted]

~~CONFIDENTIAL~~

(b)(1)
(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

~~CONFIDENTIAL~~

Figure B-1.—Examples of Correlated Emanations. A-Scope Display (U)

(b)(1)
(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

~~CONFIDENTIAL~~

Figure B-2.—Examples of Correlated Emanations. A-Scope Display (U)

~~CONFIDENTIAL~~

Figure B-3.—Examples of Correlated Emanations. A-Scope Display (U)

(b)(1)
(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

~~CONFIDENTIAL~~

Figure B-4.—Examples of Correlated Emanations. A-Scope Display (U)

(b)(1)
(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

[redacted]

~~CONFIDENTIAL~~

Figure B-5.—Examples of Correlated Emanations. Raster Display (U)

(b) (1)
(b) (3)-18 USC 798
(b) (3)-P.L. 86-36

~~CONFIDENTIAL~~

Figure B-6.—Examples of Correlated Emanations. Raster Display (U)

~~CONFIDENTIAL~~

Figure B-7.—Examples of Correlated Emanations. Raster Display (U)

CONFIDENTIAL

Figure B-8.—Examples of Correlated Emanations. Raster Display (U)

(b)(1)
(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

APPENDIX C

TEST GUIDELINES FOR PARALLEL INFORMATION TRANSFER EQUIPMENT

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Figure C-1.—Parallel Transfer of Data (U)

(b)(1)
(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

[redacted]

~~CONFIDENTIAL~~

Figure C-2.—Bit-Density Emanation Examples (U)

[redacted]

[1]NSTISSAM TEMPEST/2-91, "Compromising Emanations Analysis Handbook".

(b)(1)
(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

~~CONFIDENTIAL~~

Figure C-3.—Fingerprint Emanation Examples (U)

(b)(1)
(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

(b)(1)
(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

[redacted]

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(b) (1)
(b) (3)-18 USC 798
(b) (3)-P.L. 86-36

APPENDIX D

ALPHANUMERIC CRT DISPLAYS

D.1. (U) Scope.—This appendix describes the operation of alphanumeric CRT displays and presents guidelines for determining RED signaling rates.

D.2. (U) Introduction.

[redacted]

D.2.3 (U) The determination of Rt is made in the same manner as described in 5.5.2.

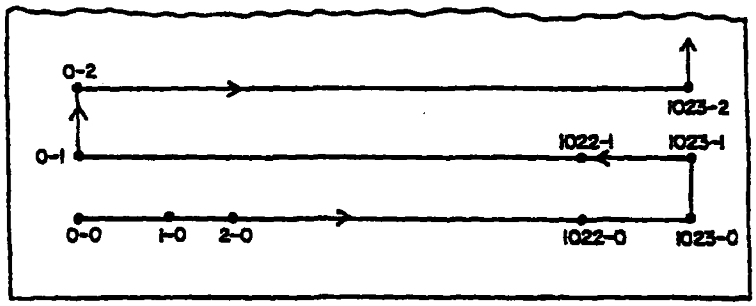
D.3. (U) Examples of Scanning and Character Generation Methods.

D.3.1 (U) Scanning.

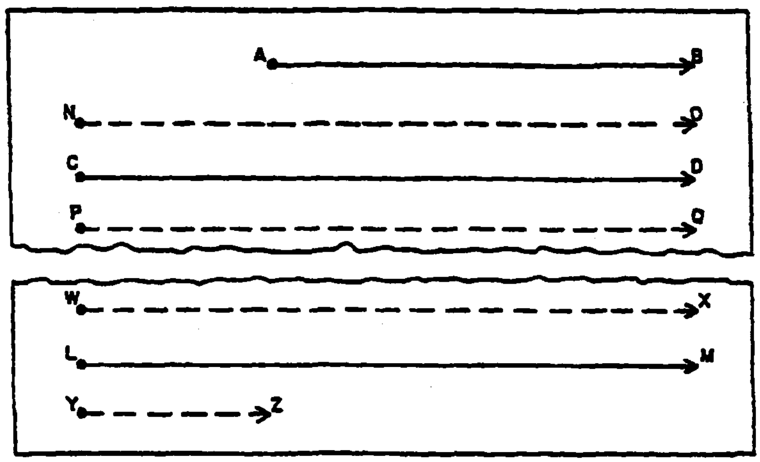
D.3.1.1 (U) Video Scan: Continuous.—In a continuous scan display, the electron beam of the CRT starts at a given coordinate point and sequentially moves through each coordinate point at a fixed sweep speed. This type of scanning can be extended to other types of CRTs, such as a standard TV monitor where the scanning is "interlaced" (see Figure D-1).

D.3.1.2 (U) Video Scan: Modified Continuous.—The electron beam of the CRT scans all the displayable points for each character of all character positions. The pattern traced by the deflection system is normally a vertical modulation of a horizontal sweep. This type of scan uses a sawtooth pattern sometimes referred to as a "diddle pulse" sawtooth pattern (see Figure D-2).

D.3.1.3 (U) Random Scan.—In a CRT display with this type of scan, the beam is not scanned linearly, but is directed from any screen location to any other.



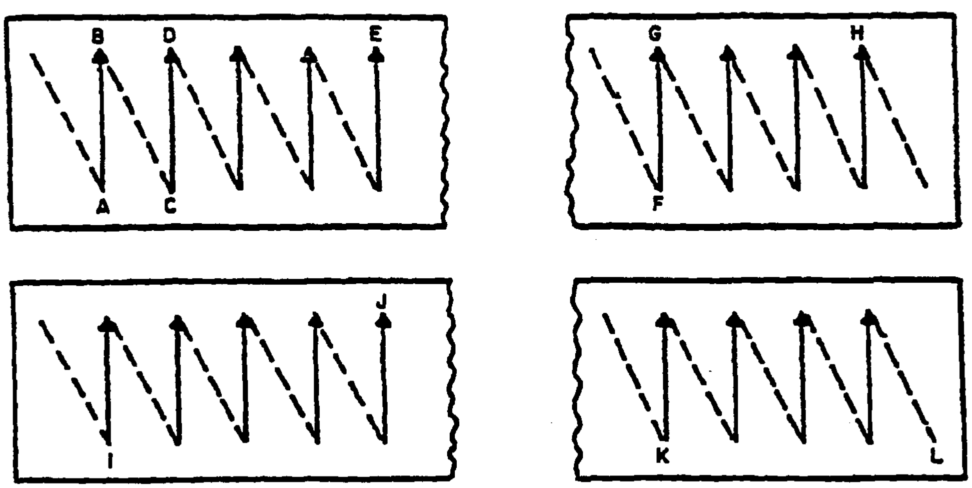
(a) 1024 X 1024 Coordinate Grid



(b) Standard TV Interlaced Scan

UNCLASSIFIED

Figure D-1.—Video Scan-Continuous (U)



UNCLASSIFIED

Figure D-2.—Video Scan-Modified Continuous (U)

D.3.2 (U) Character Generation.

D.3.2.1 (U) Standard TV Display.—The individual characters are displayed by unblanking the electron beam during line segments of a continuous scan (see Figure D-3).

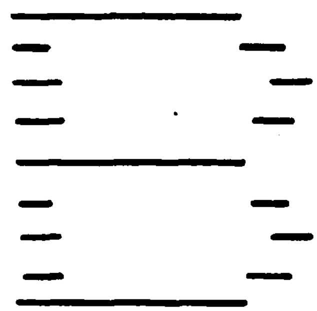
D.3.2.2 (U) Dot Matrix.—The individual characters are displayed by unblanking the electron beam at the appropriate positions in a dot matrix (see Figure D-4).

D.3.2.3 (U) Stroke or Vector Generation.—The individual characters are displayed by "drawing" small line segments (vectors) to make up the character (see Figure D-5). The program which is controlling the display must control the electron beam position, as well as unblanking, since there is no raster.

D.3.2.4 (U) Beam Extrusion.—The individual characters are displayed by passing the electron beam through a selected shaped aperture in a metal plate which causes the beam to assume the shape of the aperture when focused on the face of the CRO.

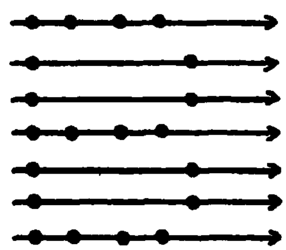
D.4. (U) Examples of Defining Rd.

(b)(3)-P.L. 86-36

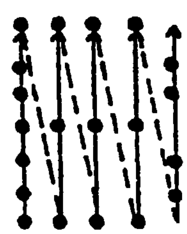


UNCLASSIFIED

Figure D-3.—Standard TV Display: Character "B" (U)



(a) Continuous Scan; Character "B"



(b) Modified Continuous Scan (Diddle Pulse); Character "B"

UNCLASSIFIED

Figure D-4.—Dot Matrix (U)

(b)(1)
(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

D.5 (U) Special Test Requirements.

D.5.1 (U) Alphanumeric CRT Displays.

[redacted]

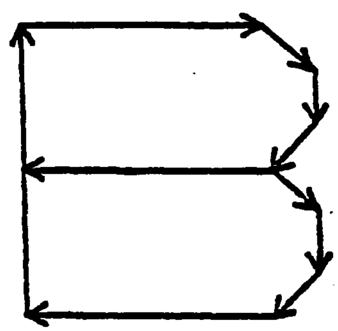
a. (~~C~~) [redacted]

b. (U) [redacted]

c. (U) [redacted]

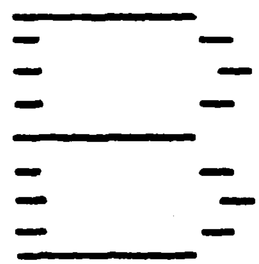
d. (~~C~~) [redacted]

D.5.3 (U) The testing organization shall provide signalling characteristics used to determine the Rd's and Rt's. Any deviations to the above test requirements shall be documented and justified.

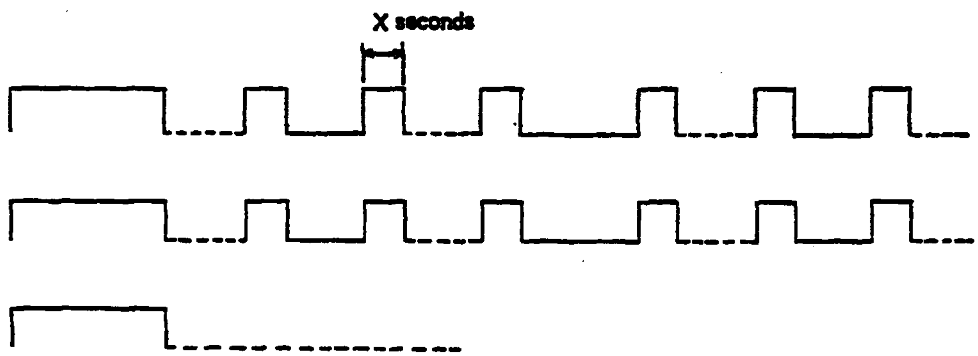


UNCLASSIFIED

Figure D-5.—Stroke or Vector Generation: Character "B" (U)



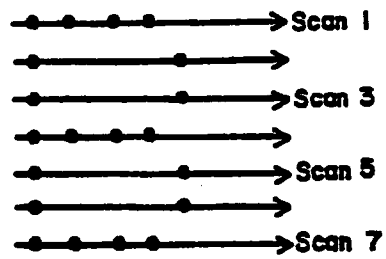
(a) TV Display of Character "B"



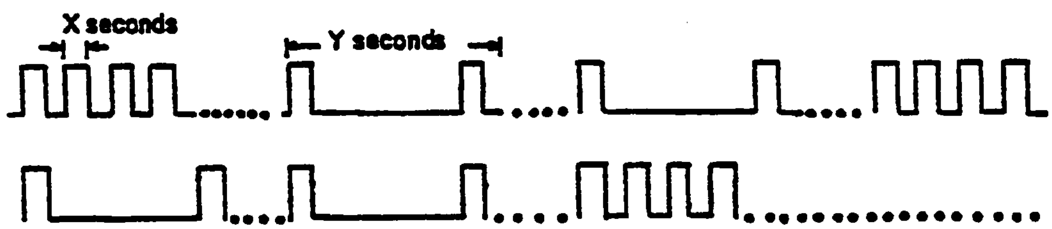
(b) Serial Unblanking Signal For Character "B"

UNCLASSIFIED

Figure D-6.—Example of TV Display (U)



(a) Dot Matrix-Continuous Scan; Character "B"



(b) Serial Unblanking Signal For Character "B"

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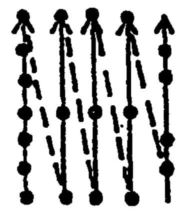
Figure D-7.—Example of Dot Matrix-Continuous Scan Display (U)

(b)(1)
(b)(3)-18 USC 798
(b)(3)-P.L. 86-36



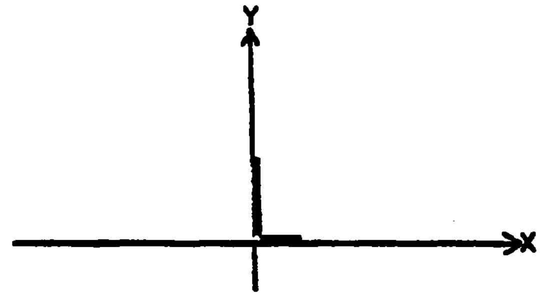
(a) Modified (Diddle Pulse) Scan; Character "B"

(b) Serial Unblanking Signal For Character "B"

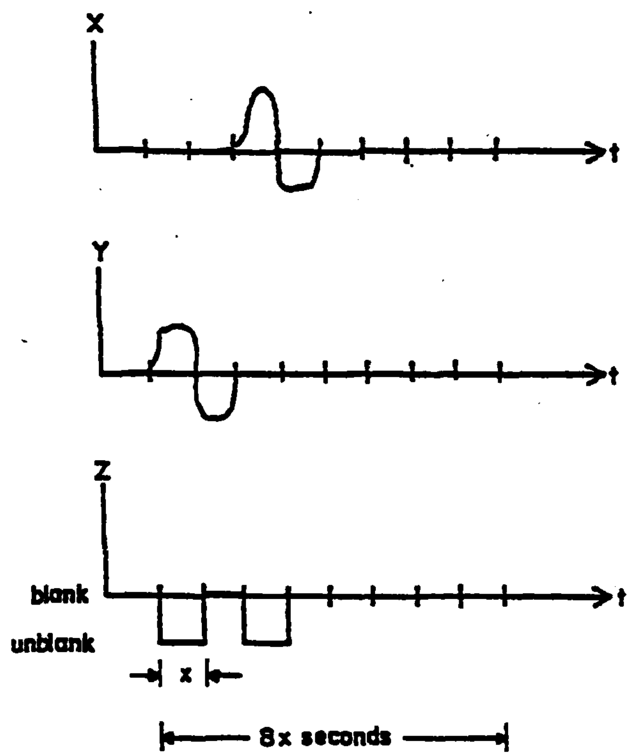
~~CONFIDENTIAL~~

Figure D-8.—Example of Dot Matrix-Modified Scan Display (U)

(b) (1)
(b) (3)-18 USC 798
(b) (3)-P.L. 86-36



(a) Display of Character "L"



(b) X, Y, and Z Display Signals For Character "L"

UNCLASSIFIED

Figure D-9.—Example of Stroke Generation Display (U)

APPENDIX E

GUIDELINES FOR AUTOMATED TESTING AND INSTRUMENTATION

E.1. (U) Purpose.

[redacted]

E.1.1 (U) Supplementary Manual Test.

[redacted]

E.1.2 (U) Alternative Approaches.

[redacted]

E.2. (U) Automated Test Procedures.

E.2.1 (U) General.

(b)(3)-P.L. 86-36

[redacted]

E.2.2 (U) Prescan Calibration Procedures.

[redacted]

E.2.3 (U) Calibration Verification During Testing.

[redacted]

(b)(3)-P.L. 86-36

E.3. (U) Automated Detection System Parameters.

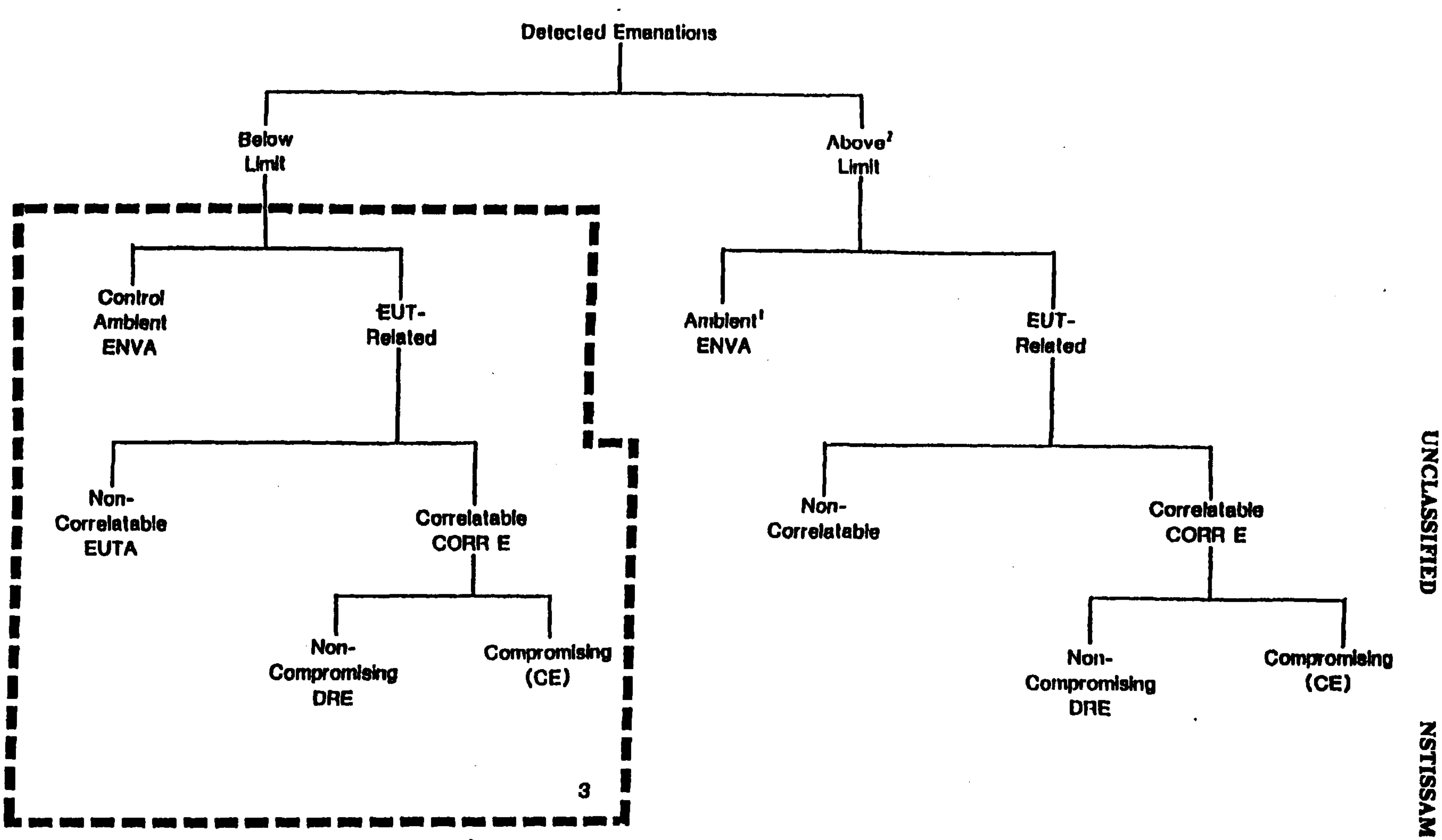
(b)(3)-P.L. 86-36

E.4. (U) Documentation Requirements.—Documentation requirements for automated testing are indicated below and in Paragraphs 6.3 and 8.4.

(b)(3)-P.L. 86-36

(b)(3)-P.L. 86-36

(b)(3)-P.L. 86-36



1. Above-spec. ambients not allowed for laboratory tests.
2. Govt. reserves right to make final decision as to whether compromising.
3. This data is not required unless specified by the sponsoring organization (see Paragraph 6.2).

UNCLASSIFIED

Figure E-1.—Sequence of Emanation Identification, Automated Testing (U)

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APPENDIX F

DETECTION SYSTEM BANDWIDTH MEASUREMENT

F.1. (U) Introduction.—The overall detection system bandwidth shall be used when determining compliance of TEMPEST detection systems with the bandwidth requirements of this document. Procedures are presented for measuring sine wave and impulse bandwidths of non-tunable detection systems and tunable detection systems with and without a Demodulator. Alternate procedures may be used, provided the same results are obtained as when using the specified procedures herein. The alternate procedures used must be documented in the test instrumentation certification report and must be approved by the sponsoring organization.

F.2. (U) 6 dB Bandwidth Measurements: Tunable Heterodyne Detection System with Demodulator.—This procedure is required for determining the overall 6 dB detection system bandwidth of tunable heterodyne detection systems at the post-detection output. This overall bandwidth is equal to the difference between the low-pass and high-pass 6 dB cutoff frequencies, as measured using F2.2.*a* through *l* below.

F.2.1 (U) Signal Generator Requirements.—This procedure accounts for the effect of both the IF and video circuits upon the overall low-pass cutoff frequencies. An RF sine wave signal generator shall be used for the measurements. The RF signal generator carrier frequency shall be tunable and shall be within the tuned frequency range of the detection system. The RF generator carrier signal shall be amplitude-modulated with a sine wave using any convenient modulation index (e.g., 30 percent). The modulation index shall be maintained constant during the measurement, unless otherwise noted. The frequency of the modulating signal shall be adjustable over the modulating frequency capability of the RF signal generator. If the maximum usable modulating frequency is greater than the expected IF bandwidth, then only one RF signal generator is required. If the expected IF bandwidth is greater than the maximum usable modulating frequency, then two RF sine wave generators are required for the test. The second RF generator shall be tunable over the same frequency range as the first RF generator, but shall not be modulated. When two RF generators are required, both generators must provide frequency accuracy and resolution which are at least one order of magnitude better than the expected overall bandwidth.

F.2.2 (U) Measurement Procedure.—The overall bandwidth shall be measured as follows:

a. (U) If one RF signal generator is required, apply the output of the generator directly to the input of the detection system. If two RF signal generators are required, apply both generators through a power divider to the input of the detection system. Inline attenuation (e.g., 20 dB) may be used as needed to provide signal attenuation and signal generator isolation. Initially, decrease the output of the second generator (if used) to zero or at least 40 dB below the output of the modulated RF generator.

b. (U) Adjust the carrier frequency of the modulated RF generator around the tuned center frequency of the detection system until the maximum level of the modulating signal is observed at the same output port of the detection system as used during TEMPEST testing. The level of the modulated carrier signal applied to the detection system and the modulation index must be such that the detection system output signal is at or below the 1 dB compression point.

c. (U) Adjust the frequency of the modulating signal until the maximum output level of the detection system is observed or the maximum available modulating frequency has been reached, whichever comes first. Readjust the RF signal generator level, if necessary, to maintain the detection system output level at or below the 1 dB compression point. Note the modulating frequency and the detection system output level as a reference.

d. (U) Maintaining the same RF generator carrier frequency, as in *c* above, reduce the frequency of the modulating signal until the output of the detection system decreases 6 dB from the reference level noted in *c* above or until the modulating frequency is essentially zero frequency (such as would occur in d.c.-coupled Demodulator), whichever comes first. Record this frequency as the 6 dB high-pass cutoff frequency.

e. (U) Increase the modulating frequency found in step *d* as necessary to produce a relatively noise free detection system output signal, but do not increase the modulating frequency to more than 10 percent of the overall bandwidth. Note the resulting modulating frequency and the detection system output level as a reference. Shift the RF carrier frequency down until the output of the detection system decreases 6 dB from the reference level of this step. Increase the RF generator carrier level by 6 dB and decrease the modulation index by 6 dB (e.g., to 15 percent).

f. (U) If only one RF signal generator is required, then increase the frequency of the modulating signal until the maximum output level of the detection system is observed. Note the new output reference level. Then, continue to increase the modulating frequency until the detection system output level decreases 6 dB from the new reference level. Record the resulting modulating frequency as the overall 6 dB low-pass frequency.

g. (U) If two RF signal generators are required, set the frequency of the second generator equal to the first generator, plus the reference modulating frequency of step *e*. Turn off the modulation of the first generator. Increase the level of the second generator until the detection system output equals the reference level of step *c* minus 6 dB. Next, increase the frequency of the second RF generator until the maximum output level of the detection system is observed. Note this output level as the new reference level. Then continue to increase the frequency of the second RF generator until the detection system output level decreases 6 dB from the new reference level. Record the resulting difference between the two RF generator frequencies as the overall 6 dB low-pass cutoff frequency.

h. (U) Subtract the result of *d* (above) from that of *f* or *g* (above) to obtain the overall 6 dB detection system bandwidth.

i. (U) Repeat the bandwidth measurements at a minimum of two tuned frequencies per decade or one near the center of each tuning band of the detection system, whichever is the greater number of readings.

F.3. (U) 6 dB Bandwidth Measurements: Tunable Heterodyne or Tunable Non-Heterodyne Detection System Without Demodulator.—The bandwidth of these detection systems shall be measured as follows:

a. (U) Apply the output of a calibrated unmodulated sine wave generator[1] to the input of the detection system.

b. (U) Adjust the carrier frequency of the cw generator around the center frequency of the detection system until the maximum output level of the detection system is observed at the same port used during TEMPEST testing. Note the output level.

c. (U) Maintaining the same cw generator carrier amplitude and detection system tuned center frequency as in *b* (above), reduce the cw generator carrier frequency until the output level of the detection system decreases 6 dB from the level obtained in *b* (above), or until the carrier frequency is essentially zero frequency (such as would occur at a detection system output with d.c. response), whichever comes first. Note this frequency.

d. (U) Repeat *c* (above), except increase the carrier frequency until the output level decreases 6 dB from the level obtained in *b* (above). Note this frequency.

e. (U) Subtract the frequency recorded in *c* (above) from that in *d* (above) to obtain the detection system bandwidth.

f. (U) Repeat the bandwidth measurements at a minimum of two frequencies per decade or one per tuning band (near the center), whichever is the greater number of readings.

[1] A swept-frequency generator with a constant output voltage may be used in lieu of the manually-tuned generator. Using a calibrated display device, the detection system bandwidth can then be read directly.

d. (U) Adjust the IG output level so that the peak-to-peak waveform displayed on the oscilloscope (at the output of the detection system) is equal to the peak-to-peak amplitude of the cw waveform recorded in *b* (above). Note the level (in volts (equivalent rms sine wave)/MHz) of the impulsive signal applied at the input of the detection system.

e. (U) Calculate the impulse bandwidth of the detection system with the following formula:

$$\text{IBW} = \frac{\text{(Sine wave input signal level in rms volts recorded in b (above).)}}{\text{(impulsive input signal level in volts (equivalent rms sine wave)/MHz, recorded in } d \text{ (above).)}}$$

f. (U) Repeat the impulse bandwidth measurements at a minimum of two tuned frequencies per decade or one per tuning band (near the center), whichever is the greater number of readings.

F.7. (U) Impulse Bandwidth Measurements: Non-Tunable Detection Systems.—The impulse bandwidth shall be measured as follows:

a. (U) Apply the output of a calibrated unmodulated sine wave generator to the input of the detection system.

b. (U) Adjust the carrier frequency of the cw generator around the center frequency of the detection system passband.

c. (U) Obtain a convenient display of the detection system output signal on an oscilloscope. Note the output peak-to-peak amplitude observed on the oscilloscope and the signal level in rms volts of the cw sine wave applied at the input of the detection system.

d. (U) Disconnect the cw generator and apply the output of a calibrated impulse generator to the input of the detection system. Set the IG repetition rate to any convenient rate less than one-fifth of the nominal overall detection system bandwidth.

e. (U) Adjust the IG output level so that the peak magnitude of the waveform displayed on the oscilloscope (at the output of the detection system) is equal to one-half the peak-to-peak amplitude of the cw waveform recorded in *c* above. Note the level, in volts (equivalent rms sine wave) MHz, of the impulsive signal applied at the input of the detection system.

f. (U) Calculate the impulse bandwidth of the detection system with the following formula:

$$\text{IBW} = \frac{\text{(Sine wave input signal level in rms volts, recorded in } c \text{ above.)}}{\text{(impulsive input signal level in volts (equivalent rms sine wave)/MHz, recorded in } d \text{ above.)}}$$

APPENDIX G

TABLES AND FIGURES

(b)(1)
(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

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(b)(1)
(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

[redacted]

~~CONFIDENTIAL~~

[redacted]

~~CONFIDENTIAL~~

(b)(3)-P.L. 86-36

UNCLASSIFIED

Note: See Table G-6 for application example

(b)(3)-P.L. 86-36

UNCLASSIFIED

[1] Lowest bit rate as defined in paragraph 3.1.4.
[2] Refer to Table G-5.

~~CONFIDENTIAL~~

Figure G-1.—Assumed Transition Time Based on Pulse Width Signaling Rate (Maximum) (U)

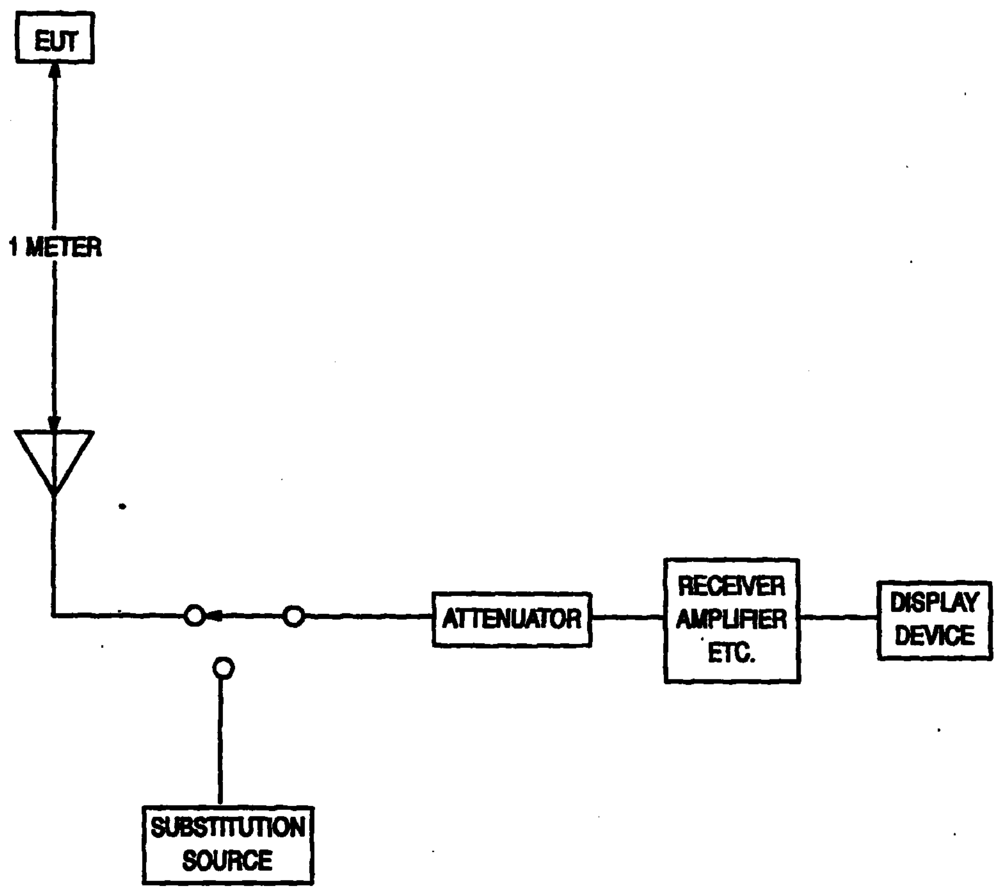
~~CONFIDENTIAL~~

Figure G-2.—Bounds on Tunable Overall Detection System Bandwidth (U)

(b)(1)
(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

~~CONFIDENTIAL~~

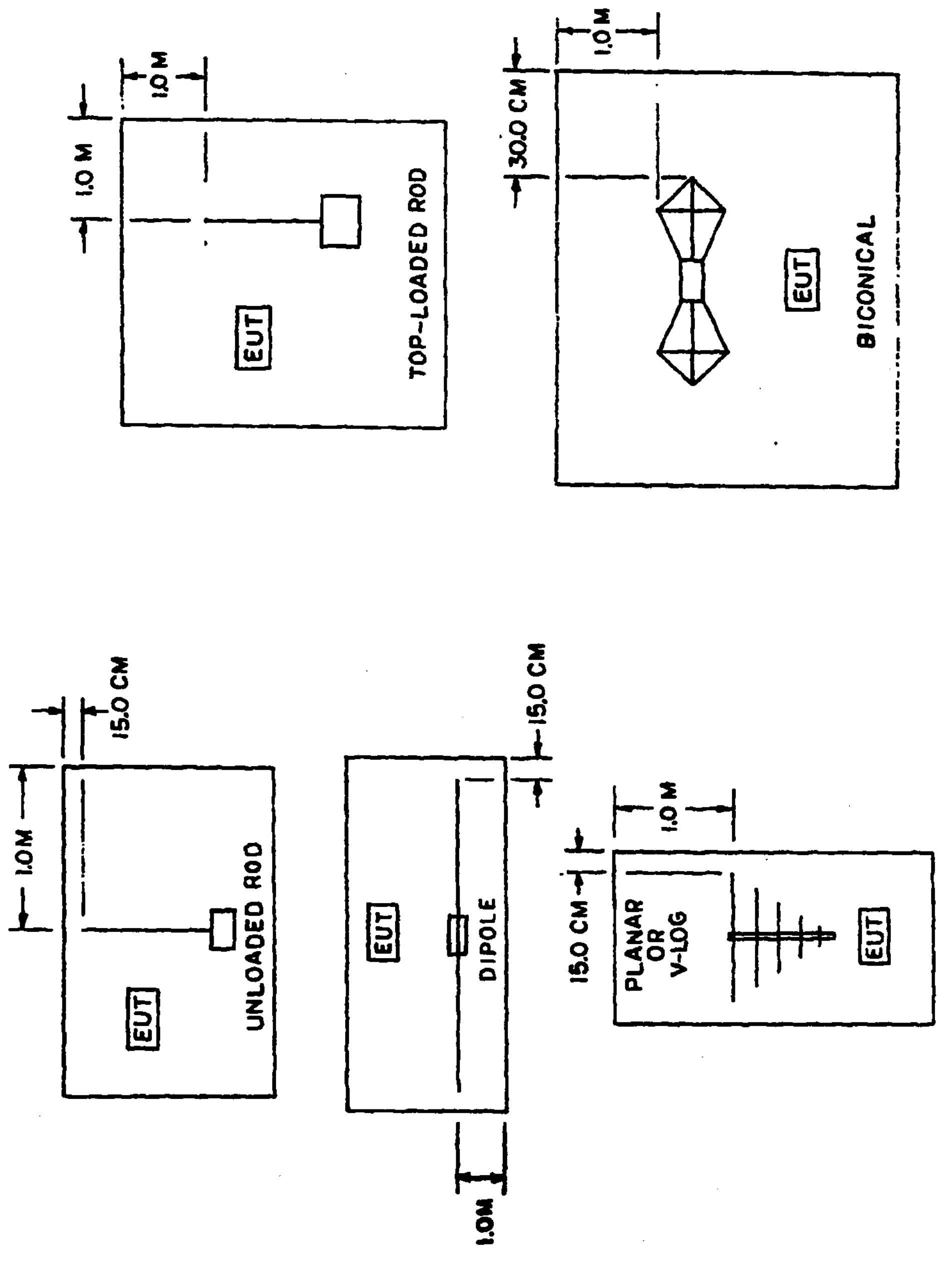
Figure G-3.—Maximum Permissible Tunable Starting Test Frequency (U)



Note: This figure is equivalent to Figure 10-1.

UNCLASSIFIED

Figure G-4.—Typical Test Instrumentation for ER Tests (U)



Note: This figure is equivalent to Figure 10-2.

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Figure G-5.—Required Minimum Antenna Distances From Metal Surfaces and Objects Other Than the EUT (U)

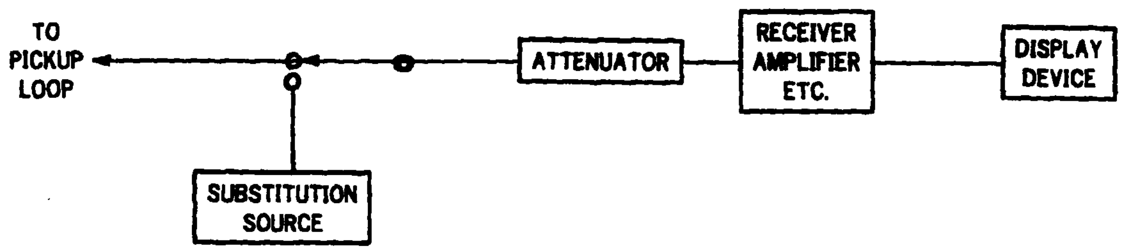

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Figure G-6.—Typical Test Instrumentation for MR Tests (U)

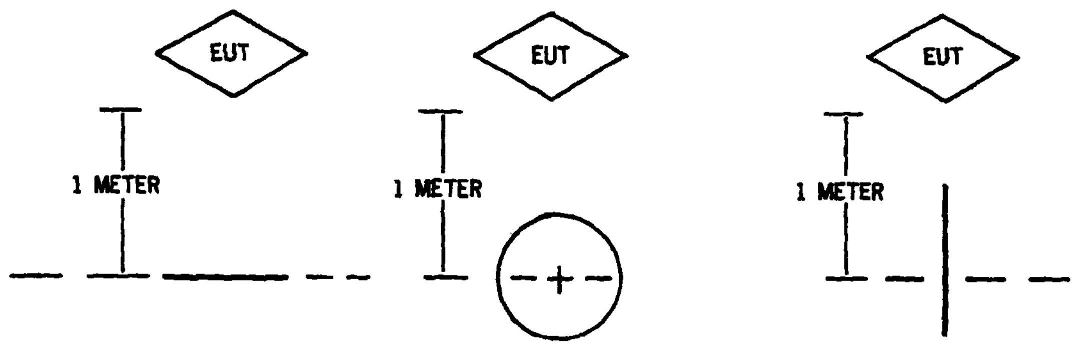

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Figure G-7.—Orientation of MR Pickup Loop (U)

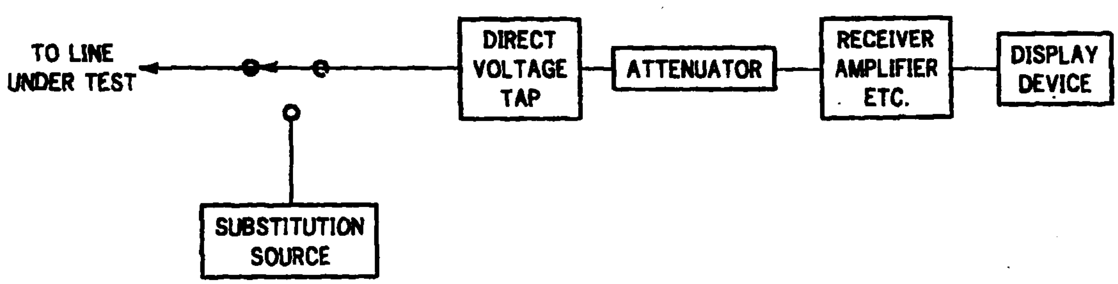

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Figure G-8.—Typical Test Instrumentation for Line Conduction Tests (excluding powerlines) (U)

(b)(1)
(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

APPENDIX H

LEVEL I

LIMITS

~~CONFIDENTIAL~~

Figure H-1.—Tunable ER Limits (U)

LEVEL I

(b)(1)
(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

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Figure H-2.—Tunable MR Limits (U)

LEVEL I

(b)(1)
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(b)(3)-P.L. 86-36

[redacted]

~~CONFIDENTIAL~~

(b) (1)
(b) (3)-18 USC 798
(b) (3)-P.L. 86-36

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Figure H-3.—Tunable BLACK Line Conduction Limits (U)

LEVEL I

(b)(1)
(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

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(b)(3)-P.L. 86-36

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(b)(3)-P.L. 86-36

LEVEL I

(b)(3)-P.L. 86-36

UNCLASSIFIED

(b)(1)
(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

Figure H-6.—Non-Tunable ER Limits (U)

LEVEL I

(b)(1)
(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

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(b) (1)
(b) (3)-18 USC 798
(b) (3)-P.L. 86-36

LEVEL I

(b)(1)
(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

[redacted]

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Doc Ref ID: A6857976 (b) (1)
(b) (3)-18 USC 798
(b) (3)-P.L. 86-36

[redacted]

LEVEL I

Doc ID: 6857978

(b)(1)
(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

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APPENDIX I
LEVEL II
LIMITS

(b)(1)
(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

LEVEL II

(b)(1)
(b)(3)-18 USC 798
(b)(3)-P.L. 86-36

[redacted]

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LEVEL II

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(b)(3)-P.L. 86-36

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(b)(3)-P.L. 86-36

LEVEL II

(b)(3)-P.L. 86-36

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APPENDIX J
LEVEL III
LIMITS

(b)(3)-P.L. 86-36

LEVEL III

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(b) (3)-18 USC 798
(b) (3)-P.L. 86-36

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APPENDIX K

IMPULSE GENERATOR CALIBRATION

K.1. (U) Procedure.—Impulse generators shall be calibrated by one of the four following methods:[1]

K.1.1 (U) Method 1.

a. (U) Apply the output of the impulse generator to be calibrated to the input of an amplitude-linear receiver having synchronously tuned, less-than-critically-coupled, circuits. Radio interference field intensity receivers are satisfactory for this purpose if their impulse bandwidth is at least five times the repetition rate of the impulse generator. Any automatic gain control (AGC) system shall be defeated. Once the receiver controls are set, they should not be changed during the calibration process.

b. (U) Obtain an oscilloscope pattern of the overall receiver response at the IF output. The oscilloscope controls shall be so adjusted that the pattern is as large as possible within the calibrated area on the face plate. Either photograph or trace the pattern. Record the oscilloscope sweep speed setting. (The sweep speed shall be calibrated accurately.)

c. (U) Use a planimeter or other integrating device to determine the area of the positive portion of the major lobe of the response waveform. (More accuracy can be obtained by summing the area under the odd-numbered lobes and subtracting from it the total area under the even-numbered lobes.) This operation shall be carried out at least five times and the average of the readings taken as the area.

d. (U) Calculate the impulse bandwidth of the receiver in accordance with the following formula:

$$\text{IBW in MHz} = \frac{\text{pattern height* in cm}}{(\text{pattern area* in cm}^2)(\text{sweep speed in sec/cm})} \times 10^{-6}$$

*Refers only to positive portion of response waveform.

e. (U) Connect a calibrated sine wave generator to the receiver. Tune the generator to the receiver's tuned frequency and adjust the output until the peak pattern height is the same as that obtained with the impulse generator in a. and b. (above). Record the output of the sine wave generator in microvolts (rms).

f. (U) Calculate $20\log_{10}(e/d)$ where e and d are the results obtained in e. and d. (above) expressed in microvolts (rms) and megahertz, respectively. This calculation gives the spectral intensity of the impulse generator output in dBμV/MHz (equivalent rms sine wave).

K.1.2 (U) Method 2.

a. (U) Select a bandpass or low-pass filter with the following characteristics:

(1) (U) Minimum upper roll-off of 18 dB/octave.

(2) (U) Maximum upper 3 dB cutoff point which is 10% of the reciprocal of the expected width of the driving impulse (from the IG to be calibrated) or 80% of the bandpass of the CRO in use, whichever is less.

(3) (U) Passband wide enough to permit passage of sufficient energy such that the peak voltage of the output waveform can be accurately read on the CRO.

(4) (U) 50 ohm input and output impedance in the passband.

b. (U) Determine the impulse bandwidth (IBW) of the filter employing the procedures specified in method 1, paragraphs a. through d. (above), substituting the word "filter" for "receiver". Once the IBW

[1]Other methods may be used if justified and approved by the sponsoring organization.

of the filter has been measured, the filter may be used to calibrate any number of IGs; however, the IBW shall be rechecked in accordance with the calibration requirements specified in Paragraph 7.6.

c. (U) Terminate the output of the IG to be calibrated with a 6 dB (minimum), 50 ohm pad and connect it to the input of the filter.

d. (U) Terminate the output of the filter with a 50 ohm resistive load and connect it to the vertical input of the CRO.

e. (U) Record the peak voltage of the filter output on the CRO microvolts.

f. (U) Calculate:

$$20\log_{10}(e/b) + \text{pad loss} - 3\text{ dB} + \text{filter insertion loss}$$

where e and b are the results obtained in paragraphs e. and b. (above), expressed in microvolts (peak) and megahertz respectively. This calculation gives the spectral intensity of the impulse generator output in dBμV/MHz (equivalent rms sine wave).

K.1.3 (U) Method 3.—Compare the output of the IG to be calibrated, with the output of another IG which has previously been calibrated, in accordance with method 1 or method 2, within the last six months.

K.1.4 (U) Method 4.

a. (U) Apply the output of the impulse generator to be calibrated to the input of a spectrum analyzer having the following characteristics:

(1) (U) Known impulse bandwidths.

(2) (U) Absolute amplitude accuracy equal to ±2 dB or better.

b. (U) Select a spectrum analyzer bandwidth at least five times the repetition rate of the impulse generator, but no larger than one-tenth the usable spectrum of the impulse generator. Select a scan time in seconds/division, no less than 10/repetition rate (Hz) to insure ten-impulse responses per division.

c. (U) Add any conversion factors to the spectrum analyzer displayed voltage needed to convert dBm to dB ref. 1 μV rms. Subtract the impulse bandwidth of the spectrum analyzer in dB ref. 1 MHz from this value to convert to dB ref. 1 μV/MHz and subtract 3 dB to convert the reading to dBμV/MHz (equivalent rms sine wave), which is the spectral intensity of the impulse generator output.

APPENDIX L

TEMPEST TEST PLAN OUTLINE

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SAMPLE TABLE OF CONTENTS

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OUTLINE DESCRIPTION (U)

Abstract (150 to 300 words)

- Identification of equipment or system
- Purpose of test, including dates
- Location of test facilities
- Functioning/operating principles
- RED data and lines identification
- Certifications included for Facility and Measurement Equipment
- Test setup including exercise and simulation equipment
- Test message statement
- Commercial—concluding statement

1.0 (U) Introduction.

1.1. (U) Introductory statement, including exact identification of EUT: name and type number; purpose of test; contractual and subcontract information, if any; brief statement of configuration or modes of operation selected for testing and for certification, if applicable; any other statements necessary to round out the introduction for the reviewer, as well as for the technician who will be following this test plan and performing the actual TEMPEST test.

1.2. (U) Include a list of all applicable documents such as NSTISSAM TEMPEST/1-91.

1.3. (U) Provide details of any waivers or exceptions, and justify.

2.0 (U) Equipment under Test.—This section of the test plan describes the EUT in precise and definitive terms.

2.1. (U) Description of the EUT.—This should include nomenclature, description of intended uses including actual applications as a system, as part of a system, or as a stand-alone, modes of operation, modes to be tested, power, I/O lines, etc.

2.2. (U) Theory of Operation.—This should be in sufficient detail or depth to provide the U.S. Government reviewer and the person performing the TEMPEST tests with the knowledge to ascertain whether the test plan exploits all TEMPEST modes and conditions. Identify control and timing signals that are associated with processing of RED data.
(Figure 2-1.—Functional Block Diagram)
(Figure 2-2.—System Block Diagram if applicable, to identify or clarify the position of the EUT in an operational system.)

2.2.1 (U) Function.—If the device or system consists of more than one box, separate paragraphs may be used to describe the functions of each (2.2.2, 2.2.3, etc.). Use either a separate block diagram for each box or a consolidated single diagram.

2.3. (U) Operating Modes.—Describe each mode of operation, e.g., manual, automatic, single channel, TDM, orderwire, etc.

3.0 (U) RED Signals.—In this section, identify each EUT RED signal type, the major internal and external RED signal sources (S1, S2, S3, etc.) for each RED signal type, and all RED signaling rates (Rd1, Rd2, Rd3, Rt1, Rt2, Rt3, etc.). It shall be considered a different RED signal type if there is a change in format, code, timing, transfer method, or parity. Determine the applicable test categories for each Rd and Rt. A time-sequence description and illustration of the RED signal flow shall be provided to properly identify all RED signal sources.

3.1. (U) RED Signal Description.

This section should present signal description in tabular form, including:

- RED signal identification including frequency
- Synchronous/asynchronous
- Signal function
- Data format, e.g., NRZ
- Code, e.g., ASCII
- Parity and other nondata information
- Data unit bit widths
- Data bit rate
- Rise and fall times
- Level, e.g., voltage, impedance, TTL, 188, etc.
- IC families
- Data delays
- Sampling information, if applicable
- Serial, parallel, MUX, etc.

3.2. (U) RED Signal Flow Diagram.—Figure L-1 presents an example of a time-sequence RED signal flow diagram. It is recommended that each RED signal be identified with consecutive numbers or letters, and that the same identification be used throughout the test plan and test report.

4.0 (U) RED and BLACK I/O Lines.—This section enumerates all lines that connect to the EUT. Identify each RED line and each BLACK line that enters or leaves the EUT or the EUT area. *Select and justify specific lines to be tested.* Justify rejection of lines not to be tested. This should include signal lines, control lines, clocks, grounds, status lines, and others. (Figure 4-1.—Input/Output Lines — This should be a block diagram that differs from the functional block diagram of Figure 2-1 since it permits each line that interconnects EUT boxes or enters/leaves the EUT area to be shown and identified. Identification of each line should be clear and complete, including information on function, time, format, level, destination, and any other pertinent features.)

5.0 (U) Potential Carriers.—Identify potential inadvertent carriers of RED information including possible areas where contamination with RED information may occur. An example could be clock harmonics, or any clock multiples or submultiples that provide timing information to more than one circuit or function. The TEMPEST test plan should point the way to search and verification by its thoroughness in listing all such potential carriers.

6.0 (U) TEMPEST Test Requirements.—This section should include all details of the planned TEMPEST test, except for preliminary information in the preceding sections. The use of tables, as applicable, will be fully acceptable, with accompanying explanations as needed.

6.1. (U) Test Procedures.—Provide a narrative description of both general and specific test procedures. Describe in general the procedures for running the tests and the process of operating the detection system to acquire and measure emanations. Include specific operation of the EUT and exerciser. The procedures for running the tests should be presented in the form of a specific guide for the TEMPEST test technician, including necessary adjustments for each operational mode to be explored. Include herein any special conditions to be observed and any specific software requirements to attain desired operational characteristics.

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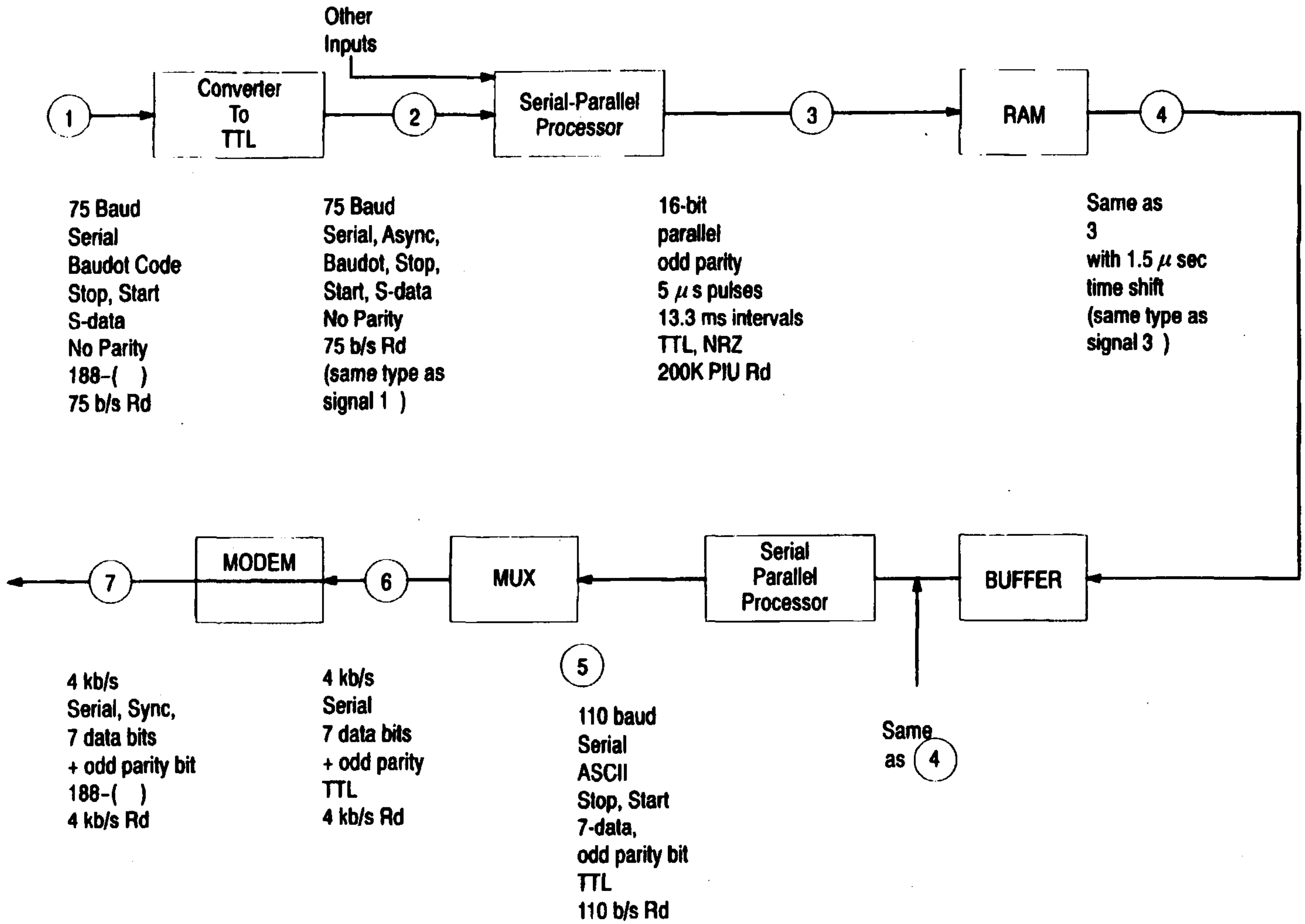

Figure L-1.—Example of Test Plan Time-Sequence RED Signal Flow Diagram, Simplified (U)

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6.2. (U) Documentation.—Describe herein accessory equipment used for documentation, such as camera, chart recorder, etc. Include examples of data sheets used for manual recording of raw data for each test and for correcting, adjusting, and normalizing results. Attach examples of type/s of data sheets to be used.
(Figure 6-4.—Example(s) of Documentation Forms)

6.3. (U) Test Media.—List the various media in which tests are to be performed including ER, MR, PLC, etc. (as well as tunable and non-tunable). Include each signal line, control line, clock line, powerline, etc., to be tested. Exceptions, deletions, limitations, or modifications will require rationale and authority from the sponsoring organization for each change.

6.4. (U) RED Signals and Test Categories.—From the RED signal sources identified in Paragraph 3.0, *select those RED signals/sources to be investigated* as part of this TEMPEST test. Justify those not selected for testing. Select the appropriate test category for each RED signal source.

6.5. (U) Frequency Ranges.—Include a narrative justifying selection of appropriate frequency ranges for both tunable and non-tunable tests.

6.6. (U) Bandwidth/Bandpass Selections.—Explain selections of bandwidths and bandpasses for tunable and non-tunable tests. State the bandwidth limitations, if any, of the instrumentation.

6.7. (U) Exercise Equipment and Modes of Operation.—Describe the equipment and system to be used to exercise the EUT. Present the rationale for selection of this equipment and this test system. Include explanation why certain modes, if any, were selected for test exercise and why other modes of operation, if any, were excluded from such testing. Describe the physical location of the exercise equipment. Describe use of any special operating techniques, e.g., use of software to exercise certain portions of the EUT.
(Figure 6-1.—Exercise Equipment, Diagram)

6.8. (U) Test Setups.

6.8.1 (U) Clearly describe and diagram the test setup(s) to be used for text media examinations (ER, MR, BLC, PLC, and RLC). Generally, only one diagram will be needed; however, additional diagrams may be necessary for clarity. Include the test environment or shielded test enclosure, EUT, auxiliary equipment, exercise equipment, power supplies, blocks, detection and measurement equipment, oscilloscopes, PLISN's, filters, EUT ground planes, grounds, etc. Specify EUT grounding methods for both signal and safety. Also, specify how the cabinet is connected in the grounding scheme. The description and diagram should make clear what is to be in the test enclosure(s), what is to be placed in any auxiliary shielded enclosure(s), and what is to be placed or used outside shielded enclosures. Provide justification if the type and installation of conduits and cables used in the EUT test setup are not the same as those specified for the actual operational installation.

6.8.2 (U) If the equipment or system can or may be operated in more than one mode or more than one configuration, list and describe all such variations. If applicable, explain why certain modes are selected and why others are not to be tested. This explanation should tie in with the intent of this test and thus with the EUT description in Paragraphs 1.0 and 2.1 of this test plan. Accordingly, TEMPEST accreditation, as a result of the test to be performed, will not include the equipment or system in the modes or configurations excluded in this test plan, unless due justification is provided herein.
(Figure 6-5, and, if required, 6-6, 6-7, etc.: Test Setup)

6.9. (U) Monitor Signals.—Explain and diagram specifically how and where monitor and/or synchronization signals are to be derived for the purpose of comparing or correlating detected emanations with RED signals in Paragraph 3.0 of this test plan. Describe what precautions will be taken to preclude signal distortions and false indications of detected emanations.
(Figure 6-2.—Synchronize/Monitor Test Points)

6.10. (U) Test Messages.

6.10.1 (U) Select test messages, words, characters, or input states which will succeed in running the EUT through all combinations of conditions representative of all operational usages. Test messages should also be selected or designed to aid in rapid correlation of detected emanations by assuring a high degree of recognition or identification.

6.10.2 (U) Present in this section all the actual test messages to be used for testing, and include rationale for selections made.

6.11. (U) Predicted Detected Output Signals.—Include explanation of hypothetical detected compromising emanations. These should relate directly to the test messages described in Paragraph 6.10 above.
(Figure 6-3.—Predicted Detected Output Signals)

6.12. (U) Test Matrix.—This section should gather together in a single table, as a ready reference, all information required to perform all TEMPEST tests.
(*Table 6-1: Test Matrix.* See example in Table L-1).

TABLE L-1

EXAMPLE OF TEST MATRIX (U)

Your Test #	Spec.	EUT	S*	Rd	Cat.	Test Medium	Test Type	Freq. Range	Bandwidth	Rcvr	Ampl	Filter	Ant	Approx. Test Schedule
1AA-1	1-91	etc	S1	xkb/s	X	ER	TUN	1-10MHz	.25MHz	etc	etc			6/16/91
1AA-2	1-91	etc	S1	xkb/s	X	ER	TUN	10-100M	1M					6/16/91
1AA-3	1-91	etc	S1	xkb/s	X	ER	TUN	100-1000M	5M					6/16/91
1AA-4	1-91	etc	S1	xkb/s	X	ER	TUN	1-10GHz	5M					6/16/91
2AA-1	1-91	etc	S2	ykHz	Z	ER	TUN	3-30MHz	etc					6/16/91
2AA-2	1-91	etc	S2	ykHz	Z	ER	TUN	30-300M						6/16/91

Notes

1 Detailed breakdown in this table may be simplified if these details have been provided in test tables.

2 Numbering scheme shown in column 1 is only an example. Whatever scheme is selected should be consistent and clear throughout the test plan and the TEMPEST test including data sheets and the test report.

S*—RED signal source description

e g S1 = parallel I/O
S2 = printer data
S3 = RAM-UART
S4 = CPU-RAM
S5 = etc.

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7.0 (U) Test Capabilities.—This is the section for reporting on facilities to be employed in the projected TEMPEST testing, if not covered in a separate facilities certification report.

7.1. (U) Test Facilities.

7.1.1 (U) Describe facilities to be used in the planned test, including dimensions, type of construction, shielding materials, panel seam scheme, attenuation, door(s), lighting, air-conditioning, air ducts, powerline filtering, power entrance, signal entrance scheme, grounding details, use of companion room(s) for test equipment and/or exercise equipment.
(Figure 7-1.—Shielded Enclosure(s))

7.1.2 (U) If not covered in a separate certification report, include herein as Figure 7-2, certification attesting to test facility in accordance with Paragraph 6.5 of this document.

7.2. (U) Instrumentation.

7.2.1 (U) Describe measurement equipment, including detection equipment, antennas, attenuators, oscilloscopes, power supplies, filters, PLISN's, signal generators, IG's, probes, etc., if not covered in a separate detection system certification report.
(Table 7-1: Instrumentation)

7.2.2 (U) Include manufacturer, type number, description, frequency range, categories covered, bandwidths, etc., as applicable.

7.2.3 (U) If not covered in a separate certification report, include herein, as Figure 7-3, detailed certification attesting to last calibration of frequencies, sensitivity, etc., in accordance with Paragraph 6.4 of this document.

7.3. (U) Personnel Qualifications.—Provide qualifications of supervisory and technical personnel who prepared this test plan, as well as those who will perform the tests and those who will write the TEMPEST evaluation report.

INSTRUCTIONS FOR COMPLETING TEMPEST PROFILE FORM

ACCESSION NUMBER	Leave blank, number assigned by the NTIC.
CLASSIFICATION	Fill in classification of profile.
ORIGINATING SERVICE OR AGENCY	Fill in the name and address of service or agency that is paying for the test or originated test tasking.
ORIGINATOR'S ID NO./ PROJECT NO.	Number assigned by testing organization to this project. Enter task number or report number.
CONTRACT NUMBER	Enter contract number if applicable.
TYPE	Enter X in the appropriate line: Lab, Fielded, or Study.
TESTING ORGANIZATION	Enter name and address of testing organization.
TEST STANDARD	Enter test standard(s) applicable to equipment.
DATES OF TEST	Enter dates equipment was under test (from – to).
REPORT TITLE	Enter official title of report as it appears on the front cover.
REPORT DATE	Enter date of the report as it appears on the front cover.
DISTRIBUTION CODE	Enter X in the appropriate line. If report is limited, and cannot be released to the entire TAG Community, attach explanation.
ABSTRACT	Brief description of the report.
OBJECTIVES	Enter X in the appropriate line.
EUT DESCRIPTION	Brief description of equipment under test; to include: MODEL NUMBER Enter model number. MANUFACTURER (no abbreviations) EQUIPMENT NAME Enter other names equipment is known by (e.g., LaserJet Series III, SPARCStation, SCOPE etc., do not enter the model number here). EQUIPMENT CATEGORY (see NTIC's TEMPEST Zone Assignments publication. EQUIPMENT COMMENTS List any options or equipment tested with the equipment (e.g., tested with a Zenith ZCM-1492 monitor).
RESULTS	Enter NSTISSAM TEMPEST Level and enter X in the appropriate compliant box. Enter Zone Rating as: A–D, B–D, C–D, or D Enter Walk-Away Distance (if applicable). Enter Comments about the Results.

NTIC NUMBER ________ CLASSFICATION ________

TEMPEST Profile

Originating Service or Agency	Orig. ID No./Project No. Contact No.	Type Laboratory ____ Field ____ Study ____
Testing Organization	Test Standard	Dates of Test
Report Title	Report Date	Dist. Code All TAG ____ Limited ____

ABSTRACT

OBJECTIVES

NSTISSAM TEMPEST/1-92 Compliance Evaluation ____
TEMPEST Zone Evaluation ____

EUT DESCRIPTION

Model No. ____ Manufacturer ____
Equipment Name ____
Equipment Category ____
Equipment Comments:

RESULTS

NSTISSAM TEMPEST Level ____ Compliant: Yes ____ No ____
Zone Rating ____ Walk-Away Distance ____
Result Comments:

UNCLASSIFIED
(when blank)

CLASSIFICATION

COMMENT FORM
for

Use one form per comment,
Return completed form to:

Director
National Security Agency
ATTN: C9
Fort George G. Meade, Maryland 20755-6000

1. Date:

2. Name of Contributor:

3. Name of Organization:

4. Address of Organization:

5. Reference section in document (paragraph, page number, line number if required: if general comment describe subject to be discussed):

6. Comment (What should be changed?):

7. Alternative (What should it be changed to?):

8. Rationale (why should change be made?):

If more space is required for any of the above items, use extra sheet(s) and attach to this form.

NSTISSAM TEMPEST/1-92

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DA (SAIS-SDC) (15)
DA (DAMI-CIC) (5)
CNO (OP941J) (3)
CMC (CC) (5)
COMJSOC (J62)
The Joint Staff (J6K) (5)
The Joint Staff (DIRM/SCD/ISOB)
USCINCLANT (J6) (2)
USCINCCENT (CCJ6) (4)
USCINCEUR (ECJ6) (2)
CINCFOR (FCJ6) (2)
USCINCPAC (J6) (2)
USCINCSO (SCJ6) (2)
USCINCSPACE (J4-J6) (2)
USCINCSOC (SOJ6) (2)
USSTRATCOM (2)
USCINCTRANS (TCJ6) (2)
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HQ USAF (SCXX) (2)
HQ USAF (SCS) (3)
HQS USMC (CODE CCT-63) (2)
AFCSC/SRMT (10)
COMUSFJAPAN (J6) (2)
COMUSFKOREA (J6) (2)
Defense Courier Service (2)
DIA (DSE-2B) (10)
DIA (DPS-2C) (5)
DIS (V0432) (1)
DIS (V0060)
DLA (DLA-IA) (2)
DNA (ISIS)
CDR JIEO
COMDT COGARD (G-TTS-4) (3)
COMCOGARDLANTAREA
COMCOGARDPACAREA
COMCOGARDONE
COMCOGARDTWO
COMCOGARDFIVE
COMCOGARDSEVEN
COMCOGARDEIGHT
COMCOGARDNINE
COMCOGARDELEVEN

COMCOGARDTHIRTEEN
COMCOGARDFOURTEEN
COMCOGARDSEVENTEEN
COMSPAWARSYSCOM (PMW 151) (3)
DCMS (TD) (2)
CG MCDEC (DEVCEN C3) (2)
Dept. of Agriculture (MSD/FAS) (2)
Dept. of Commerce ((MIS/OIRM/TMD) (2)
Dept. of Energy (AD241.1) (5)
Dept. of Health & Human Services (IG) (2)
Dept. of Interior (PPS-S MS5040 MIB) (2)
Dept. of Justice (JMD/SEPS) (2)
Dept. of State (DS/CMI/ISS) (5)
Dept. of State (SA-34, DTS-PO)
Dept. of State (DS/CMP/ES) (5)
Dept. of Transportation (OIS M-70) (2)
Dept. of Transportation (OST/M-70 (2)
Dept. of Treasury (MST) (10)
Dept. of Treasury (TSD) (2)
CIA (OC-CSD) (2)
CIA (DIR OIT) (2)
CIA (ISSG/OS) (2)
CIA (Chief, TEMPEST Division, (OS) (15)
CIA (Chief INFOSEC OIT)
CIA (Reference Library)
DIR, CCISCMO (2)
DIR, CCISCMO (Planning Office (2)
DIR, Naval Criminal Investigative Service (Code 26T) (20)
DISA (Code DIPP) (2)
DMA (TSC)
DMA (IS)
DMA (ISD) (2)
Drug Enforcement Administration (OSTC) (2)
FAA (ACO-300) (6)
FBI (TSD) (5)
FCC (OMD) (2)
FEMA (NP-IR) (7)
FEMA 9NP-IR-TS-ES0 (3)
GSA (KVI) (5)
NASA (JIS)
NASA (OS) (2)
NASA (JT)
NASA (NIS) (2)
NCS (MGR) (2)
NCS (NCS-EP-E) (2)
NRC (8203-MNBB) (3)
USDELMC (INFOSEC REP)
U.S. Customs Service (65)
WHCA (SSD) (3)

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