1 MAY 2014

NATIONAL SECURITY AGENCY
CENTRAL SECURITY SERVICE
FORT GEORGE G. MEADE, MARYLAND 20755-6000

FOIA Case: 51573C
24 April 2014

JOHN L YOUNG
251 W 89TH ST STE 6E
NEW YORK NY 10024

Dear Mr. Young:

This further responds to your Freedom of Information Act (FOIA) request of 9 October 2006 for copies of 93 National Security Systems Issuances as listed on the index at http://www.cnss.gov. In earlier responses, we provided a total of 4 documents (118 pages), which are responsive to items 33, 50, 84 and 91 of your request. Your request continues to be processed under the FOIA, and one additional document you requested responsive to item 86 is enclosed. This document is also responsive to another FOIA case, therefore it is being provided to you and the other requester at this time. Certain information, however, has been deleted from the enclosure, and two documents (22 pages), responsive to items 15 and 16 of your request, have been withheld in their entirety.

Some of the withheld information was found to be currently and properly classified in accordance with Executive Order 13526. This information meets the criteria for classification as set forth in Subparagraph (c) of Section 1.4 and remains classified SECRET and CONFIDENTIAL as provided in Section 1.2 of the Executive Order. The information is classified because its disclosure could reasonably be expected to cause serious damage to the national security. The information is exempt from automatic declassification in accordance with Section 3.3(b)(3) of E.O. 13526. Because the information is currently and properly classified, it is exempt from disclosure pursuant to the first exemption of the FOIA (5 U.S.C. Section 552(b)(1)).

In addition, this Agency is authorized by various statutes to protect certain information concerning its activities. We have determined that such information exists in these documents. Accordingly, those portions are exempt from disclosure pursuant to the third exemption of the FOIA, which provides for the withholding of information specifically protected from disclosure by

statute. The specific statutes applicable in this case are Title 18 U.S. Code 798; and Section 6, Public Law 86-36 (50 U.S. Code 3605).

The Initial Denial Authority for NSA information is the Associate Director for Policy and Records, David J. Sherman. Since some documents were withheld in their entirety and information was withheld from the enclosure, you may construe this as a partial denial of your request. You are hereby advised of this Agency's appeal procedures. Any person denied access to information may file an appeal to the NSA/CSS Freedom of Information Act Appeal Authority. The appeal must be postmarked no later than 60 calendar days from the date of the initial denial letter. The appeal shall be in writing addressed to the NSA/CSS FOIA Appeal Authority (DJ4), National Security Agency, 9800 Savage Road STE 6248, Fort George G. Meade, MD 20755-6248. The appeal shall reference the initial denial of access and shall contain, in sufficient detail and particularity, the grounds upon which the requester believes release of the information is required. The NSA/CSS Appeal Authority will endeavor to respond to the appeal within 20 working days after receipt, absent any unusual circumstances.

We also are informing you of fees due associated with this request. Processing of your FOIA request for copies of 93 National Security Systems Issuances is continuing, and the accumulated costs for your request to date total $102.55, of which you have already paid $88.00 (current balance is $14.55).

The total fee so far represents four hours of search, and duplication to date totals 197 pages (118 pages provided in our first two interim responses, and 79 pages provided now). We anticipate that an additional 2100 pages will be provided in additional responses, which will bring your total cost to $414.55, of which $329.55 will be the approximate final balance. Costs are computed in accordance with DoD Regulation 5400.7-R, which assesses $44.00 per hour for search and $.15 per page for duplication. As an "all other" requester, you are entitled to 2 hours of search and duplication of 100 pages free. This has been taken into account when calculating the assessable costs noted above.

Since you indicated your willingness to pay fees, we are not assessing them at this time. However, we will require full payment before we make the final release. Before we complete the review of the remaining documents, we request that you reaffirm your commitment to pay any additional incurred fees. Please provide a statement regarding your willingness to pay all assessable fees. If we do not hear from you within 30 days of the date of this letter, we will

assume that you are no longer interested in pursuing this request, and we will administratively close your case with no further processing.

Sincerely,

PAMELA N. PHILLIPS
Chief
FOIA/PA Office

Encl:
a/s

~~SECRET//NOFORN~~

~~CONFIDENTIAL//MR~~

CNSS Advisory Memorandum
TEMPEST 01-02
October 2002

(U) NONSTOP EVALUATION STANDARD

Derived From: Classification Guide for Information Systems Security Information
Dated: March 1992
Declassify On: Source Marked "OADR"
Date of Source: March 1992

~~SECRET//NOFORN~~

~~CONFIDENTIAL//MR~~

CNSS Advisory Memorandum
TEMPEST 01-02

Committee on National Security Systems

National Manager

FOREWORD

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

~~(S)~~ 1. ~~(C)~~

2. (U//~~FOUO~~) This standard supersedes National COMSEC/EMSEC Information Memorandum (NACSEM) 5112, *NONSTOP Evaluation Techniques*, dated April 1975.

3. (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.

4. (U) Representatives of the Committee on National Security Systems (CNSS) may obtain additional copies of this advisory memorandum from the Secretariat at the address listed below.

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

6. (U) This standard is not releasable to foreign nations without the written consent of:

National Security Agency
ATTN: I1, STE 6576
9800 Savage Road
Fort George G. Meade, MD 20755-6576

MICHAEL V. HAYDEN
Lieutenant General, USAF

CNSS Secretariat (I42) . National Security Agency . 9800 Savage Road .
STE 6716 . Ft. Meade MD 20755-6716
(410) 854-6805 . UFAX: (410) 854-6814
nstissc@radium.ncsc.mil

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TABLES

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SECTION 1 – (U) PURPOSE AND SCOPE

1.1 ~~(C)~~ Introduction -

1.1.1 ~~(U//FOUO)~~ TEMPEST - CE are unintentional intelligence-bearing signals that, if intercepted and analyzed, disclose the national security information transmitted, received, handled or otherwise processed by any information processing equipment. CE may propagate from classified processing systems as electromagnetic radiation or couple onto metal conductors such as signal lines and power lines. CE propagated in this form can be intercepted directly from a nearby location. *NSTISSAM TEMPEST/1-92* addresses the test requirements for systems that propagate CE in these forms.

~~(S)~~ 1.1.2 ~~(S)~~ NONSTOP -

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~~(S)~~ 1.2 ~~(S)~~ Purpose

a. (U) Requirements for equipment testing

b. (U) Requirements for certification of test instrumentation

c. (U) Requirements for documentation

~~(S)~~ 1.3 ~~(S)~~ Scope

1.4 (U) Application - This document is intended for use by U.S. Government departments, agencies and their authorized contractors.

~~(S)~~ 1.5 ~~(S)~~

1.6 (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:

National Security Agency
Attn: C31, Suite 6706
9800 Savage Road
Fort George G. Meade, MD 20755-6706

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

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SECTION 2 – (U) REFERENCE DOCUMENTS

2.1 (U) Documents - The following listed documents supplement the information included in this document. U.S. Government personnel can request TEMPEST copies through their CNSS representative. Contractors should contact their contracting officer.

2.2 (U) Military Specifications

MIL-STD-45662	(U) Calibration System Requirements	

2.3 (U) National TEMPEST Documents

NSTISSI 4002	(U) Classification Guide for COMSEC Information	5 Jun 86
NSTISSI 7001	(U) NONSTOP Countermeasures	15 Jun 94
NSTISSI 7002	(U) TEMPEST Glossary	17 Mar 95
NSTISSAM TEMPEST/2-91	(U) Compromising Emanations Analysis Handbook	20 Dec 91
NSTISSAM TEMPEST/1-92	(U) Compromising Emanations Laboratory Test Requirements, Electromagnetics	15 Dec 92
NSTISSAM TEMPEST/2-95	(U) RED/BLACK Installation Guidance	12 Dec 95

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SECTION 3 – (U) 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 *NSTISSI 7002, TEMPEST Glossary.*

3.1.1 (U) Definition of Shall - The use of **shall** in a direction means that the following actions or procedures are required by this standard, i.e., mandatory.

3.1.2 (U) Definition of Should - The use of **should** in a direction means that the following actions or procedures are recommended but are not required by this standard.

3.1.3 (U) Definition of General Terms

a. (U//~~FOUO~~) Associated Signal - A RED signal that may be coupled into and passed by an equipment under test, but is not intentionally processed by the EUT.

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b. (U) Bit Density - The total number of 1's in the particular byte or word.

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

d. (U//~~FOUO~~) 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, and parallel information units per second (PIU) for parallel transfer. For telegraphic signal codes, the term "baud" is synonymous with "bits per second."

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

f. (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 denotes a group of eight bits where the digits are operated upon simultaneously as a unit. (A byte usually connotes a group of eight bits.)

g. (U) Carrier - A wave having at least one characteristic that may be varied from a known reference value by modulation.

h. (U//~~FOUO~~) Character Time - Period of a data character transfer cycle. Character time is the reciprocal of the repetition rate of the data characters.

i. (U) Compression - The reduction in gain at one level of a signal with respect to the gain at another level of the same signal. When expressed as a ratio (as in 1dB compression) it is the ratio of a non-compressed signal level (linear gain) to the compressed signal level (non-linear gain).

j. (U) Conversion Factor - A general term that refers to adjustments that 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, dBμV to dBμA/ m), current probe factor (dBμV to dBμA) and bandwidth conversion factor (dBμV/kHz to dBμV/MHz).

k. (U) Correction Factor - A general term that refers to adjustments that 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.

l. (U) Demodulator - A device that operates on a modulated carrier wave in such a way that it recovers the wave that originally modulated the carrier.

m. (U//~~FOUO~~) Detection System - The equipment used to perform a NONSTOP test that includes transducers, detectors, and display devices. Recording devices are also included if they are the only means of displaying the emanations during the test.

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U//~~FOUO~~ [redacted] 3)-P.L. 86-36

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

s. (U) Instantaneous Dynamic Range (IDR) - Range of signal levels that 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.

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~~//FOUO~~

t. (U) High-Level - An RF signal level that is greater than or equal to -30 dBm. [redacted]

u. (U) Low Byte, High Byte - Terms used to distinguish between two bytes that 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, . . .).

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v. (U) Low-Level - An RF signal that is less than -30 dBm.

w. (U) Noise Floor - Measurement of the noise that 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.

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

~~(S)~~ [redacted] (C)

z. (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.

aa. (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.

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

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

dd. (U//~~FOUO~~) [redacted] (b)(3) P.L. 86-36

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

ii. (U//~~FOUO~~) 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.

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

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

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

mm. (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.

nn. (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.

oo. (U//FOUO) 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.

pp. (U) Transition Density Total - The number of transitions from 1 to 0 plus the number of transitions from 0 to 1 that occur between consecutive bytes or words when the transfer occurs in an NRZ parallel format.

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tt. (U) Wobbulate - A term used to describe the continual shifting of a CW tone from one frequency to another by slewing between the two frequency extremes.

uu. (U) Word - A group of bytes stored or transferred together as a unit.

3.2 (U) Abbreviations

(U) A - ampere
(U) ac - alternating current
(U) AGC - automatic gain control
(U) AM - amplitude modulation
(U) BFO - beat frequency oscillator
(U) BLC - black line conduction
(U) b/s - bits per second
(U) BW - bandwidth
(U) CE - compromising emanations
(U) cm - centimeter
(U) CORR E - correlated emanations
(U) CRO - cathode-ray oscilloscope
(U) CRT - cathode-ray tube
(U) cw - continuous wave
(U) dB - decibel
(U) dBc - dB below carrier level
(U) dc - direct current
(U) DRE - data related emanations
(U) DSN - detection system noise
(U) DSS - detection system sensitivity
(U) ENVA - environmental ambient
(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) FM - frequency modulation
(U) G - giga - prefix for 10^9 multiplier
(U) Hz - hertz
(U) IDR - instantaneous dynamic range
(U) IF - intermediate frequency
(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) n - nano - prefix for 10^{-9} multiplier
(U) NRZ - nonreturn-to-zero
(U) OE - other emanations
(U) p - pico - prefix for 10^{-12} multiplier
(U) PIU - parallel information unit (per second)
(U) PLC - powerline conduction
(U) PLISN - powerline impedance stabilization network
(U) Rd - RED analog signaling rate or RED pulse width signaling rate or RED digital signaling rate
(U) RF - radio frequency
(U) rms - root-mean-square
(U) Rt - RED transition time signaling rate
(U) RZ - return-to-zero
(U) S/ACF - signal averaging calibration factor
(U) SOI - signal of interest
(U) Tt - transition time
(U) V - volt

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SECTION 4 – (U) REQUIREMENTS

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~~(S)~~ 4.1 ~~(C)~~ Basic Requirement

~~(S)~~ 4.1.1 ~~(C)~~ NONSTOP Requirement

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~~(S)~~ 4.4 ~~(C)~~ Use of Alternative Testing Approaches

~~(S)~~ 4.5 ~~(C)~~ Reduction of Test Requirements

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4.6 (U/~~FOUO~~) Extension of Specified Requirements - If during course of testing or subsequent evaluation or analysis, a phenomenon or emanation is encountered that lies outside the specified requirements of this document that 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.

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SECTION 5 – (U) GENERAL APPROACH

5.1 (U//~~FOUO~~) Introduction - This section presents general information, test requirements and procedures for conducting a NONSTOP evaluation of equipment, referred to herein as the equipment under test (EUT). Specific procedures and test requirements are presented in Sections 7 through 12.

~~(S)~~ 5.2 ~~(C)~~ Test Approach -

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5.3 (U) General Test Sequence - The general sequence of required and optional tests that are to be performed is provided in the following paragraphs. The specific test procedures are provided in Section 10.

~~(S)~~ 5.3.1 ~~(C)~~

~~(S)~~ 5.3.2 ~~(C)~~

~~(S)~~ 5.3 ~~(C)~~

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SECTION 6 – (U) DOCUMENTATION AND CERTIFICATION REQUIREMENTS

6.1 (U) Introduction - This section details the documentation and certification requirements for verifying compliance with this standard.

~~(S)~~ 6.2 ~~(C)~~

[redacted]

6.3 (U) Data Recording

6.3.1 (U//~~FOUO~~) Correlated Emanations - When correlated emanations are detected, they shall be measured and recorded. The signals shall be analyzed to determine if they are CE or DRE. Where correlated emanations are not detected, sufficient measurements shall be made to ascertain the level of TEMPEST-limited ambient emanations from the EUT.

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~~(S)~~ 6.3.2 ~~(C)~~

[redacted]

6.3.3 (U) Data Sheets - All data taken during testing of the EUT shall be recorded on data sheets. The data sheets should 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).

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.

~~(S)~~ (2) ~~(C)~~
~~(S)~~ (3) ~~(C)~~

[redacted]

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(4) (U) Overall detection system bandwidth and predetection bandwidth.
(5) (U) Calibrated source signal generator reading in appropriate units.
(6) (U) Conversion and correction factors identified and listed separately.

(7) (U) Adjusted reading (absolute emanation level) in appropriate units.
(8) (U) Identification of emanation (see Paragraph 6.3.5).
(9) (U) Description of detected emanation timing (60 Hz, etc.).
(10) (U) Comments, e.g., any observations considered helpful in identifying or describing detected emanations or special test conditions.

6.3.4 (U) Emanation Recordings - Provide recordings (photographs, digital images or other data formats specified by the sponsoring organization) representative of all correlated emanations detected. 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. The recordings shall clearly show the emanations.

6.3.5 (U//~~FOUO~~) Emanation Designators - When performing searches for correlated emanations, the following emanation designators shall be used for identifying detected emanations and ambient signals on data sheets and graphs and for other results presented in the EUT test report:

CORR E	- correlated emanations that consist of either
CE	- compromising emanations; or
DRE	- data related emanations; correlated emanations that are not compromising.
OE	- other emanations that consist of either:
EUTA	- EUT TEMPEST-limited ambient (noncorrelated EUT emanations); or
ENVA	- environmental TEMPEST-limited ambient.
DSN[1]	- detection system noise.

6.4 (U//~~FOUO~~) Test Instrumentation Certification Report - All instrumentation (e.g., detection system and signal generators) used for NONSTOP testing must be certified and approved prior to performing NONSTOP 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 five 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 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 NONSTOP test instrumentation, including the nomenclature, identification number, bandwidths, frequency ranges, and manufacturer of receivers, probes, signal generators, oscilloscopes, etc.

d. (U) High- and low-level sensitivities for each bandwidth used for all detection system test configurations.

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 non-compliance with the sensitivity, bandwidth and frequency requirements. Specify the steps that were taken in an effort to comply with these requirements.

(U) [1]DSN normally does not represent an emanation as such; the designator is included here for completeness.

6.5 (U) Test Report - At the completion of the TEMPEST tests, a report shall be written that 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).

e. (U) Date of most recent calibration of test instrumentation prior to NONSTOP 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, including power sources.

h. (U) Critical installation details determined as a result of either preliminary or formal testing that are necessary for the EUT to meet the requirements 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:

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~~(S)~~ (2) ~~(C)~~
~~(S)~~ (3) ~~(C)~~

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(4) (U) Data, including all emanation levels and noise levels.

~~(S)~~ (5) ~~(C)~~

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

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

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

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

m. (U) Conclusions.

n. (U) Recommendations.

o. (U) Names of test personnel.

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SECTION 7 – (U) INSTRUMENTATION REQUIREMENTS

7.1 (S) Introduction [redacted]

7.2.3 (U//~~FOUO~~) Bandwidth Requirements - The 6 dB bandwidth requirements for all detection systems shall be based on the signaling rates of the RED signals of interest as determined in Section 10.2. Bandwidths for detection systems shall comply with the requirements specified in Section 10.3.2. The pre-detection bandwidth (intermediate frequency (IF) bandwidth for heterodyne detection systems) shall not be greater than three times the overall detection system bandwidth. The shape factor (see definition in Section 3) of the tunable detection systems shall not exceed 10:1[2] when measured at the center of each decade of frequency or the center of each tuning band, whichever is the greater number of measurements. Pulse-stretching circuits may be used on the output of the detection system, provided the following requirements are met:

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

7.3 (U//~~FOUO~~) [redacted]

(S) [redacted]

(U) [2] 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.

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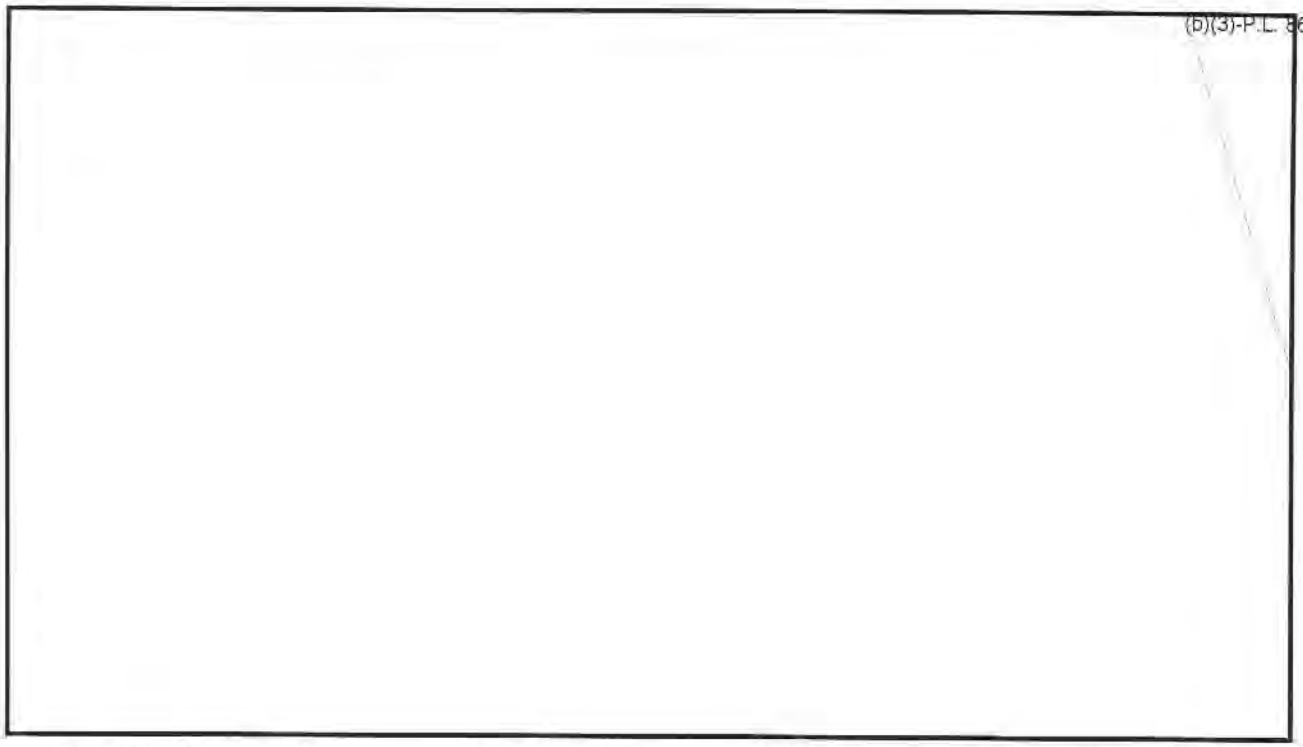

7.4 (U) 6 dB Bandwidth Measurements - The detection system bandwidth measurement requirements specified in this paragraph shall apply to the entire detection system, including the transducer[5] (voltage or current probe for susceptibility tests) and display device (oscilloscope, digital storage scope, 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 detection system shall be measured 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.

7.4.1 (U) Introduction - This procedure determines 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 7.4.3 a through i below. 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.

7.4.2 (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

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(U) [5] 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.

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 that are at least one order of magnitude better than the expected overall bandwidth. (b)(3)-P L 86-36

7.4.3 (U) Measurement Procedure - The overall bandwidth shall be measured as follows:

a. (U//FOUO)

h. (U) Subtract the result of d (above) from that of 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.

7.5 (U) Signal Measurement Standards - The acceptable calibration standards, for the purpose of this document, are sine wave generators that 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 that bypasses the signal generator attenuator shall not induce errors in any measurements.

c. (U) Amplitude accuracy: ±l dB for fc ≤ 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-ST-45662. If, during any of the above tests, 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 – (U) TEST ENVIRONMENT

8.1 (U//~~FOUO~~) Introduction - [redacted] (b)(3)-P.L. 86-36

8.2 (U//~~FOUO~~) Test Facility - [redacted]

8.3 (U) Test Configuration

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

8.3.2 (U) Systems Located In Test Facilities

a. (U) Ground Plane - The EUT shall be grounded as in a normal installation and shall be placed 4 to 6 cm above a ground plane. 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 8.3.3. When bonding straps are required to complete the test setup (exclusive of bonding straps from the ground plane to a 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 ancillary cables shall be placed on, but isolated from, the ground plane with nonconductive materials or standoff insulators 4 to 6 cm in height.

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c. (U) Installation Details - If either preliminary or formal tests reveal that certain installation details (reference grounding and shielding) are necessary in order that the EUT meet the requirements of this document, then such details must be documented in the test report. Likewise, any EUT test installation details that differ from that provided in the NONSTOP test plan shall also be documented in the test report.

8.3.3 (U) EUT Ground Plane - The EUT ground plane (required for tests performed in a test facility) 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 applicable. 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 dc bonding resistance between the ground plane and the shielded enclosure shall not exceed

2.5 milli-ohms.

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8.3.4 (U) Test Detection System - The detection system shall be installed and configured to minimize undesired signal coupling from the EUT or EUT exerciser, and to minimize sensitivity degradation resulting from high-level environmental ambient signals. Sensitivity degradation can be minimized by using equipment case shields, interconnection wiring and shielded terminations.

8.3.5 (U) EUT Exercising Equipment - Stimulus equipment used to exercise the EUT shall be located and connected to minimize coupling to the EUT. This equipment processes signals similar, or identical, to those processed by the EUT. Such signals could inadvertently couple into the detection system and be misinterpreted as EUT compromising emanations. The following steps can aid in reducing coupling effects from the stimulus equipment:

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

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 (if used); filter passbands should be no greater than those required to pass stimulus signals.

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SECTION 9 – (U) EQUIPMENT UNDER TEST OPERATION

(S) 9.1 (C) Introduction -

9.4 (U//~~FOUO~~) RED Signal Processing Equipment Operation - During NONSTOP testing, exercise the RED signal processing equipment in all of its operational modes. All circuits that are active during a given mode of operation shall be in operation when that mode is tested. As required by the RED signal processing equipment 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 RED signal processing equipment shall be operated at the signaling rates used to determine the test instrumentation requirements. All doors, panels, etc. shall be opened or closed, as in normal operating condition.

[redacted]

9.4.2 (U//~~FOUO~~) 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//~~FOUO~~) A wobbulated cw signal centered near the EUT signaling rate that was used to determine the detection system bandwidth. The maximum frequency extremes (highest minus lowest frequency) shall be 10 percent of the center frequency with a maximum slew-cycle rate between 0.1 percent and 1 percent of the center frequency.

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

9.4.3 (U) EUT Signaling Rate, Analog Voice Signals - If a simulated RED data input signal is used, it shall take one, or a combination, of the following forms:

a. (U//~~FOUO~~) A wobbulated cw signal that is centered at 500 Hz. The frequency difference (highest minus lowest frequency) shall be between 100 Hz and 500 Hz with a maximum slew-cycle rate between 1 Hz and 10 Hz.

b. (U//~~FOUO~~) An on-off cw signal that is centered at 500 Hz. The keying rate shall be between 1 Hz and 10 Hz.

c. (U//~~FOUO~~) An EUT signaling rate of 500 Hz shall be used to determine the test criteria for analog speech signals.

~~(S)~~ 9.5 ~~(C)~~ [redacted]

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SECTION 10 – (U) EMANATIONS SEARCH

~~(S)~~ 10.1 ~~(C)~~ Introduction

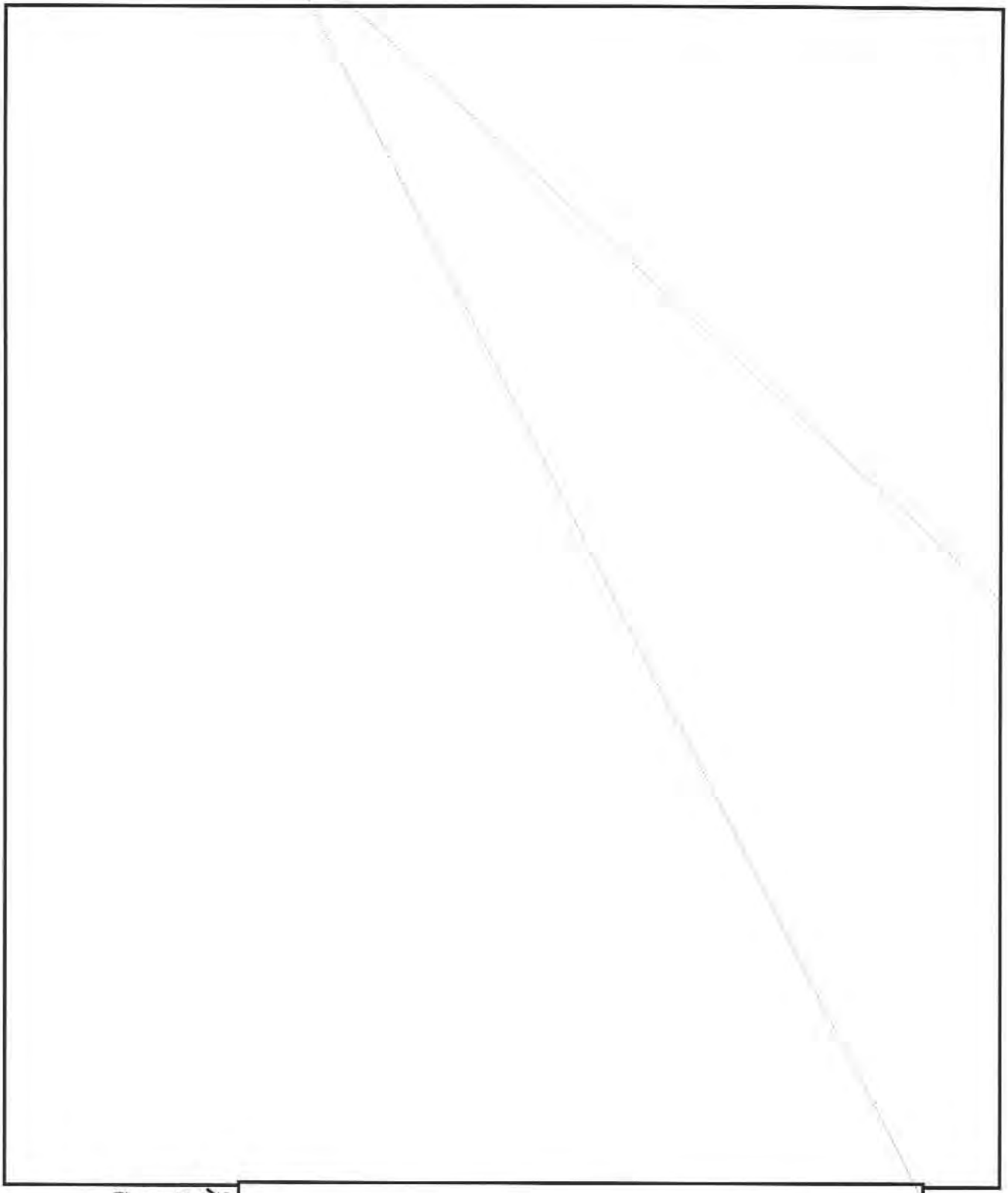

Figure 10-1 (C)
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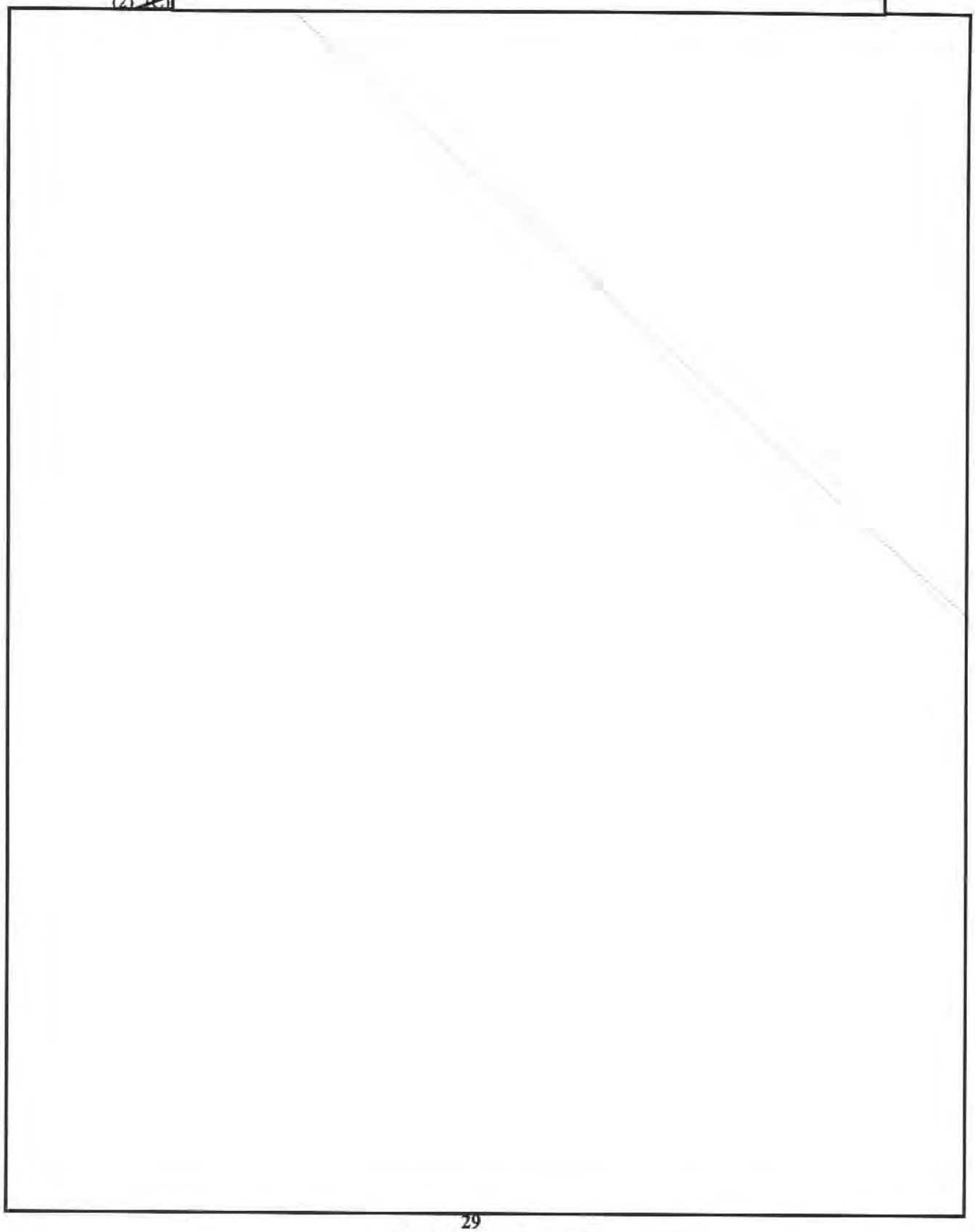

10.3.3 (U//~~FOUO~~)

10.3.4 (U//~~FOUO~~) Search Optimization - If correlated emanations are detected during any part of the tunable test, use the following procedures to optimize the detection system. Increase and decrease the bandwidth of the detection system 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. (b)(3)-P.L. 86-36

The 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.

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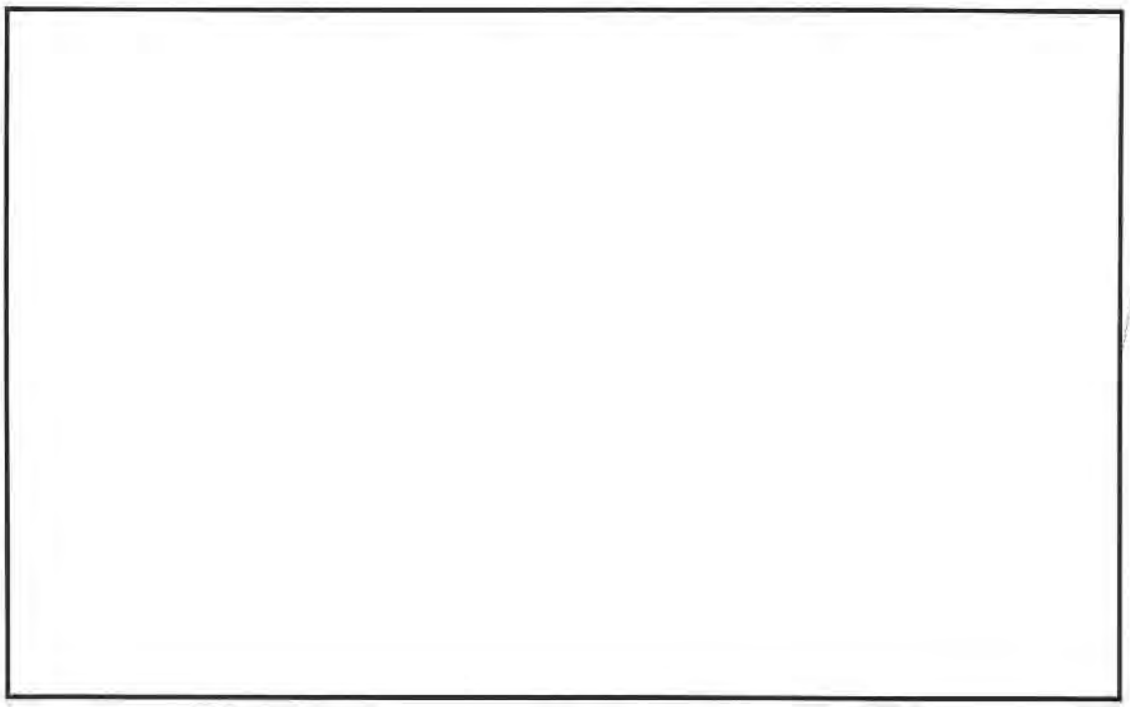

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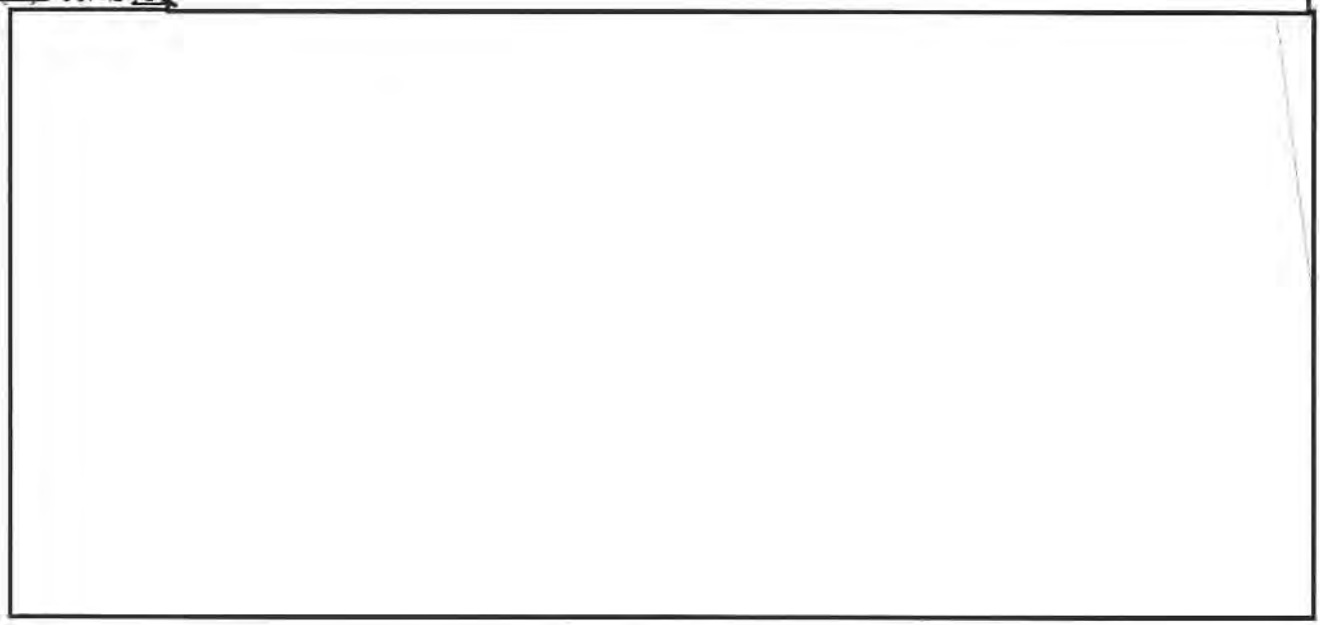

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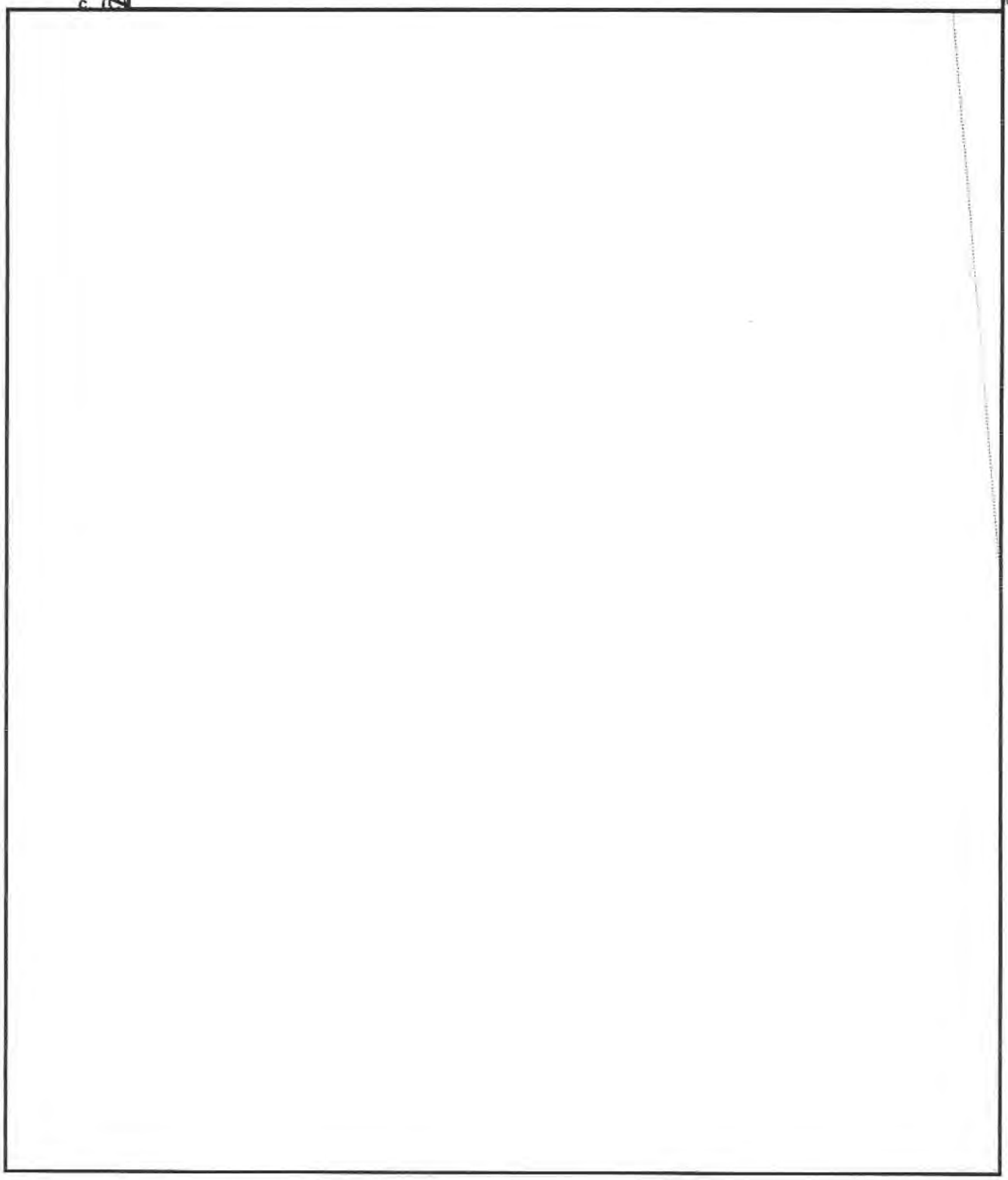

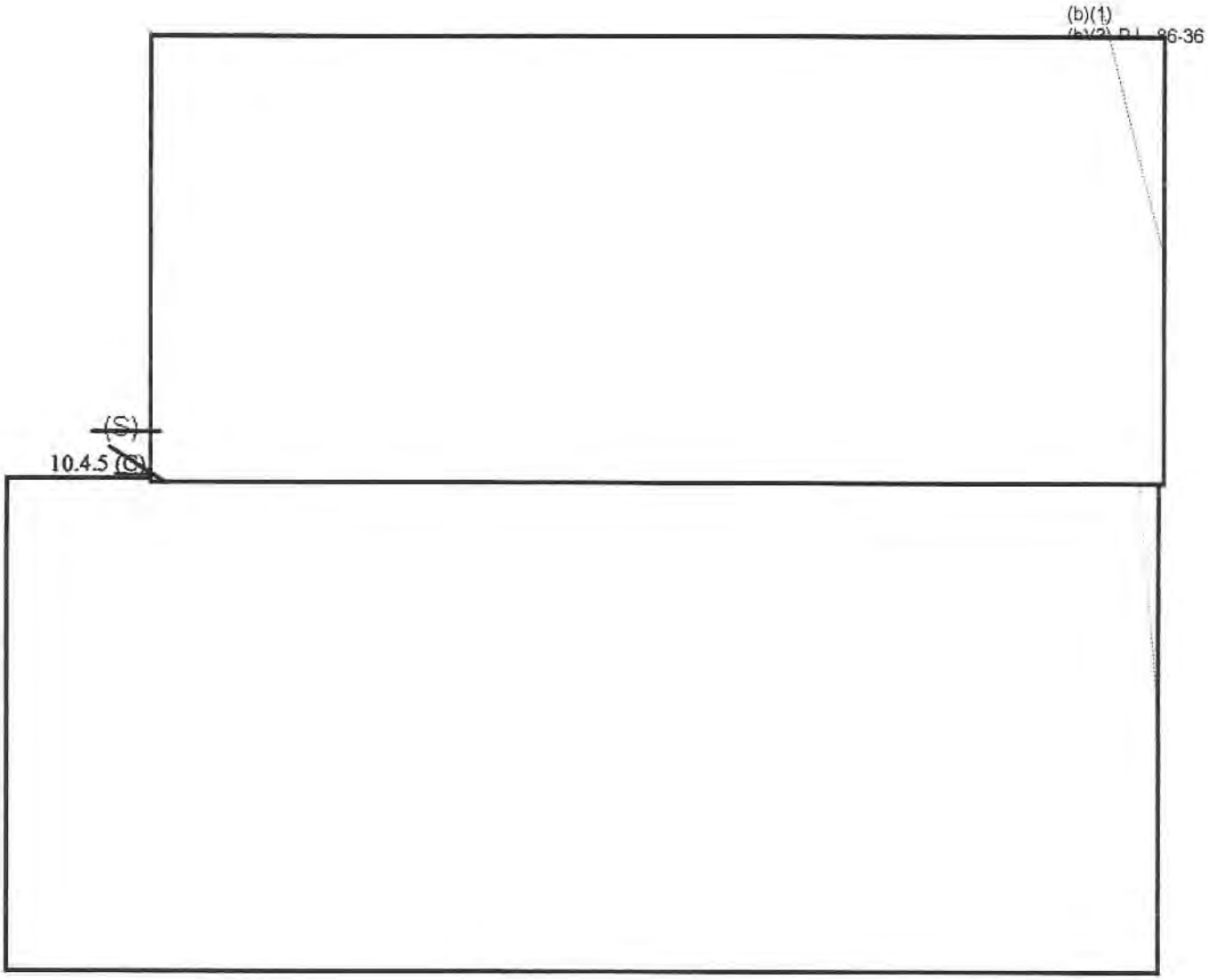
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SECTION 11 – (U) EMANATIONS MEASUREMENTS

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~~(S)~~ 11.2 ~~(C)~~ General

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

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a. (U) Frequency accuracy: ±5%

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

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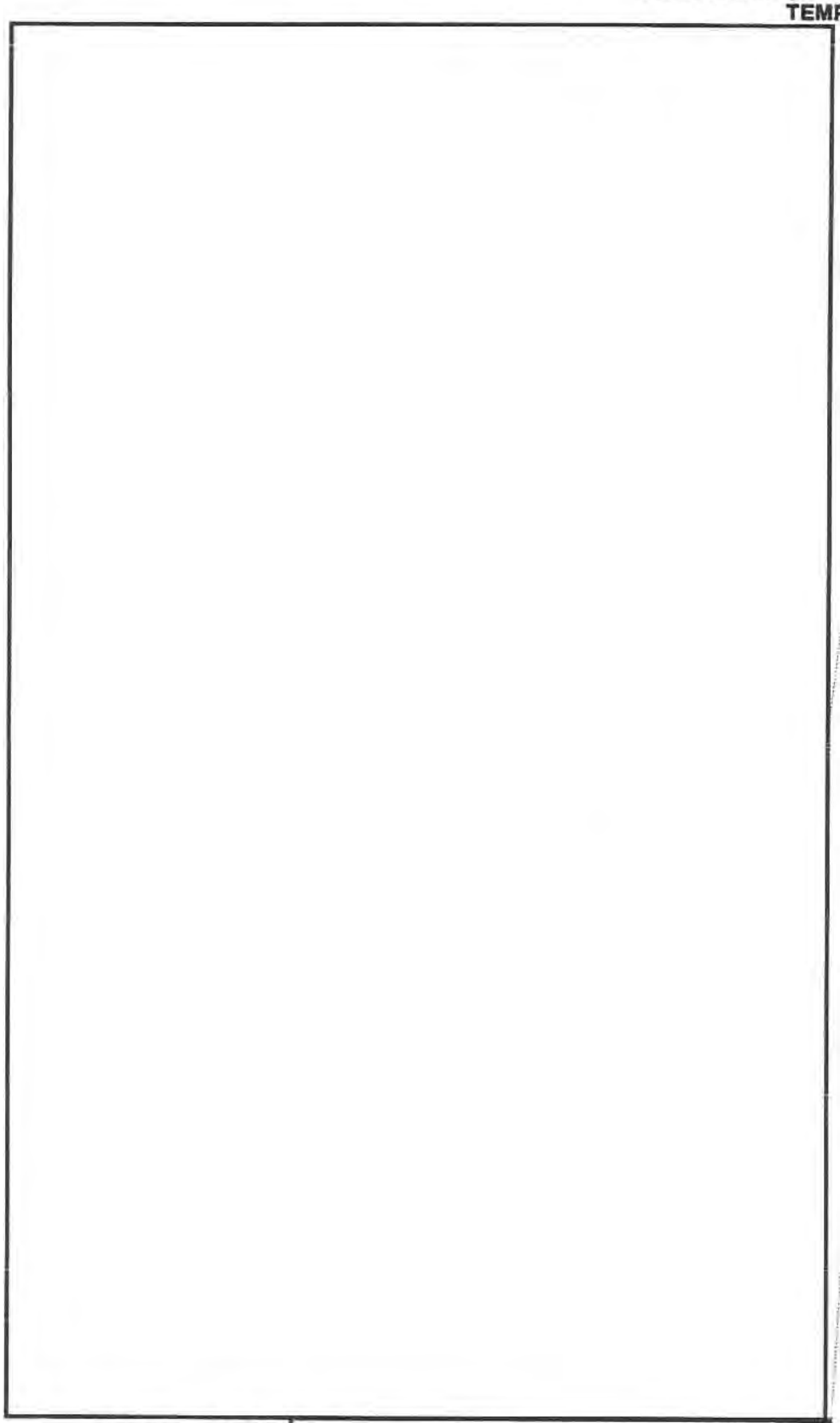
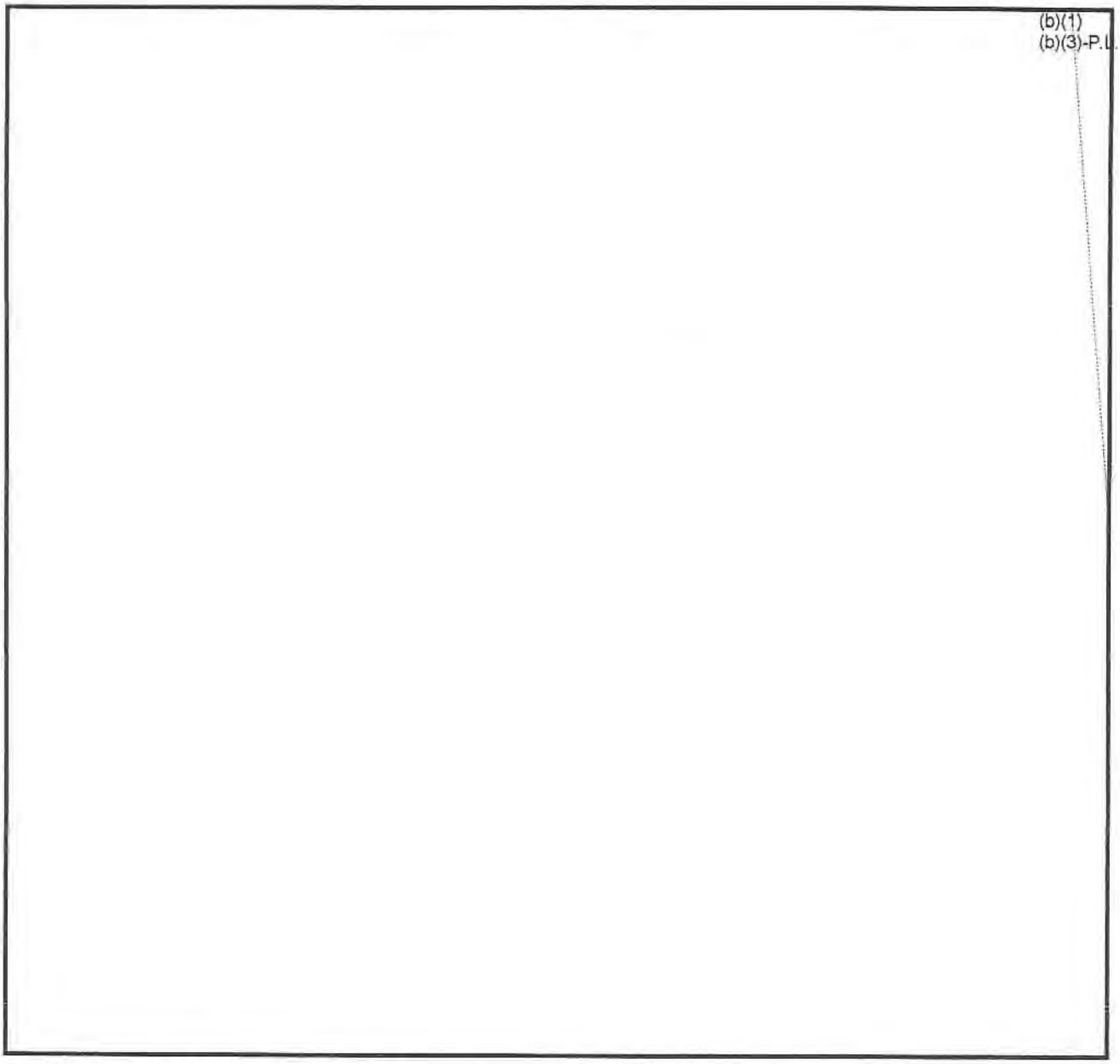


~~(S)~~ Figure 11-1 ~~(S)~~



11.5 (U) Signal and Noise Measurements

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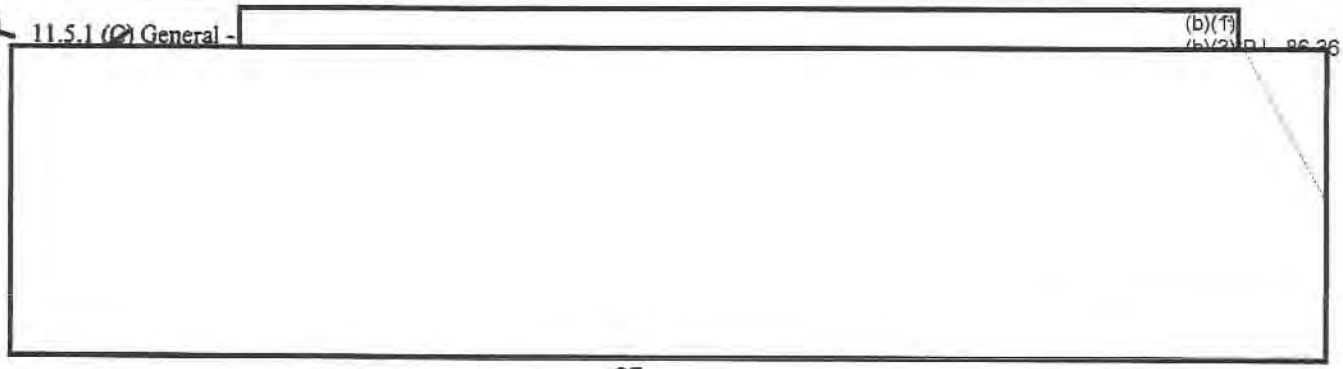

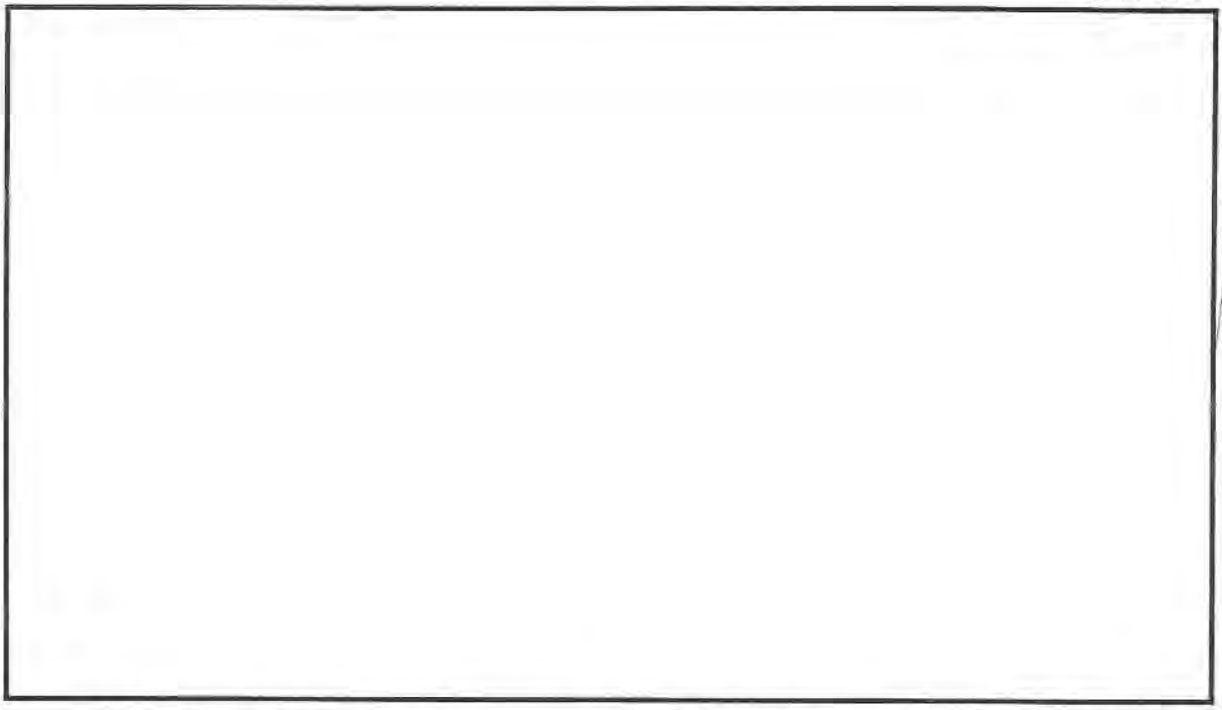

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11.5.2 (U) Procedure 1: Statistical Measurements - Using this procedure, the voltage parameters of the detected emanation to be measured and documented are the peak signal mean (S_p) and the rms noise (N_σ). It may be necessary to document sets of 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 Section 1).

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 (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.

a. (U) Serial Signals - Figure 11-3 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.

(1) (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.

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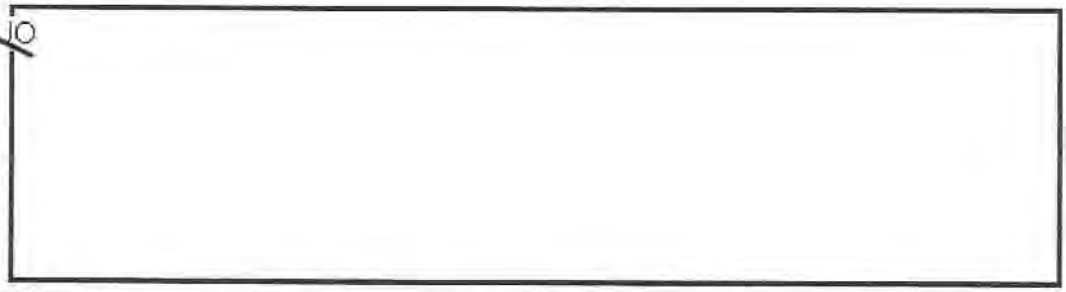

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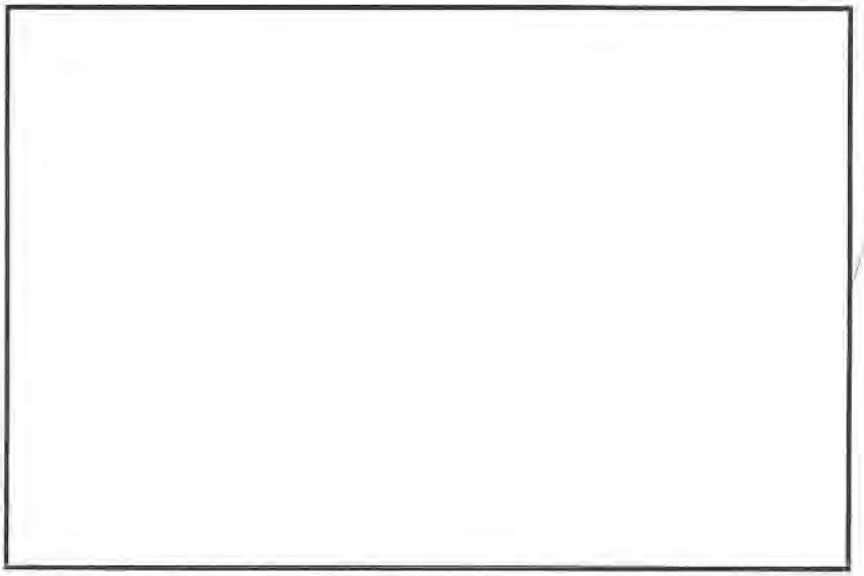
b. (U) Small Signal-to-Noise Ratios - When correlated emanations are characterized by small signal-to-noise ratios, performing separate signal and noise measurements may be difficult. An alternate procedure may be used that requires a visual measurement representing the signal plus noise, and a visual measurement representing the noise

alone. Figure 11-4 illustrates this type of emanation (ideal). The voltage levels to be measured are E_1 and E_2.

(1) (U) The noise measurement is equal to: $N_{pp} = E_2 - E_1$
(2) (U) The signal plus noise measurement is equal to: $S + N_p = E_2$
(3) (U) The signal level is computed using the following equation: $S = E_2 - N_{pp}/2 = (E_2 + E_1) \div 2$

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 either is serially or parallel-processed.



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c. (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 NONSTOP testing do not appear in this form, the concept remains the same and the measurement procedure should be easily extended. The noise voltage measurements 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_σ (dB) + 14 dB

(U) [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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~~(S)~~ SECTION 12 – (C)

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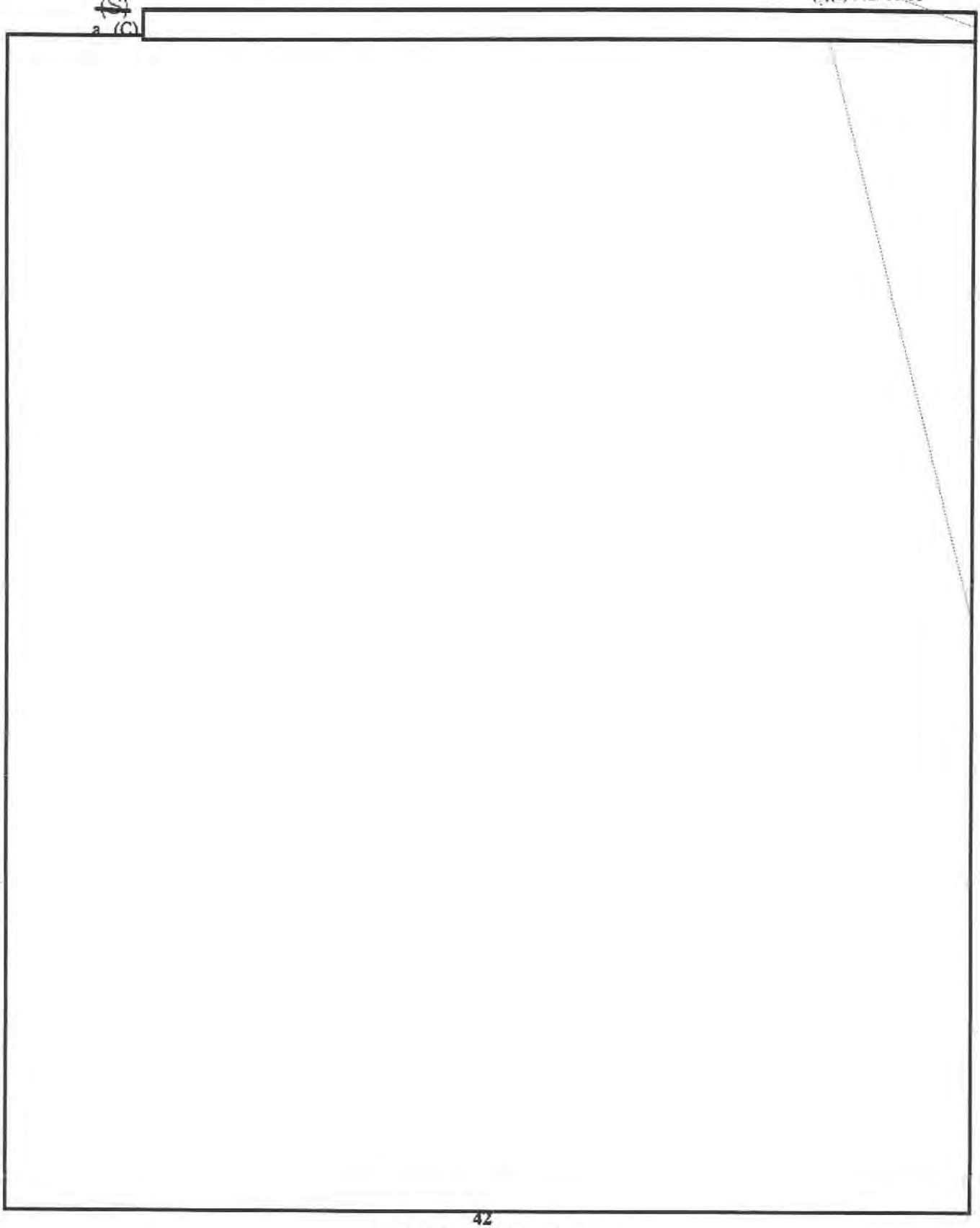

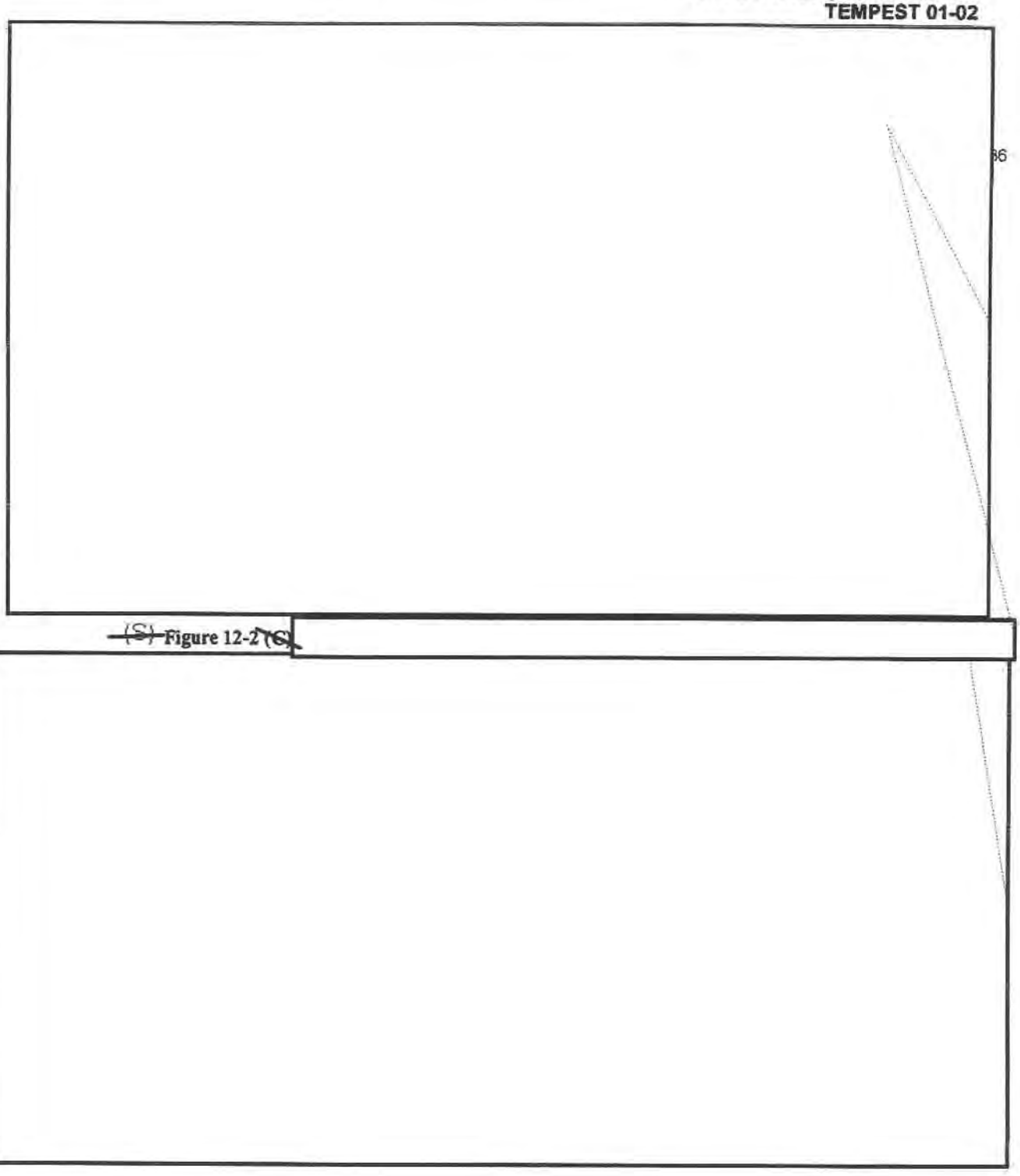

~~(S)~~ Figure 12-2 ~~(S)~~

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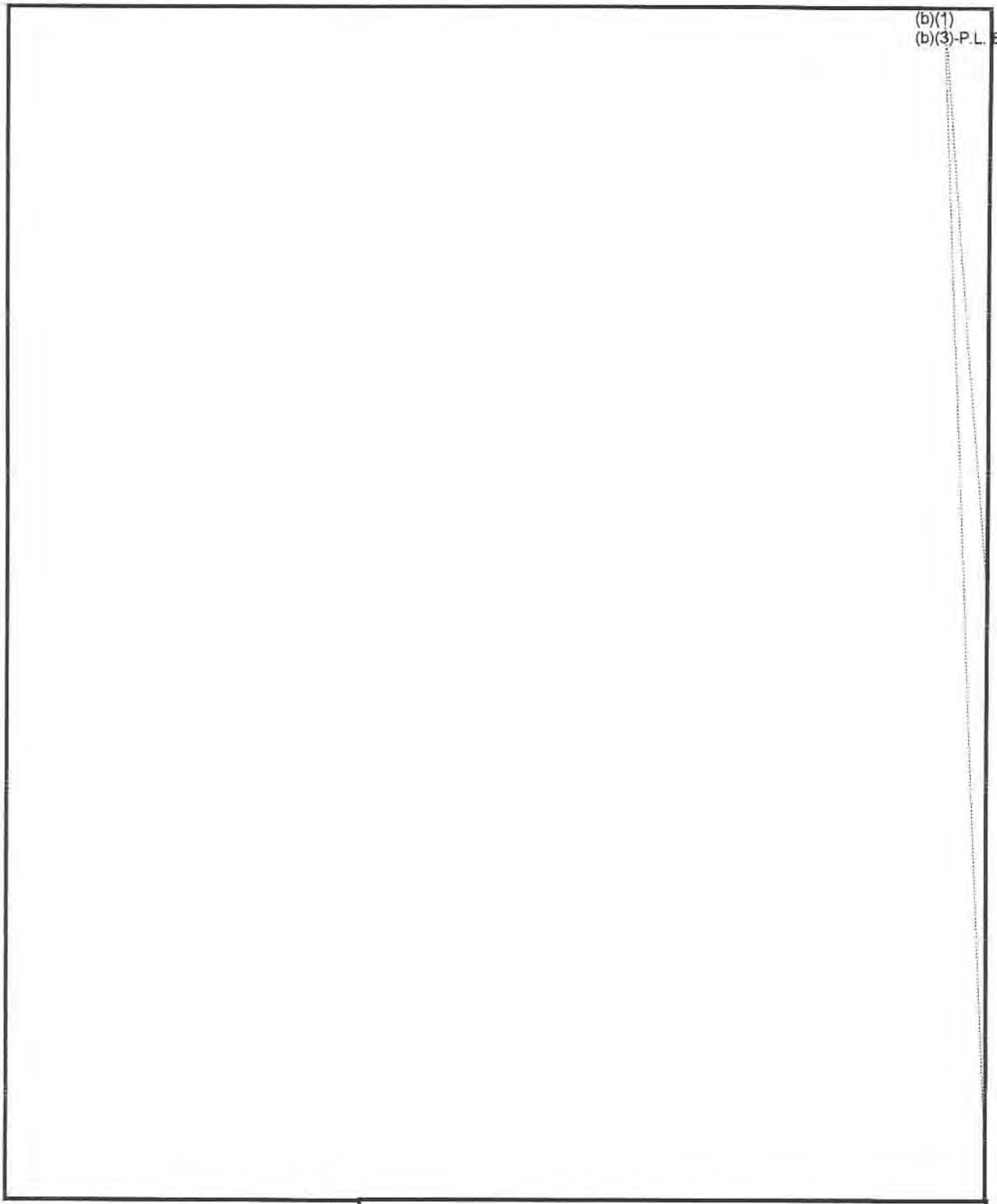

(S) Figure 12-4 (S)

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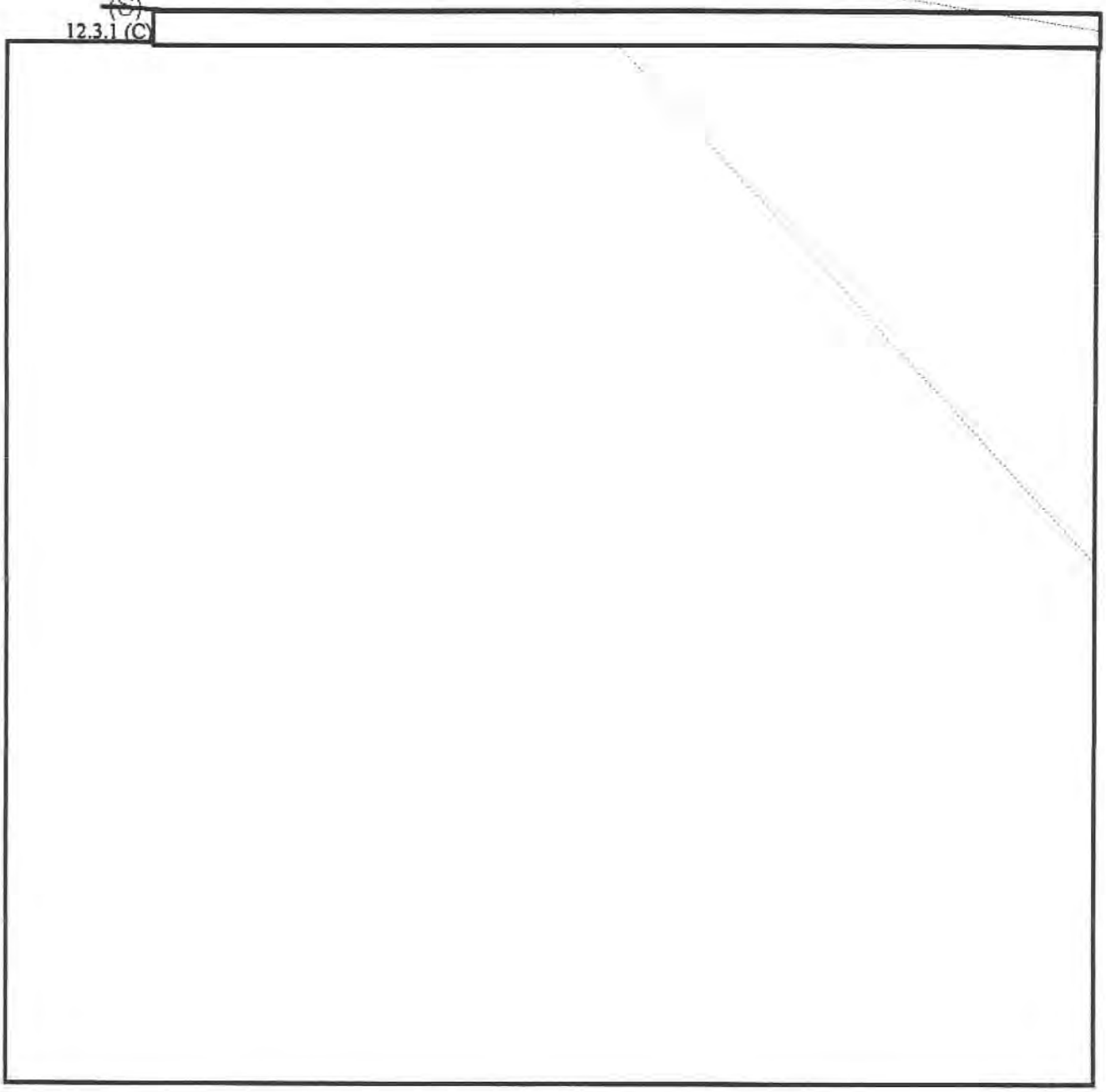

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SECTION 13 – (U) ANALYSIS OF VOICE SIGNALS

13.1 (U//~~FOUO~~) Introduction - The purpose of this section is to provide test procedures that can be used to analyze the information content in a TEMPEST voice channel. A spoken word test provides a qualitative measure of the voice channel. A test tone test provides a quantitative measure of the voice channel. Both tests must be performed to determine if the voice emanations are compromising.

13.2 (U//~~FOUO~~) Scope - This section covers crosstalk signals associated with systems that process baseband analog speech signals, and is not applicable to other types of analog data or to speech signals that are modulated or frequency shifted.

13.3 (U//~~FOUO~~) General Test Requirements - A keyed or wobbulated 500 Hz test tone shall be used as the RED test message during searches for analog voice, as described in Section 9. Detection of the test tone is not sufficient to determine if the voice signals are compromising. Whenever the test tone is detected, two additional test procedures shall be performed to analyze the signals. A spoken word test shall be performed if it is allowed by the EUT configuration. The detection system bandwidth shall be optimized at the beginning of the test procedure to enhance intelligibility of the voice signals. A speech test tone test shall then be performed. The NONSTOP detection system bandwidth shall be greater than or equal to 3 KHz, but less than or equal to 20 KHz.

13.4 (U//~~FOUO~~) Spoken Word Test Procedure - Configure the speech channel for normal operation and monitor the output of the speech channel aurally. Adjust the volume control to the highest level that will be used during normal operation. If this level produces distortion, reduce the volume until the distortion is no longer audible. Randomly select ten sentences from the intelligibility tests in Table 13-1 and speak them into the speech channel. Listen to the output of the NONSTOP channel and determine that words are intelligible. If 25% of the words in the test sentences are intelligible, then the speech signals are compromising.

1. Mabel stood on the rock.	15. The plants grew tall and green.
2. Sue cleaned up the old house.	16. Swim to that other rock.
3. Show the rich lady out.	17. The bathroom sink is clogged.
4. The auto stopped itself.	18. You should clean the black pot.
5. The others liked to play.	19. No boys can take that course.
6. Don't splash paint on that rug.	20. These mushrooms taste awful.
7. He caught them at your house.	21. She threw mud on that wall.
8. It was too late for lunch.	22. The lawyers wrote that will.
9. She broke the old red jar.	23. The braid is much too long.
10. His jackknife looked so sharp.	24. She had on elbow gloves.
11. Most gum costs four pennies.	25. They took a test for school.
12. That herb garden looks fine.	26. The stop sign fell over.
13. The miners panned for gold.	27. He lost all those letters.
14. Fred was wrong to be blunt.	

Table 13-1 (U) Sentences for Testing Speech Equipment (U)

13.5 (U) Speech Tones Test Procedure

13.5.1 (U) Test Instrumentation - The test instrumentation shall consist of a test tone detection system and an injection system. An optional spectral shaping filter may be used with the injection system.

a. (U//~~FOUO~~) Detection system - The speech test tone detection system shall consist of a spectrum analyzer, either a swept frequency or Fast Fourier Transform (FFT) type. The spectrum analyzer shall operate over the test frequency range of 50 to 5000 Hz with a bandwidth or frequency resolution less than or equal to 50 Hz. The spectrum analyzer noise floor must be less than that of the system under evaluation throughout the test frequency

range. If the characteristic output impedance of the NONSTOP detection system does not equal the spectrum analyzer input impedance, an impedance matching network should be employed.

b. (U//~~FOUO~~) Injection system - The speech test tones shall be generated by a tracking oscillator synchronized with the detection system, or shall be generated by a discrete tone generator. The frequency response of the tracking oscillator or tone generator shall be within ±2 dB over the test frequency range of 50 to 5000 Hz. If the characteristic input impedance of the EUT does not equal the speech test tone generator output impedance, an impedance matching network should be employed.

c. (U//~~FOUO~~) Spectral Shaping Filter - A spectral shaping filter may be used to simulate the power spectrum of speech. The frequency response of the filter shall be within ±2 dB of the spectral shaping correction levels at each of the twelve test frequencies specified in the speech test table, Table 13-2. The characteristic input and output impedance of the filter shall match the output impedance of the tracking oscillator or tone generator.

13.5.2 (U) Test Procedure

a. (U//~~FOUO~~) Speech System Setup - Adjust the speech system volume control to the highest level that is used for normal operation. If this level produces distortion, reduce the volume until the distortion is no longer audible. Do not disturb the speech system for the remainder of the test.

b. (U//~~FOUO~~) Injection Levels - Remove the system microphone or speech input and replace it with the test injection system. Tune the swept oscillator or tone generator to 500 Hz. Monitor the speech system output with a spectrum analyzer. Adjust the level of the injection system to the maximum possible level before either compression or clipping by the speech system occurs. Record the injection system level as the reference level. Tune to 100 Hz and 3000 Hz and verify that there is no compression or clipping by the speech system at these frequencies. If there is compression or clipping at either frequency, a spectral shaping filter must be used.[1]

c. (U//~~FOUO~~) Frequency Shift - Inject a 500 Hz tone into the input of the speech system and monitor the output of the speech system with the spectrum analyzer. Adjust the generator frequency to identify the tone and to avoid any ambient noise. Compare the generator frequency with the tone frequency measured on the spectrum analyzer. If there is a shift in the frequencies, the speech system has shifted the frequency spectrum and this test procedure does not apply.

d. (U//~~FOUO~~) Test Tone Level Measurement - Connect the injection system to the input of the speech system and set the injection system level to the reference level established in section 13.5.2.b. Remove any intended signal from the EUT output and connect the test tone detection system to the output of the NONSTOP detection system.

(1) (U//~~FOUO~~) Measurement Procedure with Tracking Oscillator - Select a spectrum analyzer IF bandwidth or frequency resolution setting less than or equal to 50 Hz and a frequency span that includes the test frequency range of 50 to 5000 Hz. With the spectrum analyzer, measure the level at each test tone frequency as listed in Table 13-2. Measurements at other than the listed frequencies may be made to avoid ambient noise (such as power line harmonics). Remove the tracking oscillator from the input of the speech system and measure the noise level at each test tone frequency.

(2) (U//~~FOUO~~) Measurement Procedure with Signal Generator - Set the signal generator frequency to the first test tone frequency in the Speech Test Table, Table 13-2. Select a spectrum analyzer IF bandwidth or frequency resolution setting less than or equal to 50 Hz and a frequency span that includes the test tone. Adjust the generator frequency to avoid ambient noise (such as power line harmonics). With the spectrum analyzer, measure the level at the tone frequency and record the results into the speech test table. Remove the tone from the input of the speech system and measure the noise level at the tone frequency. Repeat the procedure for each test tone frequency.

(S) 13.5.3 (~~C~~) Speech Tone Test Results -

(U) [1]An alternative is to use the test tone procedure and manually adjust the output level for each tone frequency.

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(b)(1)
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TEST TONE (No)	FREQ (Hz)	SSCF (dB)	SIGNAL LEVEL (dB)	SIGNAL +SSCF (dB)	NOISE LEVEL (dB)	BWCF (dB)	NOISE +BWCF (dB)	S/N RATIO (dB)
1	100	-5						
2	150	-3						
3	250	0						
4	350	0						
5	500	0						
6	750	-5						
7	1000	-8						
8	1250	-10						
9	1500	-13						
10	1750	-15						
11	2000	-17						
12	3000	-23						

Note: Add the Spectral Shaping Correction Factor (SSCF) only if a spectral shaping filter is not used.

Table 13-2 (U) Speech Test Table (U)

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(S)
a. (C)

13.5.4 (U) Documentation - Documentation of the test parameters shall include a detailed block diagram of the test instrumentation used. The block diagram shall reflect all impedances and transformations. The documentation shall also specify the speech system settings, speech system modes of operation, injection system levels and spectrum analyzer settings.

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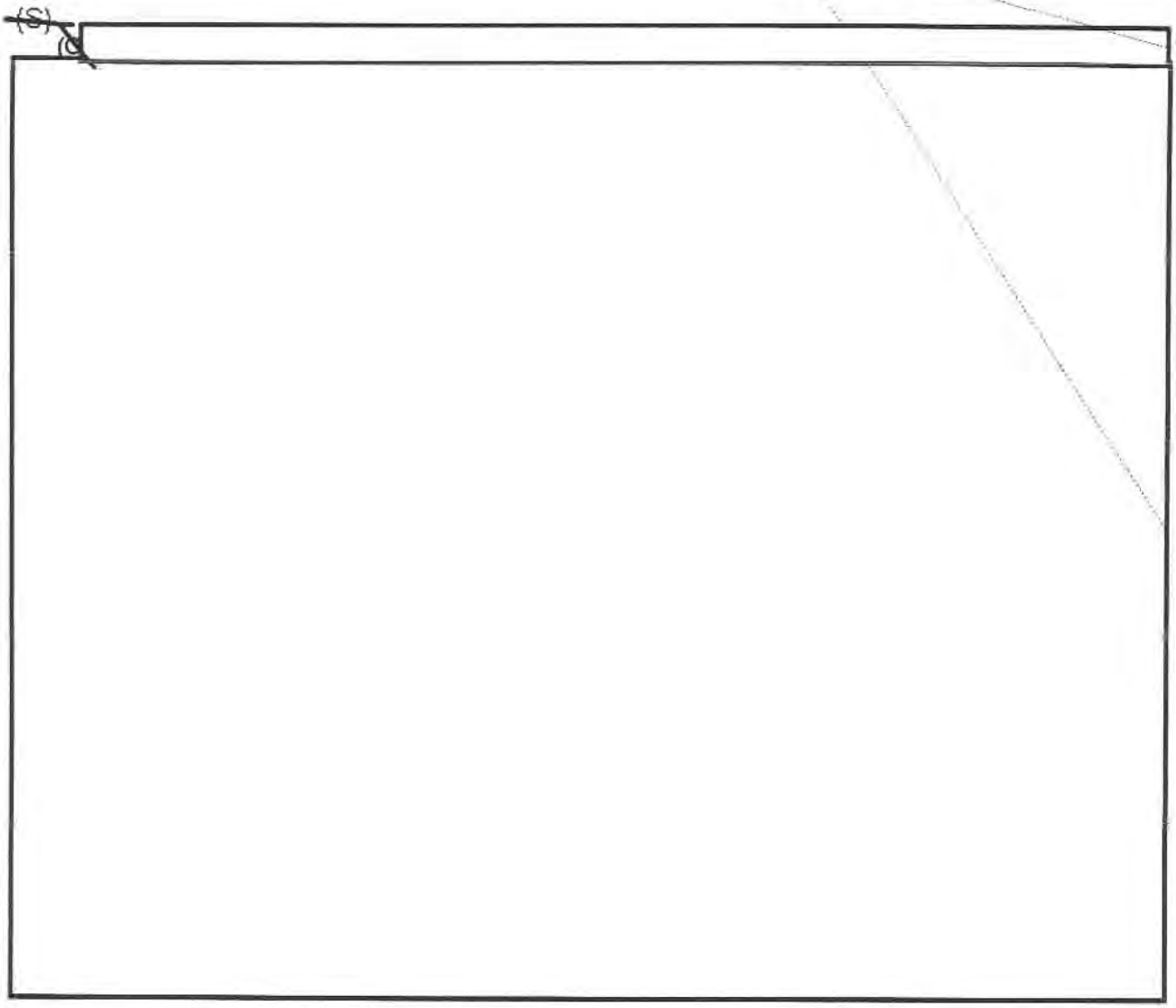
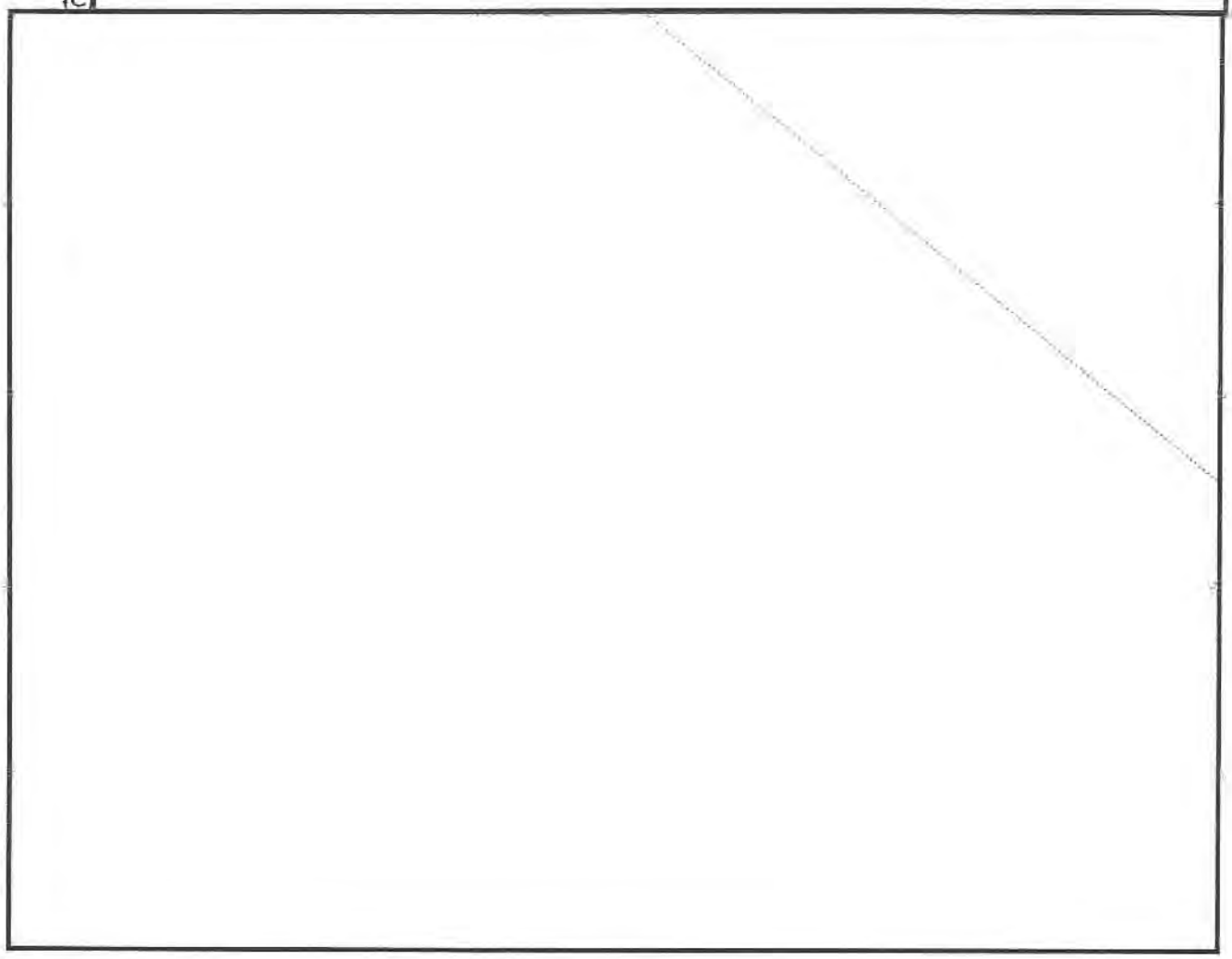
(b)(3)-P.L. 86-36

~~(S)~~



~~(S)~~ (C)



Bandwidth Correction Factor (BWCF)= 10 • $\log_{10}$ [1000/BW (Hz)]

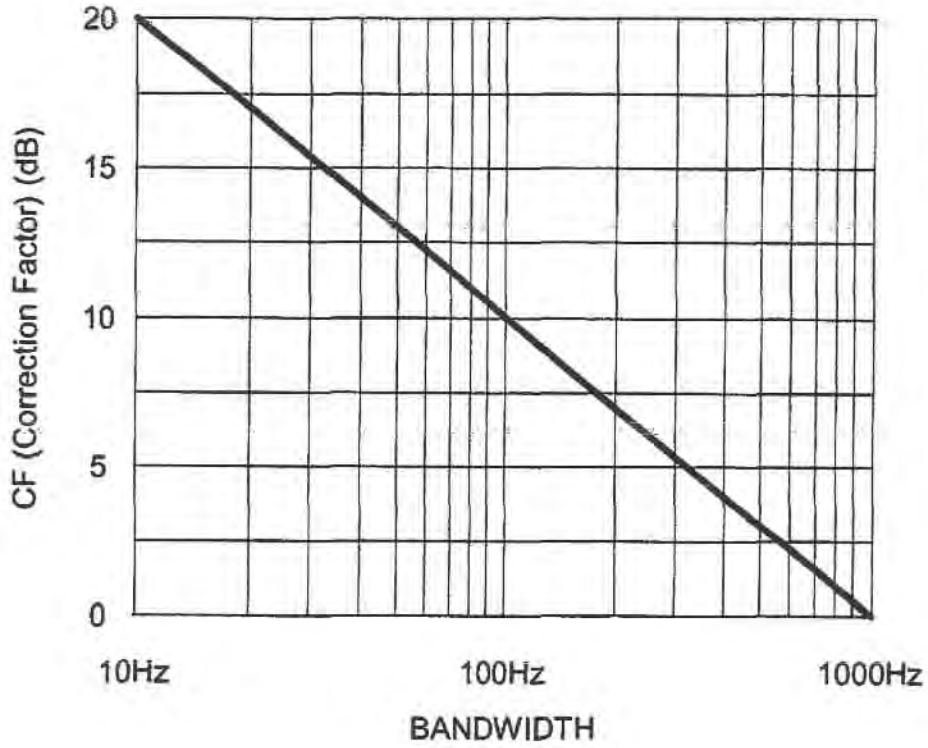


Figure 13-3 (U) Bandwidth Correction Factor (U)

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SECTION 14 – (U) DESCRIPTION OF CORRELATED SIGNALS

14.1 (S)

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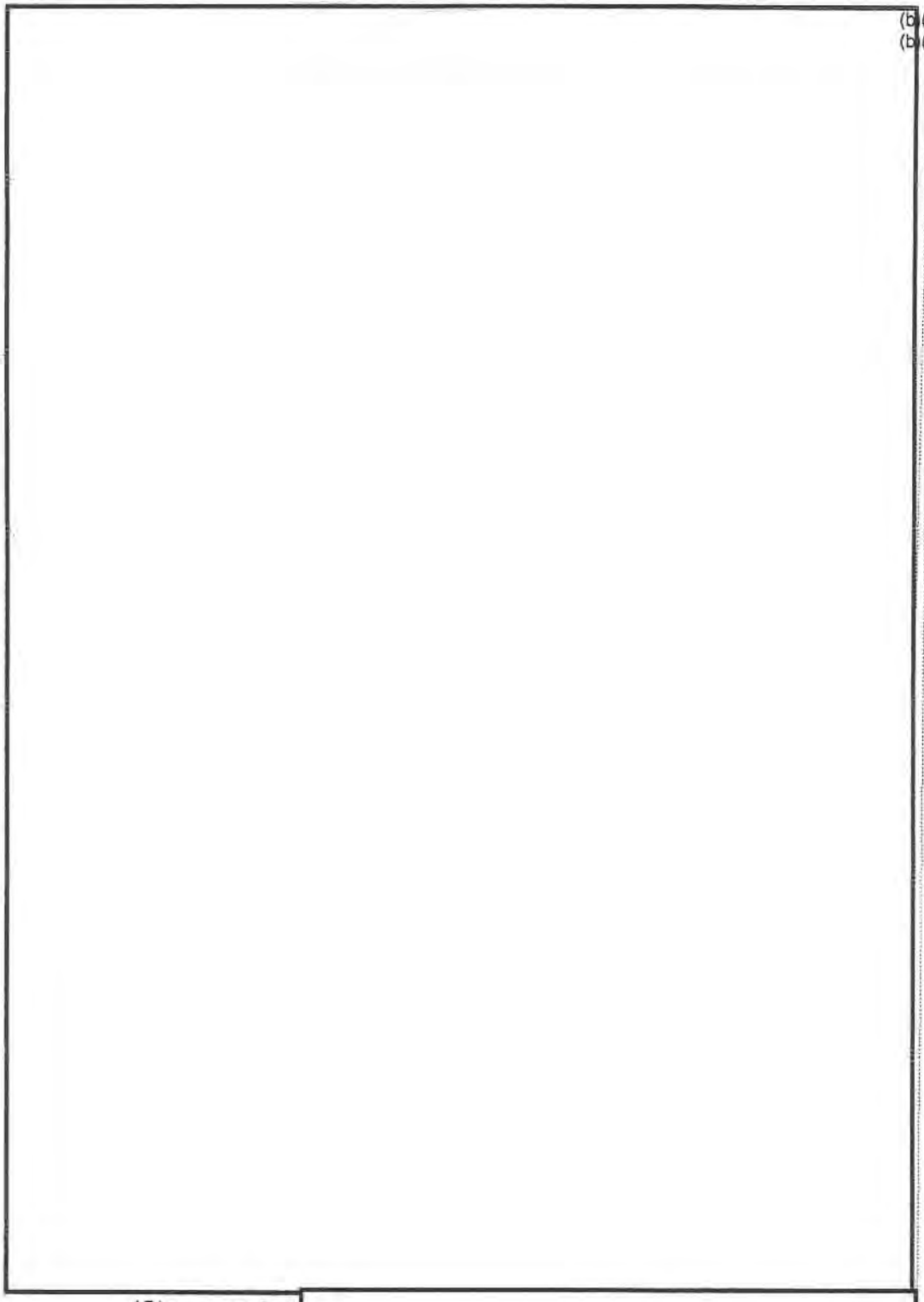

~~(S)~~ Figure 14-1 (C)

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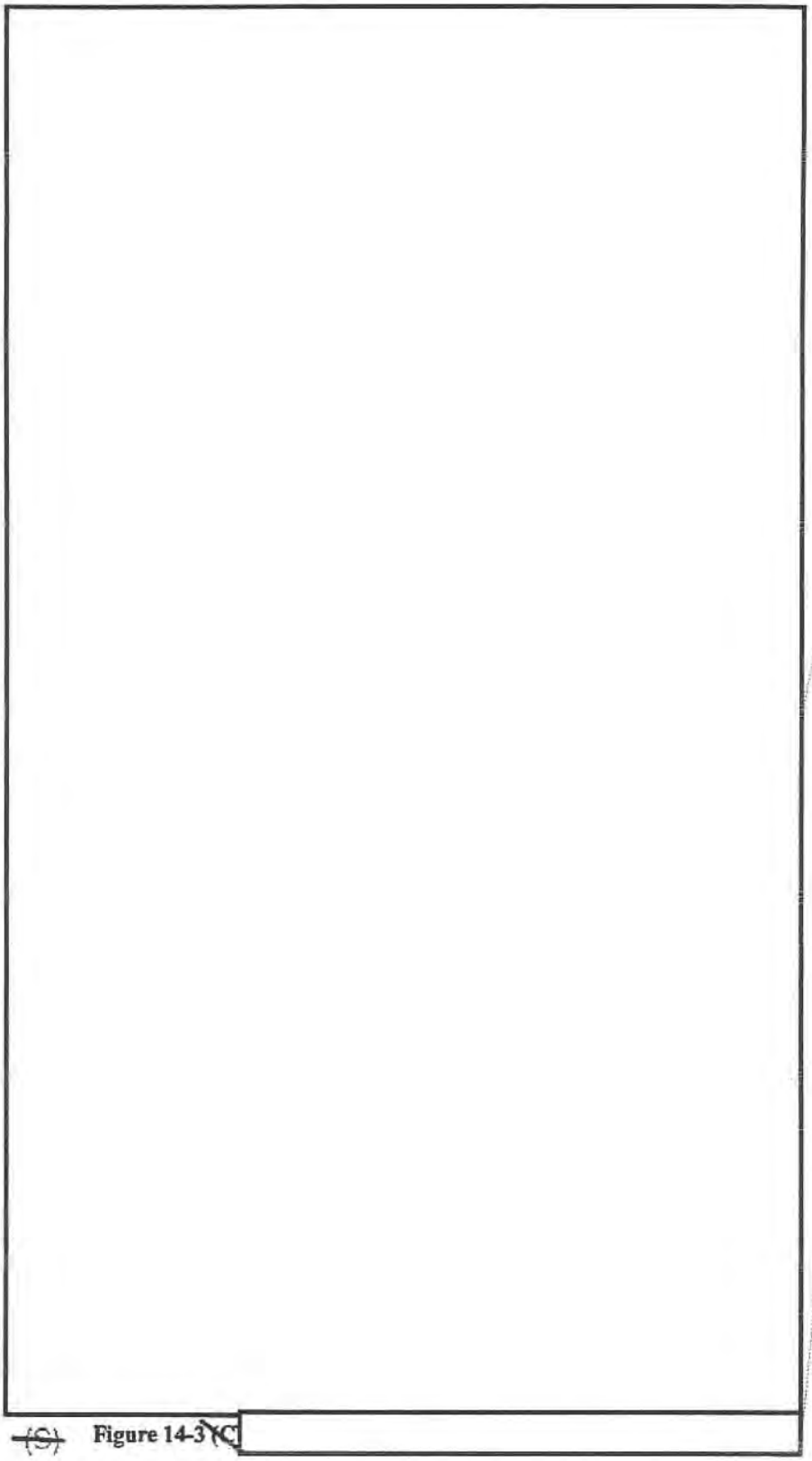
(S) Figure 14-2 (C)

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



~~(S)~~ Figure 14-3 ~~(C)~~

(U//FOUO)

SECTION 15 -

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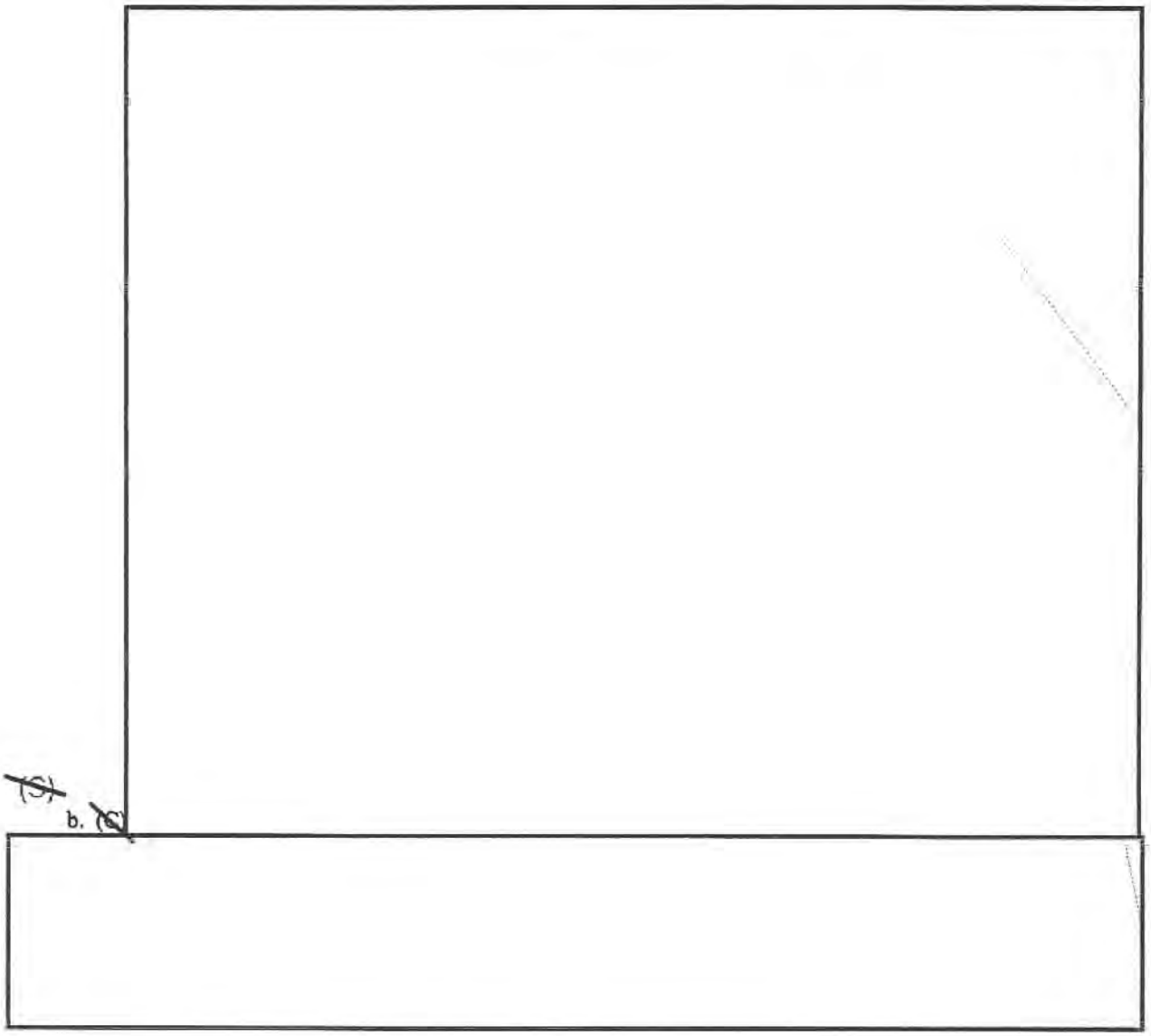
15.1 (S) Purpose



(U) [1]NSTISSAM TEMPEST/2-91, *Compromising Emanations Analysis Handbook.*

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

~~(S)~~ Table 15-1 ~~(C)~~

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(S) 15.4 (C)

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

(S) 15.4.1 (C)

86

(S) 15.4.2 (C)

(b)(1)
86-36

(S) 15.4.3 (C)

(b)(1)
86-36

15.6 (U) Evaluation of Results

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(S) 15.7 (c)

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(b)(1)

SECTION 16 – (U) ALPHANUMERIC CRT DISPLAYS

16.1 (U//~~FOUO~~) Scope - This section describes the operation of alphanumeric CRT displays and presents guidelines for determining RED signaling rates.

(~~S~~) 16.2 (~~C~~) Introduction

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

16.3 (U) Examples of Scanning and Character Generation Methods

16.3.1 (U) Scanning

a. (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 16-1).

b. (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 16-2).

c. (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.

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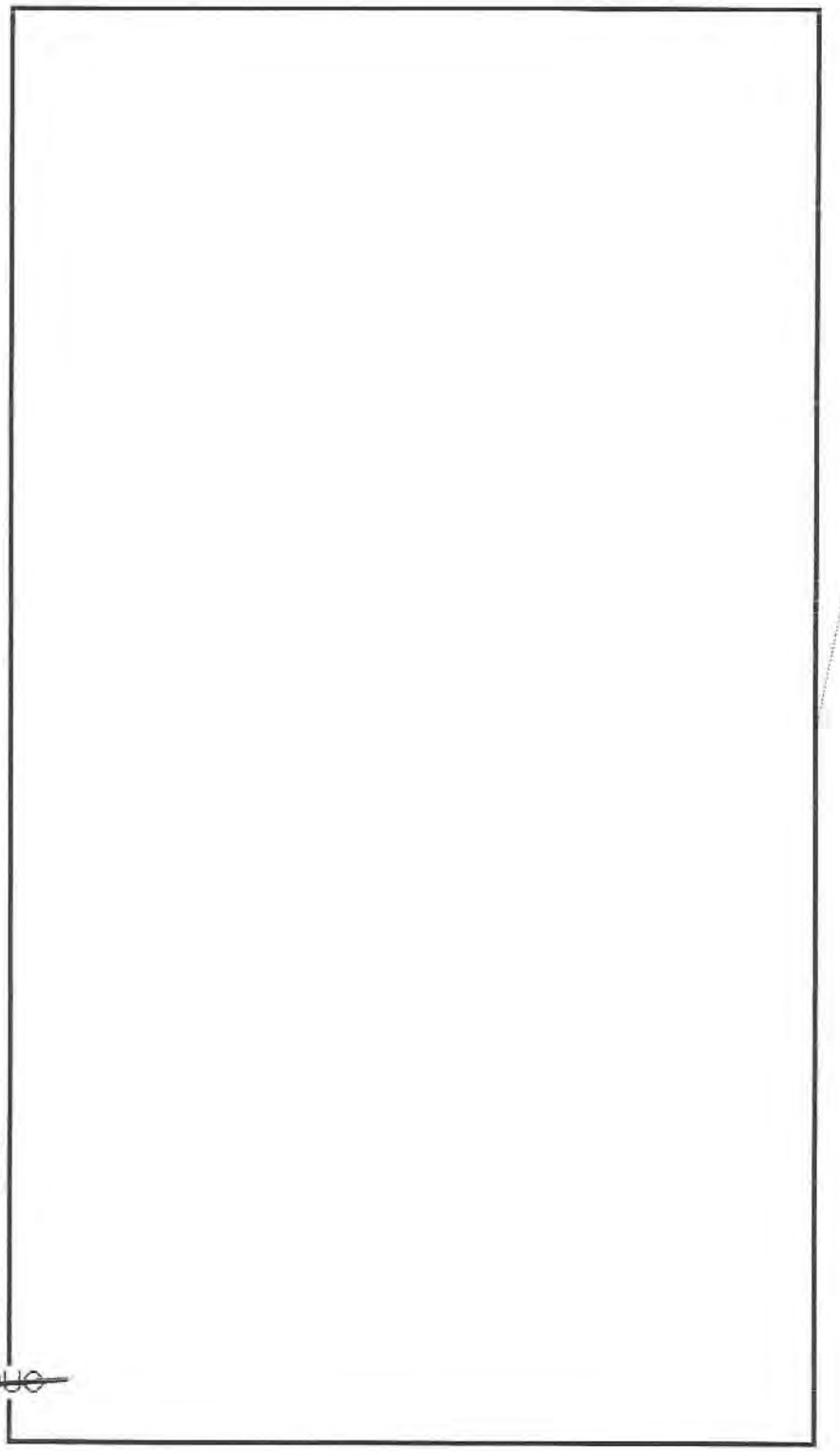

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16.3.2 (U) Character Generation

a. (U) Standard TV Display - The individual characters are displayed by unblanking the electron beam during line segments of a continuous scan (see Figure 16-3).

b. (U) Dot Matrix - The individual characters are displayed by unblanking the electron beam at the appropriate positions in a dot matrix (see Figure 16-4).

c. (U) Stroke or Vector Generation - The individual characters are displayed by "drawing" small line segments (vectors) to make up the character (see Figure 16-5). The program that is controlling the display must control the electron beam position, as well as unblanking, since there is no raster.

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

16.4 (U) Examples of Defining Rd

16.4.1 (U//~~FOUO~~)

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(S) 16.4.2 (C)

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(S) 16.4.3 (C)

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16.4.4 (U//~~FOUO~~)

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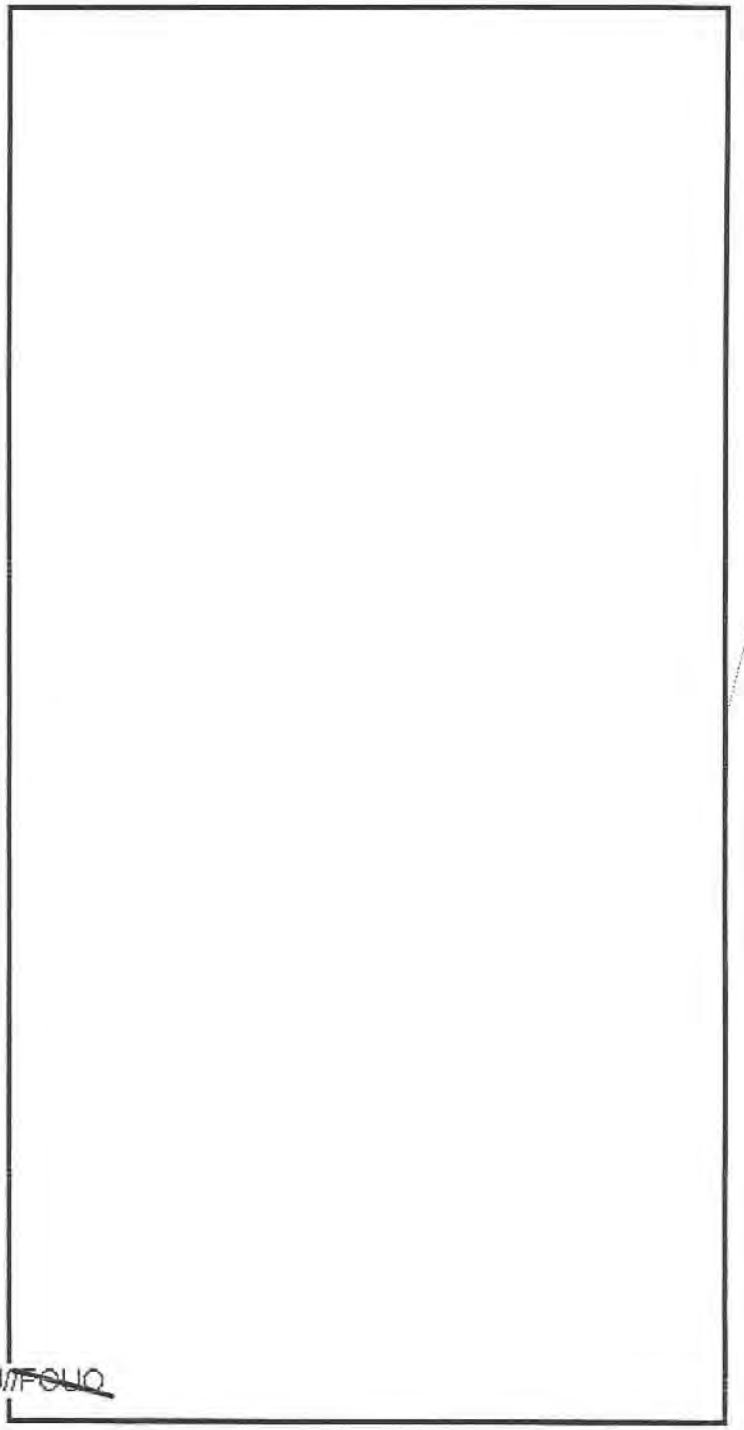
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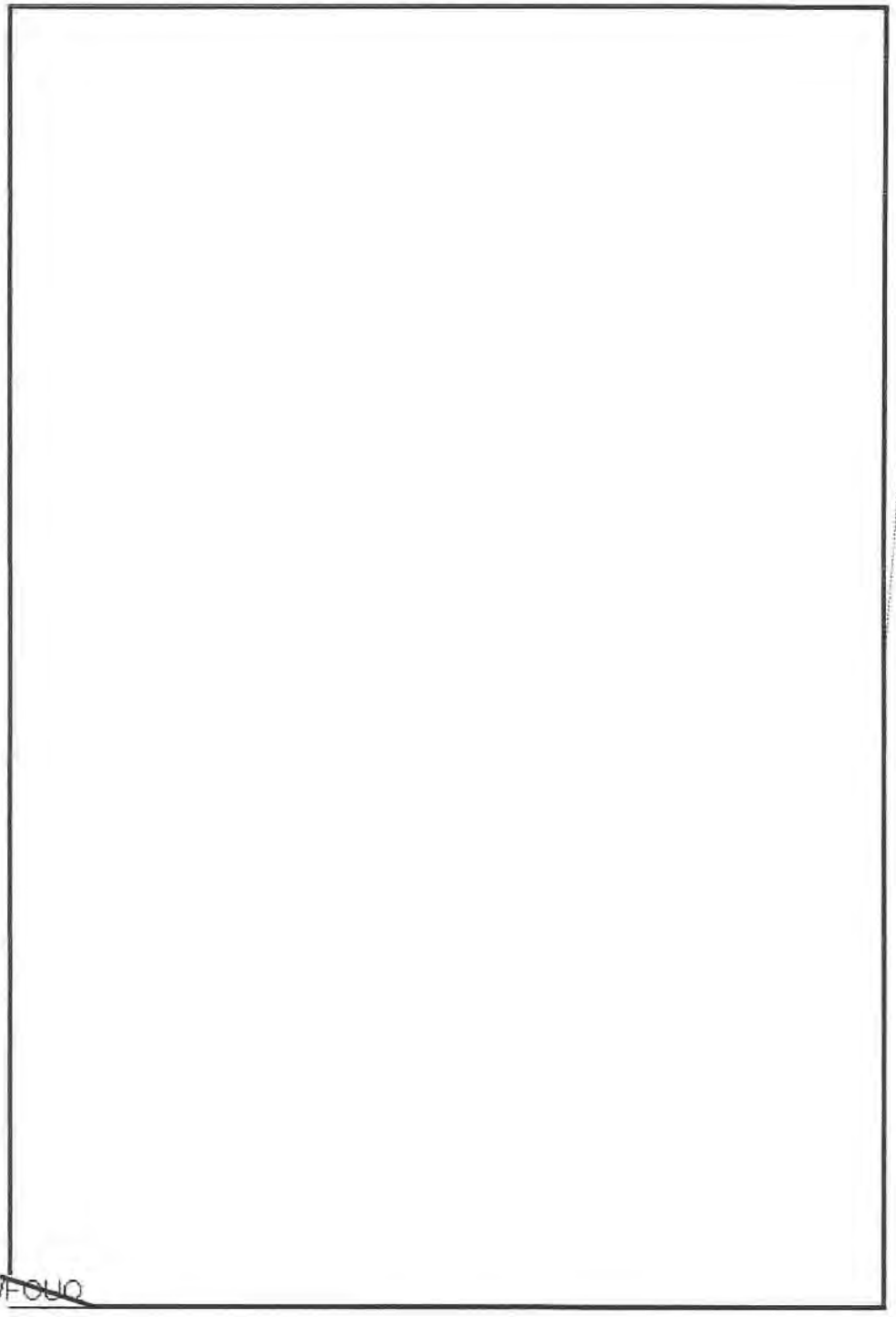
U//~~FOUO~~



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U//~~FOUO~~

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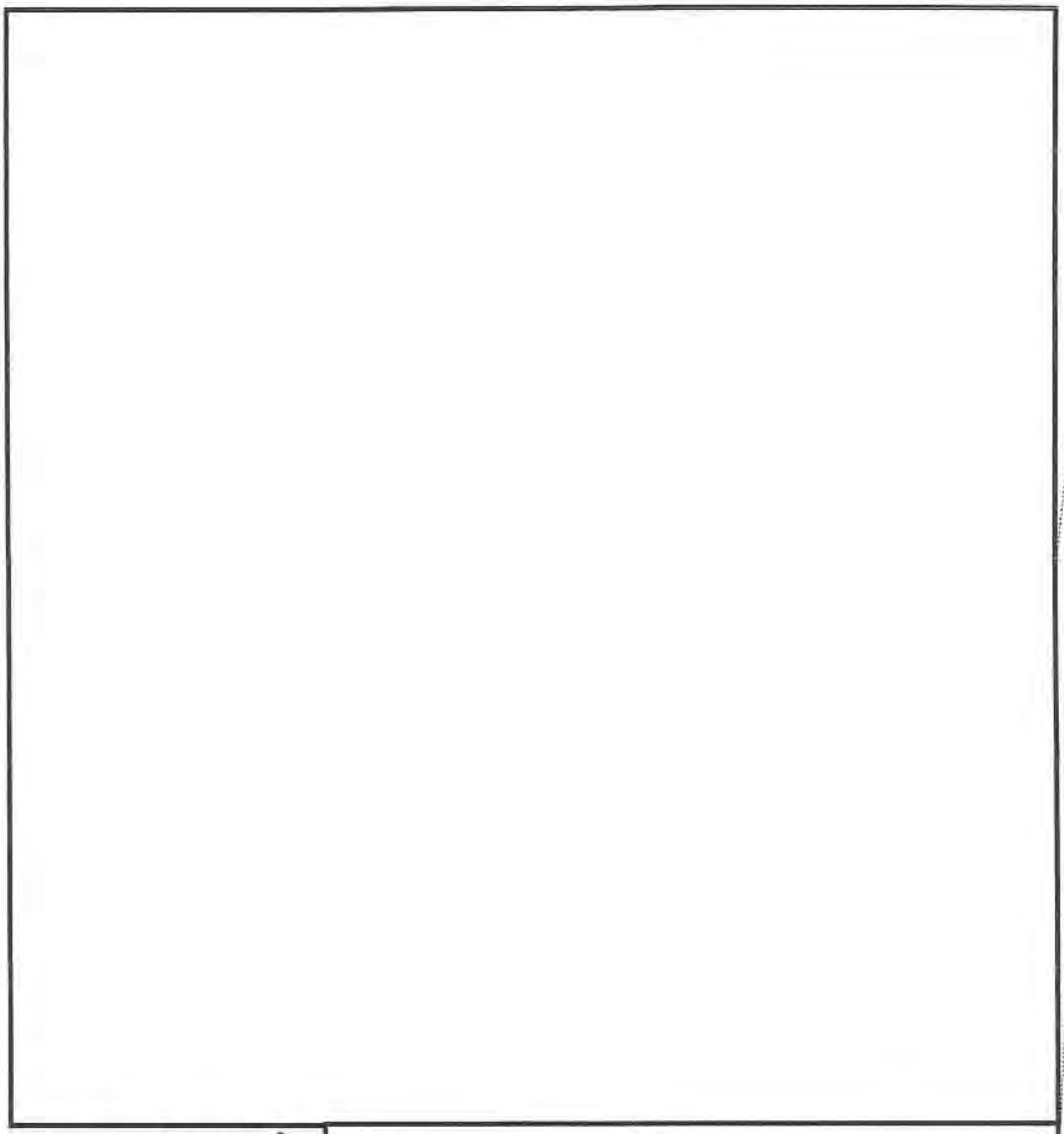
~~(S)~~ Figure 16-7 ~~(C)~~



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~~(S)~~ ~~Figure 16-8 (C)~~

16.5 (U) Special Test Requirements

16.5.1 (U//FOUO) Alphanumeric CRT Displays

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16.5.2 (U) Bit Mapped Displays

a. (C)

c. (U//FOUO)

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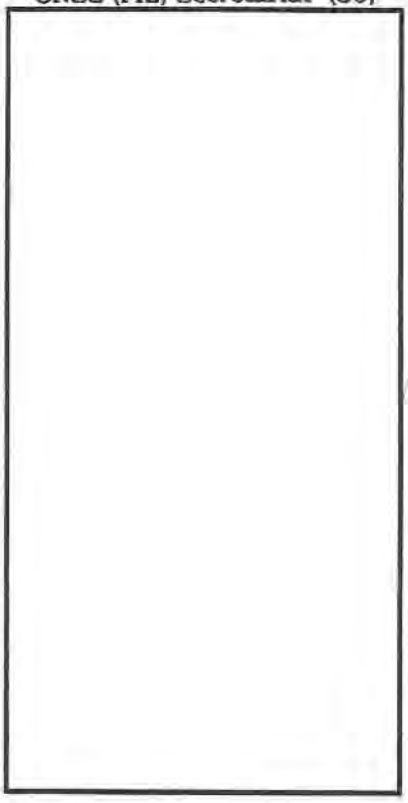
DISTRIBUTION:

AGC/IAD
IAD REG
A Registry
A3
C
D2
D4 SIGCOM
V
V1
X
Y
C31 NTIC (3)
C31 TEMPEST (Staples)
I41
I412 (5)
I411
DK1
Y2
Y5
NSA Liaison Ft. Huachuca
CNSS (I42) Secretariat (50)



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