

NTIA Handbook HB-14-504

**ITS Publications Handbook  
Volume II: Style Guide  
Third Edition**

**ITS Editorial Review Board**



***handbook series***

---

U.S. DEPARTMENT OF COMMERCE • National Telecommunications and Information Administration





NTIA Handbook HB-14-504

# **ITS Publications Handbook**

## **Volume II: Style Guide**

### **Third Edition**

**ITS Editorial Review Board**



**U.S. DEPARTMENT OF COMMERCE**

March 2014



## **DISCLAIMER**

Certain commercial equipment, software, and services are mentioned in this report to describe aspects of the ways that they may be used in publications. The mention of such entities should not be construed as any endorsement, approval, or recommendation, or as a statement that they are in any way superior to or more noteworthy than similar entities that were not mentioned.



## CONTENTS

Figures .....	viii
Tables .....	ix
1. Introduction.....	1
2. General Format Guidelines .....	3
2.1 Page Numbering .....	4
2.2 Character and Paragraph Format.....	4
2.3 Capitalization, Spelling, and Punctuation.....	4
2.4 Guidelines for Metric Usage.....	5
2.5 Guidelines for Use of Commercial Identifiers.....	5
2.6 Guidelines for Formatting Hyperlinks.....	6
3. Elements of the Publication .....	7
3.1 Front Material .....	8
3.1.1 Front Cover .....	8
3.1.2 Title Page .....	8
3.1.3 Product/Partial Disclaimer (Optional).....	8
3.1.4 Foreword and Preface (Optional).....	10
3.1.5 Table of Contents .....	10
3.1.6 List of Figures (Optional) .....	10
3.1.7 List of Tables (Optional) .....	10
3.1.8 List of Abbreviations/Acronyms and Symbols (Optional).....	11
3.1.9 Glossary of Terms (Optional) .....	11
3.1.10 Executive Summary (Optional).....	11
3.2 Body of Report.....	12
3.2.1 Title .....	12
3.2.2 Authors' Names and Affiliations .....	12
3.2.3 Abstract.....	13
3.2.4 Keywords.....	13
3.2.5 Introduction.....	13
3.2.6 Main Text.....	14
3.2.7 Headings .....	14
3.2.8 Lists .....	15
3.2.9 Acknowledgements (Optional) .....	16
3.3 Reference Material .....	16
3.3.1 Footnotes, References, and Bibliography.....	16
3.3.2 Appendices (Optional).....	16
3.3.3 Index (Optional) .....	16
3.3.4 Bibliographic Data Sheet.....	17
4. Reference and Bibliographic Style.....	18
4.1 Reference Style .....	18
4.2 Citations within the Text .....	18

4.2.1 Open-literature Citations .....	19
4.2.2 Other Citations .....	19
4.3 Entries within the Reference List .....	20
4.3.1 Corporate Author Citations.....	21
4.3.2 Examples of Reference List Style .....	21
4.4 Content of the Bibliography.....	27
4.5 Annotated Bibliographies .....	27
5. Instructions for Figures.....	29
5.1 General.....	29
5.2 Numbering Figures .....	30
5.3 Figure Captions .....	31
5.4 Foldouts .....	31
5.5 Computer-generated Graphs and Graphics.....	32
5.6 Photographs.....	33
6. Instructions for Tables.....	35
7. Equations and Other Mathematical Expressions .....	36
7.1 Placement and Alignment of Equations .....	36
7.2 Punctuation and Spacing within Equations .....	36
7.2.1 Horizontal Alignment of Signs .....	36
7.2.2 Punctuating Mathematical Symbols.....	37
7.3 Punctuation in Context .....	37
7.4 Formatting.....	38
7.5 Numbering and Referencing .....	39
8. Notations.....	40
8.1 Footnotes.....	40
8.2 Endnotes .....	40
8.3 Headers .....	40
8.4 Footers .....	40
9. Software and Data Products.....	41
10. Appendix Guidelines .....	43
10.1 Appendix Title .....	43
10.2 Appendix Page Numbering.....	43
10.3 Appendix Section Numbering.....	43
10.4 Multivolume ITS Reports .....	43
10.5 Disproportionately Large Appendices.....	44
10.6 References in the Appendices .....	44
10.7 Equation Numbers, Figure Numbers, and Table Numbers in Appendices.....	44
10.8 External Documents as Appendices .....	44
11. Preparation for Printing .....	45
11.1 General.....	45



11.2 Manuscripts Published in Hard Copy .....	45
11.3 Publications Officer Responsibilities .....	45

## FIGURES

Figure 1. Example of a landscape orientation for text illustrations. ....	29
Figure 2. Illustration of page-number orientation for page with figure and text. ....	30
Figure 3. Illustration of a single foldout. ....	32
Figure 4. Illustration of a back-to-back foldout. ....	32

## TABLES

Table 1. Elements of a publication.....	7
Table 2. Heading formats. ....	15
Table 3. Full sub-region Y, CB, CR values.....	35



# ITS PUBLICATIONS HANDBOOK VOLUME II: STYLE GUIDE

ITS Editorial Review Board<sup>1</sup>

This is the third edition of a handbook intended to help Institute for Telecommunication Sciences (ITS) staff produce reports and papers in accordance with ITS, National Telecommunications and Information Administration, Department of Commerce, and Federal Government standards. It is based on the “ITS Publications Handbook,” last updated in 2008, and the “Quick Reference Guide to ITS Publications,” published in 1993. Volume I, “Policies,” describes policies applicable to the preparation and quality review of manuscripts for publication and discusses policy issues such as the use of commercial names in ITS publications. Volume II, “Style Guide,” provides guidelines for the publication of documents so that their appearance is uniform, consistent, and appropriately formal. Templates and best practices formerly included in Volume III have been included in a set of procedures developed to support this handbook.

Key words: Institute for Telecommunication Sciences, National Telecommunications and Information Administration, Style Guide; Technical Publications

## 1. INTRODUCTION

Publication of reports and papers is the primary means of dissemination of results of the National Telecommunications and Information Administration’s (NTIA) Institute for Telecommunication Sciences’ (ITS) research and engineering programs and services. ITS strives to promote prompt dissemination via the most effective media, while maintaining the highest standards of quality, accuracy, and technical soundness. The goal of this handbook and its supporting procedures is to ensure substantive, accurate, and clear expressions of ITS work.

The guidelines in this handbook apply to both printed and electronically published documents, with very few exceptions—notably Section 11 of this volume, Preparation for Printing, which is only relevant to documents that will be printed.

This handbook is based on the “ITS Publications Handbook,” last updated in 2008, and the “Quick Reference Guide to ITS Publications,” published in 1993. The previous editions of this

---

<sup>1</sup> Members of the ITS Editorial Review Board who participated in the development of the third edition of this handbook include Kristen Davis, Chriss A. Hammerschmidt, William Kozma, Heather Ottke, Anna E. Paulson, Margaret H. Pinson, Lilli Segre, and John M. Vanderau. Technical and editorial support was also provided by Kenneth R. Tilley. All are with the Institute for Telecommunication Sciences, National Telecommunications and Information Administration, U.S. Department of Commerce, Boulder, CO 80305.

handbook were divided into three volumes: “Volume I: Policies & Procedures,” “Volume II: Style Guide” (this volume), and “Volume III: Sample NTIA Report.”

In this third edition, a number of substantive changes have been made. The intention of the restructuring is to:

- Limit the content of Volume I of the handbook, which is an ITS policy document, to general directives and statements of policy. Its title has consequently been changed to “Volume I: Policies.”
- Expand the scope of Volume II of the handbook to address changes in the technology of publication and respond to questions about format and style addressed to the Publications Officer over the period since the last revision.
- Eliminate Volume III, which had only placeholder content to illustrate style and format. Instead, the handbook itself has been formatted as an NTIA Handbook and so acts as a sample, and electronic templates have been made available for the software programs and versions currently in use that embody the guidance in Volume II.

Specific hyperlinks and references to particular technologies, which tend to rapidly become obsolete, are given instead in supporting procedures or cited in footnote with an access date. Because procedures are of more limited scope and subject to a shorter approval cycle, changes in technology can quickly be accommodated by changes to individual procedures.

Traditionally, all scholarly papers are published in accordance with rigidly defined rules on style and format. However, many authors desire more flexibility. Both this handbook and the supporting procedures identify strict rules by couching them in strong words such as “must,” and “required.” Guidelines from which authors may deviate (in a systematic, consistent manner in each paper) are described with words such as “should,” or “are recommended.” Consult the ITS Publications Officer with regard to any deviations in rules about which you are uncertain. Remember that all rules on publication release, copyright, and policy matters must be strictly followed.

Authors should acquaint themselves with both volumes of the ITS Publications Handbook. Volume I explains the statutory, regulatory and administrative mandates that drive ITS policy regarding publication. It provides guidance as to content. Volume II provides guidance as to appearance. It contains specific formatting guidelines that help ensure that ITS publications adhere to the formatting norms common to our scientific community and have a “look and feel” that is consistent not only with publications by other ITS authors but also with past publications.

## 2. GENERAL FORMAT GUIDELINES

The guidelines in this style guide are intended to promote clarity and consistency in ITS publications. In general, where this handbook does not give specific directives, the recommended authorities for ITS authors are, in order of precedence:

- 1) The U.S. Government Printing Office (GPO) Style Manual<sup>2</sup> should be the first guide for a Government author. Unfortunately, this guide is somewhat limited in scope and does not follow the conventions generally recommended by scientific publication. Therefore, this handbook gives precedence to the GPO only with regard to non-scientific content.
- 2) On matters of style where the GPO is silent, authors should refer to *The Chicago Manual of Style*. This style manual first created for the University of Chicago Press has been an authoritative reference work for authors, editors, proofreaders, indexers, copywriters, designers, and publishers for over 100 years. It is broad in scope, but acknowledges the special demands of complex scientific material.
- 3) On matters of spelling, compounding or abbreviation where the GPO is silent, authors should refer to *Webster's Third New International Dictionary* or the abridged version, *Merriam-Webster's Collegiate Dictionary*.
- 4) For information about spelling and defining telecommunication technical terms, authors should consult the current edition of the American National Standard for Telecommunications Telecom Glossary<sup>3</sup> or the ITS dictionary of commonly used terms maintained by the Publications Officer.

It is not mandatory to follow without exception all rules listed in the recommended authorities for ITS authors. However, exceptions should be made on the basis of considered judgment. Throughout this handbook, additional references are given for treatment of specific types of content.

At the time of publication of this handbook, the ITS standard office automation software was Microsoft Office. Format guidelines in this volume are given as much as possible in general terms so that they can be transferred to non-standard word processors or document preparation systems; however, references to automation tools and methods built into the document production software are to Microsoft Office document preparation tools. The Publications Officer provides technical support and document production services for ITS standard office automation software but may not be able to provide the same level of support for non-standard document preparation systems. If authors choose to use non-standard software, they are responsible for configuring the technology to achieve the appearance and hyperlink functionality described and modeled in this handbook, as well as the metadata tagging protocols in place at the time of publication. To clarify requirements, consult the Publications Officer.

---

<sup>2</sup> Accessed at <<http://www.gpoaccess.gov/stylemanual/browse.html>> on August 24, 2011.

<sup>3</sup> Accessed at <<http://www.atis.org/glossary/>> on August 24, 2011.

## **2.1 Page Numbering**

Lower case Roman numerals are used for all pages preceding the text and Arabic numerals are used for all text and appendix pages. The title page is always counted as page i, and the first page of the text as page 1. However, on neither of these pages does the page number appear. All odd-numbered pages must be right-hand pages.

One numbering series only should be used for all text and appendix pages, beginning at page 1 and continuing through the end of the report. In certain special cases, e.g., a very long report where sections are written by different people, pages may be numbered by section. However, this multi-section numbering method is not preferred.

A blank page is counted as if it were numbered, whether or not its number is shown. In the Roman numeral section, blank pages are not numbered. However, in the text and appendices, blank pages are numbered. For example, if the main text ends on an odd-numbered page and a blank page must therefore be inserted before the first appendix, that page is numbered (see Section 10.2 Appendix Page Numbering).

## **2.2 Character and Paragraph Format**

An 11 or 12 point type size is preferred. For optimum readability, the font should be Times New Roman or similar serif font, although labels on graphs and other figures may be in Arial or similar sans serif font.

Use block paragraph style; leave one line space between paragraphs. Either full justification or flush left/ragged right format may be used, per the author's choice, however authors should be mindful that most office automation software does a poor job of full justification and thus full justification may make the manuscript more difficult to read and reference.

Follow standard rules for widow and orphan control: do not carry fewer than two lines of a paragraph to the next page, and do not leave fewer than two lines at the beginning of a paragraph at the bottom of a page. Do not separate a title, subtitle, or heading from the text following it.

Hyphenation is optional, but try to avoid hyphens at the end of more than two subsequent lines of text.

## **2.3 Capitalization, Spelling, and Punctuation**

The most recent edition of the U.S. GPO Style Manual<sup>4</sup> is the standard for capitalization, spelling, compounding, punctuation, and abbreviations. The U.S. GPO Style Manual Word Division Supplement should be followed for word division.

Capitalize the first letter and spell out the words "Figure," "Table," and "Section" when referring to specific figures, tables, and sections (when accompanied by a number) in the text, e.g., "As

---

<sup>4</sup> Accessed at <<http://www.gpoaccess.gov/stylemanual/browse.html>> on August 24, 2011.



shown in Figure 8...” Do not capitalize these words when they are not accompanied by a number, e.g., “As shown in the figure below...”

## 2.4 Guidelines for Metric Usage

Pursuant to U.S. DOC DAO 201-21, in which the Department of Commerce (DOC) implements the Omnibus Trade and Competitiveness Act of 1988, it is the policy of the DOC to use the metric system of measurement as the required system of weights and measures. To that end, all ITS publications will comply with that policy by using the metric system when referring to distances, weights, or other measures.

Guidance for preferred metric units and the style guide for their use should be taken from the current edition of NIST publications such as Federal Standard 376B, “Preferred Metric Units for General Use by the Federal Government”<sup>5</sup> and the “Guide for the Use of International System of Units (SI).”<sup>6</sup>

In some instances, it may be deemed useful to include the British Imperial equivalent in parentheses following the metric measurements. The NIST Guide to the SI also allows an exception in instances where the widely used and recognized customary descriptive terms for a tool or piece of equipment are expressed in other ways and the generalized dimensions of objects, apparatus, or materials, and other attributes do not enter directly into calculations or results. In these cases, for effective communication it is permissible to use the customary descriptive term and values in acceptable units are not required. Examples include common drill sizes and traditional tools used in the United States, U.S. standard fastener sizes, commercial pipe sizes, and other common terms used in the trades, the professions, the marketplace, sports, and various social activities. For example, it is permissible to refer to a “36-inch pipeline” or a “half-inch drill” without first giving the value in an acceptable unit.

## 2.5 Guidelines for Use of Commercial Identifiers

The first time you use a trademarked name in a document, place the appropriate symbol (®, ™, or ™) next to it. These symbols need not be included on subsequent uses of the trademark in the document. If the trademark is registered with the U.S. Patent Office, use the ® (registered trademark) symbol. If it is not registered, use the ™ symbol for a product or the ™ symbol for a service. For guidance, consult the manufacturer’s trademark guidelines which are generally available on the manufacturer’s Web site. If further assistance is needed, consult the Publications Officer.

A trademark or service mark should be used as an adjective, not a noun (e.g., Windows® operating system), and always begins with a capital letter.

Copyrighted material may not be used in NTIA publications without written permission from the copyright holder. The law provides a limited exception for “fair use” of copyrighted material for

---

<sup>5</sup> Accessed at <<http://ts.nist.gov/WeightsAndMeasures/Metric/fs376b.cfm>> on August 24, 2011.

<sup>6</sup> Accessed at <<http://www.nist.gov/pml/pubs/sp811/index.cfm>> on August 24, 2011.

scholarship or research purposes, but this should be asserted with extreme caution. For further information, see Section 6.6 Copyright Considerations in NTIA Handbook HB-14-503 ITS Publications Handbook Volume I: Policies or consult the Publications Officer.

## **2.6 Guidelines for Formatting Hyperlinks**

Hyperlinks should be formatted so that they are readily identifiable.<sup>7</sup> Do not distinguish hyperlinks by color alone. People who cannot differentiate between certain colors and users with devices that have non-color or non-visual displays will have trouble recognizing hyperlinks whose only identifying aspect is color.

The default hyperlink style in many word-processing programs is blue underlined text (changing to purple after the link has been clicked). ITS authors may use this style for reports printed in color or web-based reports, but for reports printed in black and white, blue color is not recommended because it will print as gray and be less readable. Another, very robust, formatting option is to place hyperlinks within angle brackets. The angle brackets themselves are not underlined, and sentence punctuation (e.g., period or comma) occurs outside the brackets. In this handbook, hyperlinks are blue, underlined, and placed within angle brackets for maximum visibility.

---

<sup>7</sup> For additional guidance, consult the current version of the World Wide Web Consortium (W3C) Web Content Accessibility Guidelines, accessed at <<http://www.w3.org/TR/WCAG20/>> on August 24, 2011.

### 3. ELEMENTS OF THE PUBLICATION

The format described here is for the NTIA formal publication series. Publications in the NTIA series that, for special reasons, depart from the prescribed format must have prior approval of the Publications Officer, Director, and/or appropriate Division Chief.

The elements included in a report should appear in the order shown in Table 1 below. The wording selected for headings may differ slightly from that shown here. No report must include this entire list—use only those headings/sections needed. The required elements are indicated in the table. The format of each element is discussed in detail in the following sections.

Table 1. Elements of a publication.

Component	Required	Optional	Element
FRONT MATERIAL (see Section 3.1)	x		Front Cover
	x		Title Page
		x	Disclaimer
		x	Preface and/or Forward
	x		Table of Contents
		x	List of Figures
		x	List of Tables
		x	List of Abbreviations and Symbols <sup>8</sup>
		x	Glossary of Terms <sup>9</sup>
		x	Executive Summary
		x	Front Cover
BODY OF REPORT (see Section 3.2)	x		Title
	x		Authors' Names and Affiliations [footnote]
	x		Abstract
	x		Keywords
	x		Introduction
	x		Main Text
	x		Conclusions or Summary
		x	Recommendations
		x	Acknowledgments
REFERENCE MATERIAL (see Section 3.3)		x	Footnotes
	x		References
		x	Bibliography
		x	Appendices
		x	Index
	x		Bibliographic Data Sheet [NTIA FORM 29]

<sup>8</sup> This list may be placed with the front material or preceding the appendix. See Section 3.1.6 List of Abbreviations/Acronyms and Symbols (Optional).

<sup>9</sup> The Glossary may be placed with the front material or as an appendix. See Section 3.1.7 Glossary of Terms (Optional).

## **3.1 Front Material**

### **3.1.1 Front Cover**

The front cover includes the report number (obtained from the Publications Officer), the title, and the authors' names, all in bold type and flush right. Below that text is the artwork for the particular publication series.

Reports that exceed 90 pages require a spine. The title of the report and the report number are printed on the spine. Because there is limited space on the spine, authors may wish to suggest an abbreviated title for use there.

### **3.1.2 Title Page**

The title page includes all the information from the cover except the publication series artwork. In place of the artwork, the Department of Commerce logo is shown, followed by the month and year of publication, all flush right.

### **3.1.3 Product/Partial Disclaimer (Optional)**

#### ***3.1.3.1 Product Disclaimer***

The U.S. Department of Commerce requires a disclaimer when commercial equipment or company names used in the research are mentioned in the report. These identifiers may be used when the report would not be complete without them, when it does not evaluate the performance of the equipment, and when a disclaimer is included that states that use of the equipment does not represent an endorsement by ITS. For further information about commercial product names in NTIA publications, see Section 6, Endorsement of Commercial Products, in NTIA Handbook HB-14-503 ITS Publications Handbook Volume I: Policies.

The product disclaimer appears on page iii of a report. (In a journal article or conference paper, the disclaimer normally appears in a footnote or in an acknowledgments section.) Two examples of the wording for a product disclaimer are given below: the first is more commonly used; the second is an example of a special case.

Certain commercial equipment, materials, and/or programs are identified in this report to specify adequately the experimental procedure. In no case does such identification imply recommendation or endorsement by the National Telecommunications and Information Administration, nor does it imply that the program or equipment identified is necessarily the best available for this application.

Certain products, technologies, and corporations are mentioned in this report to describe aspects of the ways that microwave bands are used at present or may be used in the future. The mention of such entities should not be construed as any endorsement,

approval, recommendation, prediction of success, or that they are in any way superior to or more noteworthy than similar entities that were not mentioned.

### ***3.1.3.2 Software Disclaimer***

If the report contains code that is being made publicly available, the following paragraph must be added below the product disclaimer:

This document describes software developed by NTIA. **NTIA does not make any warranty of any kind, express, implied or statutory, including, without limitation, the implied warranty of merchantability, fitness for a particular purpose, non-infringement and data accuracy. This software is provided “AS IS.”** NTIA does not warrant or make any representations regarding the use of the software or the results thereof, including but not limited to the correctness, accuracy, reliability or usefulness of the software or the results. You can use, copy, modify, and redistribute the NTIA-developed software upon your acceptance of these terms and conditions, and upon your express agreement to provide appropriate acknowledgments of NTIA’s ownership of and development of the software by keeping this exact text present in any copied or derivative works.

The user of this software (“Collaborator”) agrees to hold the U.S. Government harmless and indemnifies the U.S. Government for all liabilities, demands, damages, expenses, and losses arising out of the use by the Collaborator, or any party acting on its behalf, of NTIA/ITS software, or out of any use, sale, or other disposition by the Collaborator, or others acting on its behalf, of products made by the use of NTIA/ITS software.

### ***3.1.3.3 Partial Disclaimer***

A partial disclaimer may be used for articles, reports, etc., that are printed in non-NTIA publications and are not intended to represent official NTIA views. In such cases, the disclaimer would normally appear in a footnote or in an acknowledgments section. It should be noted that a disclaimer of this type may not be used to avoid litigation; it is simply a way to explain to the readership that the material does not represent an official NTIA position. Examples of possible wording for partial disclaimers are shown below.

The views, opinions and/or findings contained in this report do not represent an official position of the National Telecommunications and Information Administration or of the U.S. Department of Commerce.

This work was supported in part by the Center for Command and Control, and Communications Systems of the Defense Information Systems Agency (DISA) in Washington, D.C. The views and opinions contained in this paper are those of the author only and should not be construed as an official DISA or NTIA position or policy.

### **3.1.4 Foreword and Preface (Optional)**

A foreword is an introductory statement written as an endorsement by a person other than the author. The name, title, and affiliation of the foreword's author appear at the end of the foreword. The foreword precedes the preface, and appears on an odd-numbered page (with a Roman numeral page number).

The preface is written by the authors. A preface can show the relation of the work to associated efforts, give credit for the use of copyrighted materials, and/or acknowledge significant assistance received. A disclaimer may also appear in the preface. The preface always appears on an odd-numbered page with a Roman numeral page number.

### **3.1.5 Table of Contents, List of Figures, and List of Tables**

The table of contents and the optional lists of figures or tables should be automatically generated by the word processing software being used, and page numbers should be hyperlinks. The table of contents begins on an odd-numbered (Roman) page. The word "CONTENTS" (in bold capital letters) is centered at the top of the first page of the table, and the first letter of the word "Page" at the right top of the table is capitalized.

Entries in the table of contents include all sections that follow the contents page. Do not include the abstract in the table of contents. In most NTIA publications, section and subsection headings should be listed in the table of contents to the second order only. Listing beyond that level is permitted for special cases such as this document, where details of third level headings are important. Other examples include tutorials and reference documents. Only titles of appendices are required to be shown in the table of contents; their subsections and reference lists do not need to be shown here. After each heading, use a horizontal line of periods (leader dots) to the page number, which is flush right.

#### ***3.1.5.1 List of Figures (Optional)***

Generally a list of figures is included only in reports with a great number of figures, i.e., one or more figures for every page of text, or a large group of segregated figures with no text within the group. If a list of figures is deemed necessary, it may begin on the same page as the table of contents (if there is at least half a page of space remaining) or on a new page. Center the word "FIGURES" (in bold caps) at the top of the list. List the number, caption, and page number of each figure. Figure captions may be abbreviated in the list of figures. Detailed instructions for figures are given in Section 5.

#### ***3.1.5.2 List of Tables (Optional)***

Furnish this list only if it is essential. It may begin on the same page as the list of figures (if included) or the table of contents, or on a new page. Center the word "TABLES" (in bold caps) at the top of the list. Include the number, title, and page number of each table. Abbreviate lengthy titles. This list follows the list of figures, if such appears, and neither list requires a new page. Detailed instructions for tables are given in Section 6.

### **3.1.6 List of Abbreviations/Acronyms and Symbols (Optional)**

If symbols, abbreviations, and/or acronyms are numerous, separate lists are suggested; if few, they need be defined only where they are first introduced in the text. This list may be placed at the front of the text, or at the end (if it is two or more pages), preceding any appendices. Source words for acronyms should appear in the list as they are commonly used, i.e., acronyms are often upper case letters, but their source words in the spelled-out form are not capitalized unless they are proper nouns. If a list is used, type the word “ACRONYMS,” “ABBREVIATIONS,” or “SYMBOLS” (in bold caps, centered) above the list.

### **3.1.7 Glossary of Terms (Optional)**

When many unusual technical terms are used, they may be listed in alphabetical order with definitions in a glossary. When only a few such terms appear, it is preferable to define them the first time they are used in the text. A glossary may be placed in front of the main body of a report, in an appendix, or as one of the last sections of a report.

### **3.1.8 Executive Summary (Optional)**

This section, when it appears, directly follows the rest of the front material and is numbered with the front material. It precedes the abstract. It begins on an odd-numbered (Roman), right-hand page.

An executive summary is a condensed version of a report that is written for those who are interested in an overview of the subject and who do not need, or do not understand, the complex, technical content of the covered material. A concise executive summary provides the necessary facts so that a reader can select portions of the report to read in detail or to delegate to technical experts for detailed study.

The following guidelines are provided to help authors write meaningful executive summaries:

- Write the executive summary after the entire report has been written. The executive summary should stand alone so that it can be detached and circulated separately.
- Limit the material to 5 percent of the total report length (exclusive of appendices).
- Focus on your recommendations, highlighting them with “bulleted” entries or subtitles.
- Explain the purpose and scope briefly. Describe the methods in one or two sentences, and describe key findings in no more than a paragraph or two.
- Avoid technical information if possible. If technical concepts or terms are unavoidable, define them and explain their relevance in a manner suitable for the lay audience.
- Include only those equations, tables, and figures that are essential to presentation of the material. Prefix numbers for these items with “ES”: (e.g., Figure ES-1).

## 3.2 Body of Report

### 3.2.1 Title

The title is written in bold capital letters and centered at the top of page 1 of the report. Be careful to ensure that the title on page 1 exactly matches the title on the cover and the title page.

The title should be specific, pertinent, and brief. Do not begin with words or initials that mislead a person searching an index. Try to limit titles to 10 words or fewer since format dictates limited space on the cover and title pages.

### 3.2.2 Authors' Names and Affiliations

The authors' names, in regular type and initial caps, are centered below the title. They may be listed in alphabetical order, or (more commonly) in the order of their importance to the report. The word "and" is used between the last two names.

Typically an author's first name is spelled out and his/her middle name is abbreviated, but the author's preference and usual publication style should be taken into consideration here. Note that each author's name must be written exactly the same way on the front cover, the title page, and page 1 of the report.

The authors' affiliations are given in a footnote on page 1. If all authors are current employees of ITS, a single footnote mark is included after the last author. The footnote text is as follows:

<sup>1</sup>The author is with the Institute for Telecommunication Sciences, National Telecommunications and Information Administration, U.S. Department of Commerce, Boulder, CO 80305.

If any of the authors are affiliated with other organizations or are retired, a different footnote mark should be used for each author. For example, if the first author is an ITS employee, the second author was with ITS at the time the work for the report was completed but has since retired, the third author is employed by a private company, and the fourth author is an ITS employee, their names and affiliations might be shown as below:

John Q. Public,<sup>1</sup> Jane M. Doe,<sup>2</sup> George C. Roe,<sup>3</sup> and Mary T. Smith<sup>1</sup>

<sup>1</sup>The authors are with the Institute for Telecommunication Sciences, National Telecommunications and Information Administration, U.S. Department of Commerce, Boulder, CO 80305.

<sup>2</sup>The author was formerly with the Institute.

<sup>3</sup>The author is with United Telecom, Inc., Lakewood, CO 80226.



### **3.2.3 Abstract**

The abstract provides a concise condensation of the essential points of the report. No information should appear in the abstract that does not appear in the report. In other words, the abstract is not the first paragraph of the introduction. It is best to write the abstract after the report is finished.

Summarize the object of the work, the results, and the principal conclusions. Use complete sentences. Avoid the use of abbreviations that need explanations. Do not cite sections, illustrations, equations, or references. The abstract should be able to stand on its own. In multivolume reports, include a short paragraph explaining each volume in relation to the series.

The abstract appears on page 1, two lines below the authors' names. Indent 0.5 in. on both left and right margins. Do not include the word "Abstract."

### **3.2.4 Keywords**

Keywords are terms that capture the essence of the topic of a document. As researchers increasingly rely on broad Internet searching, the selection of keywords becomes more important in ensuring that a publication will be found. Keywords included in this section of the manuscript are entered as keywords in the metadata when the publication is rendered electronically and will influence the publication's ranking in search engine results.

Keywords or key phrases are listed alphabetically after the abstract, and are separated by semicolons with no period at the end. Only proper nouns are capitalized in the list.

Provide keywords that are suitable for a subject index. Provide an entry for every route that a potentially interested reader might follow in trying to find the paper in a library, database, or Internet search. Consider the following when creating keyword entries:

- Index the obvious
- Search the title and abstract in particular for possible entries
- List the research area, general type of study, or general class of processes examined
- Identify the specific problem studied and the methods used
- Indicate the type of results reported
- Use synonyms freely, or suggest cross-references
- Remember that the potential reader may not be an expert in your field

### **3.2.5 Introduction**

The introduction (Section 1) begins two lines after the list of keywords on page 1. State the object of the work, and place it in perspective so the reader understands why the work was done.

This usually requires a brief review of related literature or of current circumstances. Helpful hints in developing the introduction include the following:

- Define the problem as clearly and succinctly as possible and then analyze the problem—separate it into the elements that must be considered for its solution.
- Define the scope of your approach. Decide which areas are covered and which are not.
- After reading the introduction, the reader should know what the problem is, why it is important, and your approach to its solution.

### **3.2.6 Main Text**

This portion of the paper provides the reader with a basis for evaluating the author's conclusions and recommendations. Sections should be presented in the sequence that best contributes to the reader's understanding. To achieve this, the author must define for himself/herself:

- The level of detail to be placed here (or in an appendix, or dropped)
- The relative significance of the information to be included here
- The sequence of information that most clearly reports the work. The usual sequence is the following:
  - 1) Introductory statement of the problem
  - 2) Description of the research or analysis
  - 3) Analysis/discussion of results
  - 4) Conclusions and recommendations based on the work

### **3.2.7 Headings**

Style your document so that a numbered heading is preceded by the equivalent of two line spaces and followed by the equivalent of one line space. Separate two headings without intervening text by one line space. If you use unnumbered subheadings, set them off from the preceding and following text by the equivalent of one line space.

Place each primary-level heading on a new page (but not necessarily an odd-numbered page) unless all sections in the document are very short.

First, second, and third-level headings are numbered in Arabic numerals, and follow a decimal series with no ending period. Except for a sponsor's special requirements or in a very complex report, do not number paragraphs beyond the third level. All headings should stand out from the text and the degree of subordination should be apparent. Each division and subdivision of an

outline should normally contain at least two items; if you do not have at least two subordinate items for that level, do not insert a lower level heading.

Heading formats (including numbered and unnumbered fourth- and fifth-level headings) are described in Table 2 below and illustrated in this handbook.

Table 2. Heading formats.

Heading	Format
Primary-level	Centered, bold, numbered, and typed in all capital letters.
Second-level	Centered, bold, and numbered, first letter of each major word capitalized.
Third-level	Flush left, bold, and numbered, first letter of each major word capitalized.
Fourth-level	<i>Numbered</i> : flush left, bold italic, first letter of each major word capitalized. <i>Unnumbered</i> : flush left and bold, first letter of each major word capitalized.
Fifth-level	<i>Numbered</i> : flush left, regular italic, first level of each major word capitalized. <i>Unnumbered</i> : flush left, bold italic, first letter of each major word capitalized.

### 3.2.8 Lists

The use of lists in technical writing can streamline the information-transfer process. Some guidelines are offered here to address the format and style used in lists that are displayed in columnar form in the text (not in tables). Many different styles are possible. Consistency throughout is the key, and only one format is generally acceptable in any one ITS publication.

- Use parallel construction in all elements of the list (i.e., use the same parts of speech, the same voice, same verb tense, etc.).
- Begin each list item with a capital letter
- If list items are complete or multiple sentences, end each sentence with a period. If all list items are not complete sentences, no punctuation is used at the end of each item.
- Lists may be introduced by a phrase or by a sentence that terminates with a colon. However, a colon is not a necessary form of punctuation for introducing a list.
- Bullets (•, -, >) are generally used to identify the beginning of items in an unordered list, where the order of items is not significant. If the items are shown in the order of their importance or in a necessary sequential order, numerals or letters should be used in lieu of bullets.

In summary, use a consistent style within each list and among lists to promote readability of the final document.

### **3.2.9 Acknowledgements (Optional)**

#### **3.2.9.1 General**

Acknowledgments should be made to individuals or groups who have made significant contributions to the paper but who cannot properly be expected to share responsibility as authors for the whole paper. Acknowledgment is not a casual process:

- Acknowledgment is not usually made to people who assisted in the processing of the paper as part of their regular duties.
- As a courtesy, the author should obtain the permission of the person being acknowledged.

When acknowledgment is made for assistance in a specialized field (e.g., statistical engineering), the individual or group to whom acknowledgment is made should be given the opportunity to approve the treatment of the specialized field in the paper.

Acknowledgments are normally placed in a separate, numbered section at the end (if section numbers are used) of the paper (following the conclusions section and before the reference section). Sometimes they are placed in a preface.

#### **3.2.9.2 Credit to Sponsor Agency**

Credit to the sponsor must be given in all manuscripts reporting work done for other agencies. This may be done in a preface or in the acknowledgments. A statement such as the following is usually sufficient:

This work was sponsored by the Rome Air Development Center, Griffiss Air Force Base, New York, under contract AF 30-(603)-2485.

## **3.3 Reference Material**

### **3.3.1 Footnotes, References, and Bibliography**

Footnotes and endnotes are discussed in Section 8 and bibliographies are discussed in Section 4.

### **3.3.2 Appendices (Optional)**

Guidelines for appendices are given in Section 10.

### **3.3.3 Index (Optional)**

An index is an optional, potentially very useful, but very time-consuming addition to a report. Computer-generated indexes may be created.

### **3.3.4 Bibliographic Data Sheet**

This is a standard data sheet (NTIA Form 29) used in the processing, storage, and retrieval of reports. Do not put a page number on it. Place NTIA Form 29 on the last right-hand page of the report before the back covers (the first right-hand page following the text and appendices).

## **4. REFERENCE AND BIBLIOGRAPHIC STYLE**

### **4.1 Reference Style**

Nearly all scientific work is, to some degree, a growth of preceding work in the same or related fields. In reporting his/her work, every author has the responsibility to identify the sources that led to the development of the current project being reported. This documentation fulfills an author's obligation to give credit where credit is due. Because these sources or references play an important part in putting the work in perspective, the author must make the references accurate and complete, so that the reader who wishes to examine the references further may easily identify and access them. This section provides guidelines, instruction, and examples for uniformly citing references and compiling reference lists, bibliographies, and annotated bibliographies.

Documents cited in the text appear in a numbered list in a section called "REFERENCES." Bibliographic entries (documents not cited in the text or in the appendices but listed as supplementary information) should be listed in a separate section called "BIBLIOGRAPHY."

This handbook does not attempt to provide detailed instructions for every type of reference material. Guidelines and examples are presented for scientific reference style, and a few examples of standard legal style are given. Guidelines for style of referencing humanities literature are found in the Chicago Manual of Style.

The reference style for the more common types of scientific literature is illustrated in this section, and a general rule of referencing is given. This style is based on the IEEE style and is used by ITS.

Authors should consider the following guidelines when citing references in NTIA publications:

- Each item listed in the reference section must be available to the general public and in the open literature.
- Technical Memoranda produced before FY 2003 may be included only if they have been deposited with NTIS or if they have been scanned and placed on line on the ITS Web site, which signifies that they are available in the open literature and available to all interested parties. All Technical Memoranda produced after October 2002 can be referenced.
- Classified documents may not be listed, even if the title is unclassified. However, a classified document may include in its reference list or bibliography the title, author, and other identifiers of another classified document with equal or lower security classification.

### **4.2 Citations within the Text**

Documents cited in NTIA publications should be available to anyone. It is sometimes necessary, however, to cite oral information or documents that are not available in the open literature. This

non-referenceable information may be shown in the text, but may not be included in the reference list (see Section 4.2.2 Other Citations for further details).

#### 4.2.1 Open-literature Citations

References are listed in the text with a number in square brackets. Numbers are assigned to reference items in numerical sequence, beginning with [1] for the first citation. Examples follow for the various ways references may be shown in the text:

- When a reference is inserted in the text, include only the reference number in square brackets: "...[4]..."
- Authors' names may be included if they are relevant to the text: "...in a paper by Hoffmeyer [4]..."
- It is almost never useful to give dates of references in text.
- When citing more than one reference, present them in numerical order, separated by commas, each within its own set of brackets. A consecutive series of reference numbers may be indicated with an en dash between the first and last: "...[1]–[4], [6], [9]..."
- When using illustrations from other sources, always include the reference within the caption: "Figure 1.2...[4]..."
- When a direct quotation from a reference is included in the text, include the page number within the brackets "Shakespeare holds that "that which we call a rose by any other name would smell as sweet" [4, p. 10]"

NTIA Reports that have been sent to a printer are considered open literature because they have been assigned numbers and publication dates and will be available by the time the document referencing them is also available.

Web documents are now considered open literature. See Section 4.3.2.12 for more information.

#### 4.2.2 Other Citations

The source of material obtained from personal contact or documents not in the open literature may be cited in the text, with details given in a footnote. The NTIA author is free to discuss the substance of the documents, provided it is clear that the documents are not readily available. Such unavailable literature is not included in the reference list. Examples of ways to discuss items not in the open literature follow:

- Private communications may be mentioned in the text with a phrase such as "...the results reported by Cole (private communication)..."

- Unpublished work may be described in the text using a phrase such as “...the work by Adams (unpublished) supports...”
- A paper under consideration for publication by a trade or professional journal could be cited as follows: “Kissick (submitted for publication) discussed this theory...”

The NTIA Technical Memorandum publication series have traditionally not been included in the reference list since they have not been made widely available. However, beginning in FY 2003, Technical Memoranda are now deposited with NTIS and considered part of the open literature, and should be treated as such in references. Authors may mention older, non-open-literature, Technical Memoranda in the body of a paper either within parentheses or in the text discussion, using the words “limited distribution” as shown in the following examples:

- “Earlier investigations of this type were conducted by J.A. Hoffmeyer and L.E. Pratt (NTIA Technical Memorandum 87-120, limited distribution).”
- “Discussions of this approach are found in an NTIA Technical Memorandum of limited distribution, NTIA-TM-87-120, by J.A. Hoffmeyer and L.E. Pratt.”

### 4.3 Entries within the Reference List

At the end of the text, list all references by number (in brackets) in the order of their citation in the text, not in alphabetical order. List only one reference per reference number. Single space each reference with a double space between entries. (See examples in the following subsections.)

If the source for a cited document is NTIS, the NTIS order number and NTIS address should be given in parentheses following the page number. (The NTIS address is 5285 Port Royal Road, Springfield, VA 22161.) If the source for a cited document is GPO, the 12-digit GPO order number and GPO address should be given in parentheses following the page number. (The GPO address is: Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.) It is not necessary to repeat these addresses more than once in the reference list.

If a cited document has a Digital Object Identifier<sup>10</sup> (DOI®), it is preferable to use the DOI. For documents available on the Internet, the hyperlink form of the DOI ([http://dx.doi.org/\[DOI number\]](http://dx.doi.org/[DOI number])) should be used. An author may choose to use the DOI and a conventional URL. Examples for use of both the DOI and a conventional URL are shown in Section 4.3.2.2 Periodicals.

When citing publications in a foreign language, always give the untranslated title (unless the alphabet characters are not available on standard word-processing systems); however, the translated or romanized title may follow the original title (in parentheses).

---

<sup>10</sup> The DOI System is an ISO International Standard that provides a framework for persistent identification of assets. A DOI is a unique and permanent name assigned to a piece of intellectual property such as a journal article or book, in any medium in which it is published. Using the DOI ensures that a researcher will be able to locate the cited reference even if its hyperlink changes.



In a multivolume report, each volume contains a reference list for that volume only. Inclusion of a reference list for the entire set is at the author's discretion.

References in appendices are listed in a reference section for each appendix and are not included in the reference section for the body of the paper, unless those publications are cited both in the appendix and in the main body of the paper, or unless the appendix is exceptionally small.

There is no established procedure for referencing materials of a nonstandard nature, e.g., seven-volume sets (or multivolume series) with different authors for each volume, series that change names in the middle of the run, etc. In those cases, the general rule is to give the reader complete information in a manner consistent with the other references in the report and in a manner that will enable the reader to find the reference cited and to access the document.

Details of referencing style in both the main body of text and the appendices are left to the discretion of the author. In any manuscript, the main idea in referencing style is consistency throughout the report. Authors are invited to consult with the Publications Officer for advice on any aspect of referencing.

#### **4.3.1 Corporate Author Citations**

All Corporate Author entries—those entries published by a firm or an agency and without any individual author names—are to be listed in the reference list in a consistent manner. For example, all National Institute of Standards and Technology documents must be cited the same way in any given paper. Likewise, each time a particular technical journal is cited, its title should be written in the same way, even though different articles in the journal may be cited. For example, *IEEE Transactions on Electromagnetic Compatibility* may be spelled out in full or abbreviated in various ways, such as *IEEE Trans. Electromag. Compat.* or *IEEE Trans. EMC*, but within a given reference list, only one of these styles should be used.

#### **4.3.2 Examples of Reference List Style**

The following examples include various materials that an author will encounter when preparing a reference list. These examples show the correct reference style for listing reports, periodicals, books, articles and chapters in a book, proceedings of conferences, and legal citations in a reference list.

##### **4.3.2.1 Reports**

- [1] A. Farrar, "Calculations of power flux density levels in the 2-GHz band, Phase Three," NTIA Report 86-199, Jul. 1986 (NTIS Order No. PB 87-120523/AS).
- [2] W.A. Kissick, L.T. Jones, and W.J. Hartman, "The performance of amplitude companded sideband—Interim Report: A review and measurement plan," National Bureau of Standards Report GCR-86-511, Apr. 1986 (NTIS Order No. PB 86-196391/AS).

#### 4.3.2.2 Periodicals

- [3] J.E. Farrow and R.E. Skerjanec, "Transmission monitoring and control of strategic communication systems," *IEEE J. Selected Areas Commun.*, vol. 4, no. 2, pp. 308-312, Mar. 1986.
- [4] M.J. Miles and N.B. Seitz, "Testing network performance: A statistical analysis," *Data Comm.*, Jun. 1986.
- [5] G. Cermak, M. Pinson, and S. Wolf, "The Relationship Among Video Quality, Screen Resolution, and Bit Rate," *IEEE Transactions on Broadcasting*, vol.57, no.2, pp.258-262, June 2011. doi: 10.1109/TBC.2011.2121650  
<<http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=5729848&isnumber=5772157>>, accessed on Aug. 24, 2011
- [6] G. Cermak, M. Pinson, and S. Wolf, "The Relationship Among Video Quality, Screen Resolution, and Bit Rate," *IEEE Transactions on Broadcasting*, vol.57, no.2, pp.258-262, June 2011. <<http://dx.doi.org/10.1109/TBC.2011.2121650>>

#### 4.3.2.3 Books

- [7] J. Martin and A.R.D. Norman, *The Computerized Society*, Englewood Cliffs, NJ: Prentice-Hall, Inc., 1970, pp. 97-103.
- [8] H. Jasik, Ed., *Antenna Engineering Handbook*, New York: McGraw-Hill Book Co., 1961.

#### 4.3.2.4 Articles and Chapters in Books

- [9] J.R. Wait, "Electromagnetic surface waves," in *Advances in Radio Research*, J.A. Saxton, Ed., London: Academic Press, 1964, pp. 157-217.
- [10] F. Forstmann, "Electron states at clean surfaces," Ch. 8 of *Photoemission and the Electronic Properties of Surfaces*, B. Feuerbacher, B. Bitton, and R.F. Willis, Eds., New York: Wiley, 1979, pp. 193-226.

#### 4.3.2.5 Articles in Proceedings of Conferences and Symposia

- [11] A.D. Spaulding, "Locally optimum and suboptimum detector performance in non-Gaussian "broadband" and "narrowband" interference environments," in *Proc. 6th Symposium and Technical Exhibition on Electromagnetic Compatibility*, Zurich, Switzerland, 1985, pp. 437-442.
- [12] J.J. Lemmon, "Wideband HF noise and interference modeling," in *Proc. IEEE Military Communications Conference (MILCOM '89)*, vol. 3, Oct. 1989, pp. 48.4.1-48.4.6.

If several references cite papers from the same meeting, the meeting title may be abbreviated after spelling it out and showing the abbreviation the first time it appears. For example, *IEEE Military Communications Conference (MILCOM '89)* could be shown in subsequent references as *MILCOM '89*.

#### **4.3.2.6 Legal Citations**

The reference style for legal citations follows the convention specified in style manuals for lawyers, such as the Harvard Law Review Association's *The Bluebook: A Uniform System of Citation* (2000), 17th ed. The accepted style for referencing court cases is

[13] Willis v. Thomas, 600 F.2d 1079, 1083 (D.C. Cir. 1979)

Here, "Willis v. Thomas," is the name of the court case, "600" is the volume number, "F.2d" refers to the official reporter (Federal Reporter, second series), the number 1079 refers to the page on which the case begins, and 1083 is the page on which the actual citation or referenced material is found. For all cases other than U.S. Supreme Court cases, the court and year follow the case citation in parentheses. For Supreme Court cases, only the year follows in parentheses.

#### **4.3.2.7 Executive Department Documents**

The accepted style for referencing Executive Department documents is

[14] U.S. Department of Transportation. Federal Aviation Administration. *Surface Movement Guidance and Control System*. Advisory Circular 120-57, Dec. 1996, 62.

[15] U.S. Department of Commerce, Economics and Statistics Administration and National Telecommunications and Information Administration. *Exploring the Digital Nation: Home Broadband Internet Adoption in the United States*. Special Report, Nov. 2010.  
<[http://www.ntia.doc.gov/files/ntia/publications/esa\\_ntia\\_us\\_broadband\\_adoption\\_report\\_11082010\\_1.pdf](http://www.ntia.doc.gov/files/ntia/publications/esa_ntia_us_broadband_adoption_report_11082010_1.pdf)>, accessed on Aug. 26, 2011.

The citation leads with the name of the Government Department and Agency, followed by the publication title in italics, followed by the designation or identifier (report/paper number) and the date. If the document or report has been published as a book, use the form for citing a book's publisher and publication date (or publication place: publisher abbrev., month, year). Include the DOI or URL (if applicable) at the end.

#### **4.3.2.8 Publications by Government Commissions**

The accepted style for referencing publications by Government Commissions is

[16] Federal Communications Commission, Office of Engineering and Technology, "Millimeter Wave Propagation: Spectrum Management Implications, *Bulletin 70*, July 1997.

- [17] Federal Communications Commission, “Amendment of Part 2 of the Rules and Regulations to Establish An Allocation in the 220-225 MHz Band for the Radio Reading Services,” *Memorandum Opinion & Order*, 2 FCC Rcd 5154 (1987).

The name of the Government Commission and Office is followed by the publication title in quotation marks and the designation or identifier (report/paper number) in italics. The format for the place and date of publication depends on the venue, but generally the venue and page number would come first, followed by the venue edition—usually given as a year—in parentheses.

#### **4.3.2.9 Legislation, Regulation and Reports to Congress**

The accepted style for citing a Public Law is

- [18] Twenty-First Century Communications and Video Accessibility Act of 2010, Public Law 111-260, 111th Cong. (8 October 2010), 2754

- [19] Public Law 111-260, 111th Cong. (2010), 2754

Including the title of the act is optional. The session of congress is given and the page of the record on which the act begins. The date is the date of enactment, which can be given as the year only.

The accepted style for citing U.S. Code is

- [20] Internet Tax Freedom Act. 47 U.S.C. §151, subsections 1100–1109 (2006)

- [21] Telecommunications Act of 1996. 47 U.S.C. §153 (2006).

The title of the Act (if there is one) is followed by the U.S. Code Title number, the abbreviation U.S.C. and the section and subsection numbers, with the year of code edition cited in parentheses. The section may be cited as “sec. 123” or by using the section sign, as “§123.” If a citation in the text begins a sentence, the word “Title” precedes the title number.

Title 44 U.S.C. §1106 states that a report, document, or publication distributed by or from an Executive department or independent agency or establishment of the Government may not contain a notice that it is sent with “the compliments” of an officer of the Government, or with a special notice that it is so sent, except that notice that it has been sent, with a request for an acknowledgement of its receipt, may be given.

The accepted style for referencing the Federal register is

- [22] Final Rule: 75 Fed. Reg. 45,058 (2010) (to be codified at 47 C.F.R. pts. 2,25, and 27.

- [23] Proposed Rule: 76 Fed. Reg. 4,838 (2011) (to be codified at 47 C.F.R. pt. 64) (proposed Jan. 27, 2011).

The accepted style for referencing the Code of Federal Regulations is

[24] 47 C.F.R. §90.279 (2010).

[25] 47 C.F.R. pt. 90 Private Land Mobile Radio Services (2010).

The name of the section being cited may be included, but generally is appropriate only when the citation is to an entire part. Again, if a citation in the text begins a sentence, the word “Title” precedes the title number.

The accepted style for referencing Reports to Congress identifies the body (e.g. House or Senate) and cites the title in italics, followed by the session number, the year and the document number.

[26] U.S. Congress. Senate. *FCC Commissioners’ Technical Resource Enhancement Act: Report of the Committee on Commerce, Science, and Transportation on S.2881*, 111th Cong., 2nd Session, 2010. S. Doc. 111-251.

#### **4.3.2.10 Standards**

There are very few style guides that address citation of standards. Although the ISO standard for citations [30] includes some guidelines for standards, these are not always easy to reconcile with the general guidelines for citations in the style guides that ITS authors generally use. Certainly the citation should include the standard number, standard title, name of the issuing agency, and publication date. If the standard is published as part of a manual, the form is similar to the citation of a chapter in a book; if it is published separately, the form is similar to the citation of a report. If the standard number clearly includes the publication date (e.g., ANSI or ISO numbers), you need not repeat the date at the end of the citation, although it is not incorrect to repeat it. If a specific standard has been issued in the same form by multiple organizations, cite all of the organization acronyms separated by slashes. If you are quoting from a standard that has been reprinted, altered, or reissued by different standards organizations, cite the specific version that you used. The recommended format for ITU recommendations and papers is treated separately in Section 4.3.2.11

[27] ANSI/TIA/EIA IS-95B, “Mobile Station-Base Station Compatibility Standard for Dual-Mode Wideband Spread Spectrum Cellular System,” Telecommunications Industry Association, 2004.

[28] SAE J1606-1997, “Headlamp Design Guidelines for Mature Drivers,” in *SAE Ground Vehicle Lighting Standards Manual*, 2002 edition, Warrendale, PA: Society of Automotive Engineers, 2002, p. 104.

[29] ANSI T1.801.03 – 2003, “American National Standard for Telecommunications – Digital transport of one-way video signals – Parameters for objective performance assessment,” American National Standards Institute. Available at <[www.ansi.org](http://www.ansi.org)>.

[30] ISO 690:2010, *Information and documentation—Guidelines for bibliographic references and citations to information resources*, Geneva, Switzerland: ISO.

#### **4.3.2.11 ITU Recommendations and Papers**

The accepted style for referencing Recommendations is

- [31] Recommendation ITU-T G.108.2 (2007), *Transmission planning aspects of echo cancellers*, International Telecommunication Union, Geneva, Switzerland.
- [32] Recommendation ITU-R M.1225 (1997), *Guideline for Evaluation of Radio Transmission Technology for IMT-2000*, International Telecommunication Union, Geneva, Switzerland.
- [33] Recommendation ITU-T E.800 (09/2008), “Definitions of terms related to quality of service,” International Telecommunication Union, Geneva, Switzerland.
- [34] Recommendation ITU-T H.264 and ISO/IEC 14496-10 (2003), *Advanced Video Coding*, International Telecommunication Union, Geneva, Switzerland.

ITU Study Group Papers are treated more like journal articles, with the full Study Group identification in place of the author.

- [35] ITU-T/SG16/Q15-D-65, “Video Codec Test Model, Near Term, Version 10 (TMN-10), Draft 1,” International Telecommunication Union, Geneva, Switzerland, Apr. 1998.

#### **4.3.2.12 Patents**

When citing patents, include both the filing date and the issue date.

- [36] S. Wolf, S.D. Voran and A.A. Webster, Perception-based video quality measurement system. U.S. Patent 5,446,492, filed January 19, 1993 and issued August 29, 1995.
- [37] S. Wolf, et al., Perception-based audio visual synchronization measurement system. U.S. Patent 5,596,364, filed March 30, 1995 and issued January 21, 1997.

#### **4.3.2.13 Web Content**

Increasingly, ITS authors may find that they wish to refer to material that is only available on the Web. This is fine, provided that the source is reliable. For example, Wikipedia is not a reliable source, but the FCC Encyclopedia is. It may be useful or helpful to include a footnote that describes the Web source or an article that clearly describes the source’s *bona fides* in the references.

For text documents that appear only on the Web and do not have an assigned DOI, NTIA authors should include all the bibliographic information available as well as the URL. If the article includes a posted publication or revision date, cite that date; otherwise, supply an access date. In any case, unless a DOI is given, authors should retain dated copies, either as hard copy or in electronic form, of any reference that is available only on the Web.

- [38] L.P. Burka, "A hypertext history of multi-user documents," The MUDdex, 1993.  
<<http://www.apocalypse.org/pub/u/lpb/muddex/essay/>>, accessed on Dec. 5, 1994.

For multimedia items, NTIA authors should include all the bibliographic information available as well as the URL. If the item includes a posted publication or revision date, cite that date; otherwise, supply an access date.

- [39] "NTIA Touch Em' Up Boxing Segment 1 frames 1 to 1000 of 6047," Consumer Digital Video Library, <<http://www.cdvl.org>>, accessed on Jan 7, 2014,

#### **4.4 Content of the Bibliography**

The bibliography lists publications (available to all) pertinent to the subject of the report but not cited in the report. Typically, authors do not include cited documents in the bibliography (and do not include documents in the reference section that are not cited in the text).

The same format and style rules apply to the bibliography section as apply to the reference list, except that bibliography entries are arranged in alphabetical order, by author. The bibliography section immediately follows the reference section. The bibliography, like the list of references, may contain only documents that are available to the general public. Classified documents may not be listed in the reference list or bibliography of an unclassified paper, even if the referenced title is unclassified. However, the bibliography of a classified paper may include in its reference list or bibliography another classified document with equal or lower security classification.

Authors who wish to combine lists of references with lists of bibliographic material are advised to preserve stylistic consistency and obey stylistic rules that promote completeness and clarity in each entry. A combined list of references and bibliography must be in alphabetical order and may not be titled "REFERENCES" because not all items in the list are referred to in the text. A separate reference list, in numerical order, must always be included as well.

#### **4.5 Annotated Bibliographies**

Annotated bibliographies are lists of bibliographic materials with brief summaries added (usually, but not always, by the compiler). The style for citation of the materials in an annotated bibliography published by NTIA is the same as that for citations of references in other NTIA publications (see Section 4.2 Citations within the Text). Below are examples of typical entries in an annotated bibliography:

- H. Akima, "A model of a shaped-beam emission pattern of a satellite antenna for interference analysis," NTIA Report 86-197, Jul. 1986 (NTIS Order No. PB 86-238755/AS). For efficient use of the geostationary satellite orbit, mutual interference among satellite systems must be analyzed in the planning stage of the systems. To conserve the transmitter power, many satellite antennas in the FSS (fixed-satellite service) use the so-called shaped-beam emission patterns that cover their service areas. A computer model of a shaped-beam pattern is needed in the analysis of mutual interference. The author presents a simple model for calculating the antenna gain in the direction of an

Earth point from several contour lines given on the map of the Earth, each corresponding to an antenna gain value.

C. Rush, M. Fox, D. Bilitza, K. David, L. McNamara, F. Stewart, and M. Pokempner, "Ionospheric mapping: An update of foF2 coefficients," *Telecommun. Journal*, vol. 56, no. III, pp. 179-182, 1989. A new set of coefficients to map numerically the global variation of foF2 has been developed by a Working Group under the auspices of the International Union of Radio Science. This article describes how these new maps were obtained, and presents the results of tests to determine the extent to which they are an improvement above the current International Radio Consultative Committee (CCIR) maps.



## 5. INSTRUCTIONS FOR FIGURES

### 5.1 General

Figures or illustrations are either raster-based (photographs or scans of source material when the original source is not available or not in a computer-compatible format, also called bitmaps) or vector-based (computer generated artwork, such as illustrations or graphs). It is always preferable to use a vector-based format when one is available as this will allow the most versatility for rendering for each medium in which it is published. Authors should consult with the Publications Officer if there is any uncertainty as to the most appropriate format.

Treat figures consistently throughout the report. Font type and size for axis labels, legends and other in-figure text should be consistent throughout the publication. Prepare figures so that details will be clearly legible after final reproduction. Generally, do not add borders to illustrations and do not use background tones in line drawings unless they contribute substantially to clarity.

Mention each figure in the text. Place figures in the text immediately after the location where they are first mentioned, or as soon as practicable, except in special situations, such as a report with only a few text pages and many illustrations. In such cases, place the illustrations in numerical sequence in the back of the report. Figures may not require a separate listing (see Section 3.1.5.1).

It is preferable to place illustrations in portrait mode (with the top of the figure at the top of the page) so that they may be viewed without turning the page sideways. Portrait-mode figures may be either centered or flush left, but all must be treated the same way within a document. If an illustration must be located in landscape mode (with the figure's axis parallel to the long dimension of the page), orient it so that on an even numbered page, its bottom is near the binding, and, on an odd numbered page, its top is near the binding, as shown in Figure 1. Figure 2 illustrates page number orientation for pages with figures that share the page with text.

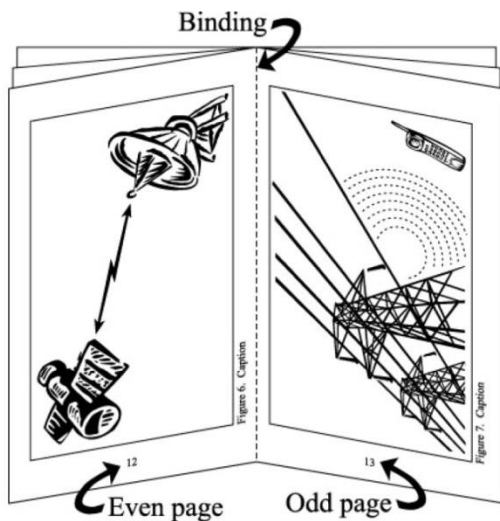


Figure 1. Example of a landscape orientation for text illustrations.

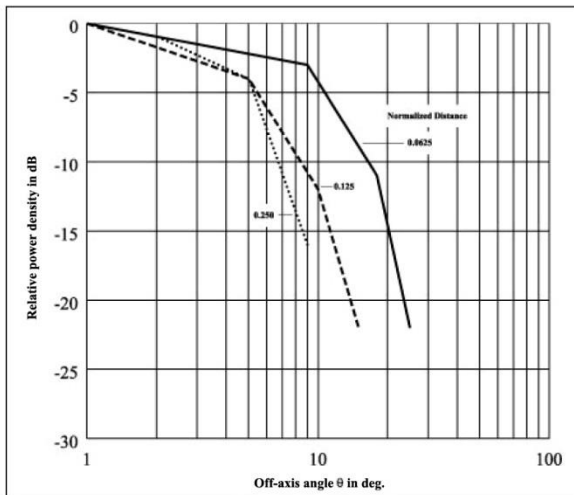


Figure 3-5b. Relative power density vs mainbeam off-axis angle,  $n=1$ ,  $D=10\lambda$ , based on data from Ref. 14.

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Lor ad min ut vel del ut ilit amconul utat. Ut adignibh et, vel dolummy niam, qui tie doloborer irit vulluptat wiscin venim verostrud te diatie eriusci ent aut prat nulput vulluptat. Ut lut lore magnim nim ea feugiam, susto consequat iure feugiam zzriuscip eum do elit velisi. Duisisim vullam velis nisit lum zzriustisl dolutpat. Ut inci tin hendip enim vel enis dolorerosto conulpu patue do od tet lor susto dip eum dunt volent wisis eum vent ulluptat, conullute moloborperil iure dio esent praesed dion vel utpatum iuscidunt amcommy nostis alit in ut velis nulputet praessequam iliquam quat nonse facincipit vel iure tat, conse commod dio od magna consequisim eugait, quating ercidunt wisi bla at, corpero consecetem incinibh exer augait lum autatum quisit tat. Loreet lumsandre mincin vendiat. Ut voluptate magnibh et, veliquat lut prat landre vel dolortie doloborperero odionulpute et vel essecte dignissed ea faccumsan ut aliquam ad te verosto odolore min ut esenis nostio elessi bla feu feu faccum ndrectum etumsan hendiation ea facidunt pratummy nibh eummy nullandiam dipis atuero coreet nonum nisl ip eugue elis nos nos nummod

(page number)

Figure 2. Illustration of page-number orientation for page with figure and text.

## 5.2 Numbering Figures

Consecutively number illustrations to which reference is made in the text using Arabic numerals, preceded by the word “Figure.” For example, “Figure 1” or “Figure 2.” The caption on figures ends with a period. Do not abbreviate the word “Figure.”

For closely related figures, the numbering scheme: “Figure 1(a),” “Figure 1(b),” “Figure 1(c)” may be used. Do not use the broken scheme: “Figure 1,” “Figure 1(a),” “Figure 1(b).” This rule applies both to figure and table numbering systems.

In a lengthy paper with many illustrations, it may be possible to number figures by section, but it should be the exception and should be done only when there is a clear necessity for doing so. The author must discuss the matter with the Publications Officer before adopting this option.

### **5.3 Figure Captions**

Make each caption distinct, and descriptive enough to diminish the need for interior labels and legends. End each caption with a period. Only the first word of the caption and any proper nouns should be capitalized. A caption should be left justified with respect to its figure. Captions should be separated from the figure number with an em space (when the software allows) or two regular spaces (when the software does not support em spaces).

The orientation of a figure must be the same as its caption: that is, a figure presented in portrait mode must have a caption placed beneath it so that both the figure and the caption can be read without rotating the page. Similarly, if a figure is presented in landscape mode, its caption must also be written in landscape mode, i.e., both figure and caption use the same page orientation.

If the portrait-mode figures in a document are all centered, their captions must also be centered, within the width of the figure. If the figures are all flush left, their captions must also be flush left. In this document, the figures and their captions are all flush left.

If the illustration is reprinted from another publication, ITS standard reference format is used to give proper credit in the caption, and, when required, state that reproduction is done with the copyright holder's permission or with the author's permission on non-copyrighted material. No copyrighted material may be used in Government publications without permission (in writing) from the holder of the copyright. This rule is rigidly followed since material published in Government publications is automatically in the public domain and copyright is lost unless it is used with permission, properly identified as copyrighted, and the copyright information provided. A limited exception to the requirement for written permission is permissible for "fair use" of copyrighted material for scholarship or research purposes, which nonetheless must be properly identified. For further information, see Section 6.6 Copyright Considerations in NTIA Handbook HB-14-503 ITS Publications Handbook Volume I: Policies or consult the Publications Officer.

### **5.4 Foldouts**

Due to cost factors, it is best to avoid the use of oversized illustrations that must be folded in publications destined for print. Often a large illustration can be divided to appear on facing pages. If foldouts must be used, make the foldouts or gate folds begin on a right hand page (never left). The reverse of the foldout must be either blank (Figure 3) or another foldout illustration (Figure 4). Also see Section 3.1.5 for details of page numbering for foldouts.

The use of oversized illustrations in publications that will be released in electronic form only requires other considerations. The electronic publishing process typically compresses images by reducing the resolution in order to ensure the complete final document is small enough to be easily accessible over the Internet. Thus, a high-resolution image incorporated in the manuscript may not present as intended at the end of the electronic publication process. Consult with the Publications Officer to determine the best way to handle high-resolution images; it may be that a lower resolution version can be included in the manuscript and individual high-resolution files made available separately.

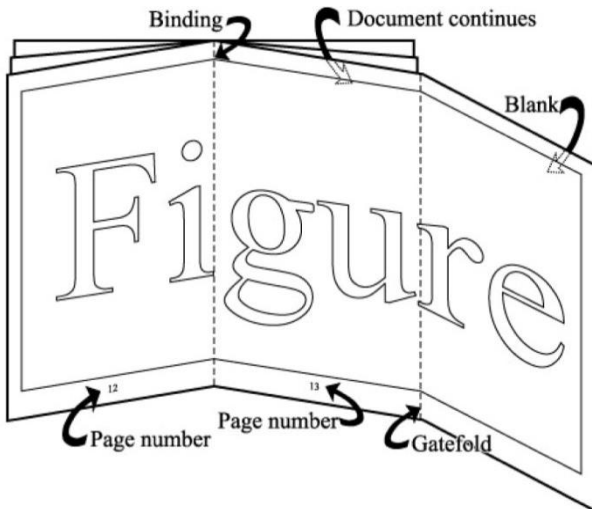


Figure 3. Illustration of a single foldout.

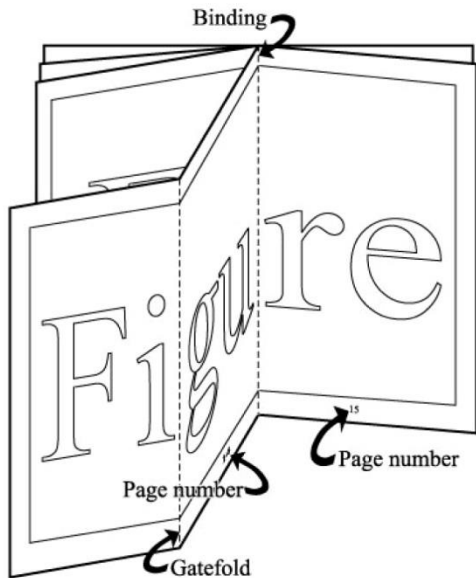


Figure 4. Illustration of a back-to-back foldout.

### 5.5 Computer-generated Graphs and Graphics

Since all NTIA publications are now made available electronically, consideration must be given to compliance with accessibility guidelines. A good practice is to ensure that graphs are clear and understandable when printed or viewed in black and white. Use color value and pattern as well as color hue to distinguish different lines on a graph, and when referencing the data series cite both the color and the pattern (“A best-fit line (solid red) is used ...” “The free-space loss is plotted for reference (light green dashed line).”

Whenever possible, computer generated graphics (including graphs) should be supplied in a vector-based format, not a raster-based format, to allow for re-sizing of the graphic without loss of detail. Consult the Publications Officer for the current preferred format.

Authors should not use fine grid backgrounds since these are difficult to reproduce clearly. Label coordinate axes clearly and include units. The first word of a label is capitalized. All labeling, including axes, legends, and notations, should use a common font (preferably Times Roman, although a sans serif font such as Arial may be used) no larger than the font size used in the report's text.

The following rules for graphs and illustrations are useful:

- Keep the design of the graph/illustration simple.
- Black-and-white (i.e., monochrome) illustrations and graphs are preferable in ITS publications, although color may be used in the case of complex data presentation where the use of monochrome interferes with the graphic's legibility.
- When choosing line weights (widths), do not use "hairline." Use a minimum width of 0.5 points. It is preferred to use different width lines to emphasize or differentiate between different elements of the illustration.
- Avoid using grayscale fills or lines which are difficult to reproduce. Use different line styles (dashed, dotted, or variants of the two) to distinguish between various plotted values. If the lines overlap too much for different line styles to help, reconsider the layout of the graph/illustration. Only use color as a last resort.

Preferably, use no more than one type font in any one graph or illustration. While computer generated type fonts are available in many varieties, using multiple styles results in a "busy" graph. If the complexity of the graphic seems to call for two or more type fonts, then the graphic should be simplified.

## **5.6 Photographs**

When dealing with original photographic prints, scan at a resolution of 300 dots-per-inch (dpi) in an appropriate color mode (8-bit grayscale for black and white photos, 24-bit color for color) if the photo will be reproduced in its original size or will be reduced. Scan at a higher resolution if the photo will be reproduced in a size larger than the original. Use an image editing program to remove dust, dirt, and other contaminants from the image. Crop the resultant file to eliminate insignificant detail. Save in a format that uses lossless compression (TIFF, PNG, or BMP).

When using digital camera images, bear in mind that the camera's resolution will determine the maximum size of the published image. Images print best at a resolution of 300 dpi or higher; 300 dpi is adequate for in-house printing or offset-printed technical reports, but high-quality press printed brochures and reports (such as the annual Technical Progress Report) require 1200 dpi minimum art. Divide the camera's image dimensions by the appropriate dpi to obtain the largest possible printed image size. For example, a 3 megapixel camera producing a 2048 x 1536

electronic image will print to a maximum size of 6.83" x 5.12" at 300 dpi. Set the camera to save images in an uncompressed format if possible, or use the lowest possible compression setting available (usually defined as Best). Crop the resultant file to eliminate insignificant detail.

## 6. INSTRUCTIONS FOR TABLES

Use letters and numbers in tables that will be at least 6 point or 2 mm (1/12 in.) high in the final reproduced report. Avoid shading, because this does not reproduce well.

Every table must have a number and a caption, placed above the table. Number tables consecutively in Arabic numerals, preceded by the word “Table” and followed by a period (e.g., “Table 1.”), and then one em space. If the option of numbering figures by section has been adopted, the same option may be used for table numbering.

As with figures and captions, tables and their titles or captions may be either flush left or centered, but must all be treated the same way within a document. See Table 1 for an example table with caption. In this document, tables and figures are flush left and so are their captions.

Each table must follow the text where it is mentioned and should appear in close proximity to that citation. In the special case where a report has only a few text pages and many tables, place the tables in numerical sequence at the back of the report.

It is preferable that tables be placed in portrait mode. If a table must be placed in landscape mode, orient it so that on an even-numbered page its base is near the stitching, and on an odd-numbered page its top is near the stitching. Thus, two landscape tables on adjacent pages can be read simultaneously. Tables placed in landscape mode on the page do not share the page with any text.

Tables may have footnotes. These are numbered in series with other footnotes and placed at the bottom of the page (see Section 8.1 Footnotes).

Table 3. Full sub-region Y, CB, CR values.

<b>Top</b>	<b>Left</b>	<b>Bottom</b>	<b>Right</b>	<b>Y</b>	<b>CB</b>	<b>CR</b>
1	10	204	109	180	0	0
1	110	204	209	162	-84	14
1	210	204	309	131	28	-84
1	310	204	409	112	-56	-70
1	410	204	509	84	56	70
1	510	204	609	65	-28	84
1	610	204	709	35	84	-14

## 7. EQUATIONS AND OTHER MATHEMATICAL EXPRESSIONS

This section consists of general guidelines that may help in preparing manuscripts with equations. Rules regarding use and format of equations and expressions cannot apply to every expression and equation. There will be exceptions, and in these cases the author should use his/her judgment.

### 7.1 Placement and Alignment of Equations

Equations should be indented or centered immediately following their first reference. Equations should be separated from the text by at least one blank line. If an expression is too long to fit within the side margins of the page, break the equation before the arithmetic symbols +, −, ·, ×, or ÷. These symbols should be aligned with one another in a broken equation with the equals sign slightly to the left, if possible. An example of this is shown below in (1).

$$F = p\sqrt{LC} + \frac{K}{2}p^{\frac{1}{2}}\sqrt{\frac{C}{L}} + \sum_{k=2}^{\infty} (-1)^{n-1} \frac{(1 \cdot 2 \cdot \dots (2n-3)) K^n}{2^n n!} \frac{1}{L^{n-1}} \sqrt{\frac{C}{L}}^{1-\frac{2}{n}} - \int_{(t=0)}^{\infty} \exp \left[ t\sqrt{LC} + \frac{K}{2} t^{\frac{1}{2}} \sqrt{\frac{C}{L}} \right] dt \quad (1)$$

A group of separate but related equations should be aligned by the equal signs and indented or centered as a whole, if possible. This can be seen in (2), (3), and (4).

$$up_{1a} = \left| \left( \frac{\partial G_a}{\partial P_{1a}} \right) \left( \frac{1}{G_a} \right) \Delta P_{1a} \right| = \frac{\Delta P_{1a}}{p_{1a}} \quad (2)$$

$$up_{2d} = \left| \left( \frac{\partial G_a}{\partial P_{2d}} \right) \left( \frac{1}{G_a} \right) \Delta P_{2d} \right| = \frac{\Delta P_{2d}}{p_{2d}} \quad (3)$$

$$up_2 = \left| \left( \frac{\partial G_a}{\partial P_{2d}} \right) \left( \frac{1}{G_a} \right) \Delta P_2 \right| = \frac{\Delta P_2}{p_2} \quad (4)$$

### 7.2 Punctuation and Spacing within Equations

#### 7.2.1 Horizontal Alignment of Signs

Signs for binary operations and relations such as + (plus sign), − (minus sign), · (multiplication dot), × (multiplication cross), ÷ (division sign), / (solidus or slash), — (division line or fraction bar), = (equals), ≠ (does not equal), > (is greater than), and < (is less than) should be kept on the same level. Generally, the word processing or typesetting tool will do this automatically. If it



does not happen automatically, verify that you have used the correct character. For example, the multiplication cross, “×” (Unicode or ASCII hex 00D7 or ASCII decimal 215), is not the same character as the letter “x” on the keyboard. For assistance entering special characters, consult your software documentation or the Publications Officer.

### 7.2.2 Punctuating Mathematical Symbols

Punctuation of mathematical symbols within equations or text is at the discretion of the author. The U.S. Government Printing Office Style Manual (2008) calls for mathematical signs +, −, ±, ×, and ÷, etc., to be closed against accompanying figures and symbols. However, LaTeX and Word Equation Editor follow the opposite convention, which is consistent with that recommended by *The Chicago Manual of Style* and generally recommended by scientific publications. If the publication to which an article is being submitted has not supplied editorial direction in this regard, or if the author is preparing an NTIA publication, ITS recommends authors ignore the GPO Style Manual and follow the conventions listed below.<sup>11</sup>

- Signs for mathematical operators are separated from text on both sides by spaces (e.g.,  $\alpha = 0.05$ , not  $\alpha=0.05$ ;  $P < 0.025$ , not  $P<0.025$ ). This is also true when the multiplication cross (×) is used to indicate a dimension (e.g., 768 × 1024 pixel display, not 768×1024 pixel display). Use non-breaking spaces on either side of the operator as necessary to avoid awkward line breaks. For assistance entering non-breaking spaces, consult your software documentation or the Publications Officer.
- Plus signs or minus signs (en dash) are separated from text by spaces when used to indicate mathematical operation (e.g.,  $1 + 1 = 2$ ), but no space is used when the symbol indicates positive or negative values (e.g., +2 is a positive value and −2 is a negative value).
- The plus-or-minus sign (±) is separated from text by spaces when used to indicate a mean ± SE (e.g.,  $12 \pm 0.02$ ; not  $12\pm 0.02$ ), but no space is used to indicate values that may be either positive or negative (e.g., ±2 indicates a positive or negative value).
- Symbols for “similar to” or “nearly equal to” are not followed by a space (e.g.,  $\sim 12$ ,  $\approx 24$ ).

### 7.3 Punctuation in Context

Punctuate sentences containing equations as if the equations were words forming part of the sentence. This is demonstrated in the following two sentences.

The equation of a straight line is  $y = mx + b$ , where  $m$  is the slope and  $b$  is the  $y$  intercept.

**not**

---

<sup>11</sup> This particular list is adapted from “*Herpetologica* and *Herpetological Monographs* Instructions for Authors – 2012a, p. 13. Accessed at < <http://www.herpetologistsleague.org/dox/HL-Instructions-for-Authors.pdf> > May 23, 2012.

The equation of a straight line is:  $y = mx + b$ . The slope is given by  $m$  and the  $y$  intercept is expressed by the letter  $b$ .

## 7.4 Formatting

Note that a simple, short equation may be entered directly in a line of text. Do not break an equation in text; it must be kept on one line. However, if the equation is referred to in the text, separate it from the text and number it.

If the in-line presentation of the equation is ambiguous, separate it from the text. For example, the equation  $D = K\lambda/4\pi n$  is ambiguous since it could be interpreted as  $D = K\left(\frac{\lambda}{4}\right)\pi n$  (standard order of operations), when what is really meant is  $D = (K\lambda)/(4\pi n)$ . A better way of expressing this is:

$$D = \frac{K\lambda}{4\pi n}. \quad (5)$$

Also note that using forced one-line format for more complicated equations can make the expression difficult to read. For example, (7) is preferable to (6).

$$f(x) = (x + 1)/(x - 1) \quad (6)$$

$$f(x) = \frac{(x + 1)}{(x - 1)} \quad (7)$$

An exception to avoiding the one-line format is the exponential function. In this case, the one-line format may be preferable. For example, (8) is preferable to (9).

$$\exp\left[t\sqrt{LC} + \frac{K}{2}t^{\frac{1}{2}}\sqrt{\frac{C}{L}}\right] \quad (8)$$

$$e^{\left[t\sqrt{LC} + \frac{K}{2}t^{\frac{1}{2}}\sqrt{\frac{C}{L}}\right]} \quad (9)$$

If the argument of the exponential is complicated, the expression can become confusing and possibly ambiguous.

Symbols should be identified immediately after first use. An example of this can be seen in the following quote:

the electromagnetic field,  $F$ , at  $x$ , is given by equation

$$F = F_0 e^{-bx} \quad (10)$$

where  $F_0$  is the electromagnetic field strength at  $x = 0$  and  $b$  is the absorption coefficient of...

It is also possible to use a list to identify the symbols in an equation, particularly when several new symbols are introduced in the same equation.

Delimiters such as parenthesis, brackets, and braces should be the same height as the expression they enclose. This can be seen in (11).

$$f(x, y) = \left[ \frac{(x^2 + 1) - y}{5y} \right] (7y - x) \quad (11)$$

It is preferable to avoid the use of negative exponents. For example,

$$f(x, y) = \frac{x}{(x^2 + y^2)^2} \quad (12)$$

is better than  $f(x, y) = x(x^2 + y^2)^{-2}$ .

Equation numbering may be done in several different ways. Every equation may be numbered, only the equations actually referred to in the text may be numbered, or equations that are part of a series may be numbered. At the very least, equations that are referred to in the text should be numbered. Use consecutive Arabic numerals, enclosed in parentheses, at the right margin on the last line of the equation. The equation numbers should be horizontally aligned with each other.

## 7.5 Numbering and Referencing

Templates developed by the Publications Officer for standard office automation software include mechanisms for automatic numbering of equations. This allows references to a particular equation to be entered as active cross references; when the document is rendered electronically, these will become internal hyperlinks.

When referring to an equation by number, write out “equation” only when it begins a sentence; otherwise, use the number of the equation in parentheses. The following two sentences provide examples of proper use of equation numbers.

Equation (1) is correctly numbered.

Correct numbering format is given by (1).

## **8. NOTATIONS**

### **8.1 Footnotes**

Footnotes may be used at the bottom of the page to address details of a level not suitable for the discussion in the main text; they also may list pertinent references for the material discussed on that page (see Section 4.2.2 Other Citations).

The presence of a footnote is indicated in the text by a superscript number (e.g., “<sup>1</sup>”). The superscript number should generally be placed at the end of a sentence or at the end of a clause. The number follows any punctuation mark except for the dash, which it precedes, and normally also follows a quotation (whether it is run in to the text or set as an extract) and a closing parenthesis. On rare occasion, it may be more appropriate to place the footnote number inside a closing parenthesis or closing quotation mark—if, for example, the note applies to a specific term within the parentheses or quote.

Footnotes are placed at the bottom of the same page where the superscript numbers indicate their existence. Occasionally, a lengthy footnote may spill onto the bottom of the next page. On both pages, the text of the footnote begins under a solid line of underscore (“leader”) that extends approximately 50 mm (2 in.) horizontally across the bottom section of the page.

All footnotes should use a single numbering sequence; this includes the author affiliation footnote as well as footnotes appearing within tables. Footnotes within tables are placed at the bottom of the page on which the table appears.

Policy rules governing text in NTIA publications apply to all footnotes as well.

### **8.2 Endnotes**

Endnotes are notes addressing details of a level not suitable for the discussion in the main text that appear at the end of the document, volume, or chapter. NTIA/ITS Publications should use footnotes rather than endnotes.

### **8.3 Headers**

Headers are used primarily to install a repetitive statement, page number, heading, etc. in a document. NTIA/ITS Publications should not use headers.

### **8.4 Footers**

Footers are used primarily for page numbering at the bottom of the page on documents or, again, to install a repetitive statement. NTIA/ITS Publications should use footers only for page numbering (see Section 2.1 Page Numbering).

## 9. SOFTWARE AND DATA PRODUCTS

A mechanism for the official publication of Software and Data Products has been established to encourage release of software and data products as official NTIA/ITS documents, archived in one central location. Software and data products can still be released without becoming official NTIA/ITS documents (e.g., when a faster turn-around is required) but authors are encouraged to publish whenever possible, in order to preserve these products.

It should be noted that ITS publication of software and data products does not impact distribution policy. That is, any processes that must be followed with respect to licensing, cost, or such must still be followed. Publication does not guarantee distribution.

In an ideal world, NTIA/ITS would perform a full technical review of every software and data product released. However, such an extensive evaluation can be prohibitively expensive and time consuming. Therefore, the two technical reviews required for other official NTIA publications may be omitted at the discretion of the release authority.

The format and review requirements are constrained to (1) a “readme” file and (2) any associated legal text. Review of these files is documented on an NTIA Form 3. An NTIA Form 9, “Request to Print,” is required if the proposed distribution methods include hard media. Software and data products that are released for publication will be disseminated via the ITS Web site. If the software or data product is release as formal NTIA publication using the SD series, an entry will be created in the publications database that will result in the software or data product being listed in publications search results and on the Browse Publications page on the ITS Web site.

The software or data product must contain the following information:

- 1) An electronic or printed “readme” file in plain text format containing the following information. If the software / data product is compressed then the readme file should be both inside and outside of the compressed file.
  - NTIA publication number
  - Software / Data Product title
  - Version number
  - Hardware / software platforms
  - The agency that produced this product (e.g., NTIA/ITS or NTIA/ITS and another agency)
  - The NTIA/ITS Web site address
  - A brief description of what this software or data product does
  - Information about all relevant patents—numbers and names

- Terms of use by which this product is governed, or where to get this information (see item 2)
  - How to install this software / data product
  - A packing list, visually separated from the rest of the readme file (e.g., by a dashed line)
  - A caveat, that if something on the packing list is missing, this is not an official distribution
  - A list of related documents, such as NTIA Reports or IEEE Standards (optional)
- 2) If the software or data product is not patented, then the software disclaimer cited in Section 3.1.3.2 must be included.
  - 3) If the software or data product is protected by a patent, then a software evaluation license, CRADA, or other legal document must be provided. The terms of this license or CRADA must be approved by a lawyer. For an example, see SD-03-396, Volume 1–5.
  - 4) When providing software or data products as part of a larger publication (e.g., supplemental software), the same information should be included.

## **10. APPENDIX GUIDELINES**

Appendices are used to present supplementary material that a) is necessary for completeness, but which, if inserted in the main body of the paper, would detract from the orderly and logical presentation of the material, or b) may be omitted by the general reader but would be valuable for the specialist in the field. The appendix may include data tabulations, detailed descriptions of equipment or procedures, derivations of equations, sample calculations, and other material that supports but is not essential to the main presentation. Usually, the sequence of material presented in the appendix follows the order of references made in the body of the paper.

### **10.1 Appendix Title**

The appendix title should be centered at the top of the first page of the appendix, and must be preceded by the word “APPENDIX” (which is followed by a colon).

If there are two or more appendices, the word “APPENDIX” on the first page of each appendix is followed by a letter designation (e.g., “APPENDIX A”), then a colon, and then by the title of that appendix.

### **10.2 Appendix Page Numbering**

The first appendix always starts on a new, odd-numbered page. The reason is that the appendices may, by the nature of the information on them, be separated from the main body of the report and may be thought of as stand-alone documents. The page preceding the first page of the first appendix is numbered, regardless of whether there is text on that page.

The first page of succeeding appendices may be placed so that they begin on either odd-numbered (right-hand) pages or even-numbered (left-hand) pages.

### **10.3 Appendix Section Numbering**

If there is only one appendix, sections in the appendix are numbered A.1, A.2, etc.

If more than one appendix exists, then the sections in Appendix A are numbered A.1, A.2, etc., and in Appendix B, they are numbered B.1, B.2, etc. Subsections of the appendices are numbered A.1.1, A.1.2, and B.1.1, B.1.2, etc.

### **10.4 Multivolume ITS Reports**

An appendix for a multivolume ITS report should be placed at the back of the volume to which it relates. This method tells the reader that there is related, appended material, and that the material of interest also is available (even if the reader has access only to the volume in hand).

It is suggested that the table of contents for each volume of a multivolume report should include the contents (section titles and appendix titles) for all volumes in the set as well as for the current volume. This will enable the reader to locate any appendix in the set.

### **10.5 Disproportionately Large Appendices**

Generally, format rules do not change for appendices that are many times larger than the report to which they are appended. In other words, the page-numbering scheme, figure-captioning scheme, and other systems remain unchanged even if the appendix is many times larger than the report to which it is appended.

### **10.6 References in the Appendices**

Generally, references in appendices use the same reference style as those in the main body of the report (see Section 4). Reference sections in the appendices are not shown in the table of contents.

References in the appendices are listed in a separate reference section for each appendix and are not included in the reference section for the body of the paper. References in Appendix A are numbered serially, thus: [A-1], [A-2], [A-3], etc. References in Appendix B are numbered serially, thus: [B-1], [B-2], [B-3], etc. If all appendix references are cited also in the main text, no separate reference section is required for the appendix; therefore, references cited in the appendix are for documents referenced in the appendix only.

### **10.7 Equation Numbers, Figure Numbers, and Table Numbers in Appendices**

Equations in Appendix A are numbered serially, thus: (A-1), (A-2), (A-3), etc. Equations in Appendix B are also numbered serially, thus (B-1), (B-2), (B-3), etc.

Figures are numbered: Figure A-1., Figure A-2., Figure A-3., etc.

Tables are also numbered in this fashion in the appendices: Table A-1., Table A-2., etc.

Note that the designation “A” is used as a prefix for appendix items when there is only one appendix.

### **10.8 External Documents as Appendices**

Occasionally, an appendix will reproduce a document that was published elsewhere. In this case, the usual ITS format rules may not be applicable to the text of that appendix.



## **11. PREPARATION FOR PRINTING**

### **11.1 General**

Since 2013, most NTIA formal publications, such as Technical Reports, Technical Memoranda, Special Publications, and Handbooks, are made available to the public in electronic form (on the ITS Web site). Any of these may be printed on a case-by-case basis, depending on the importance of printed copies to the sponsor, the public, or the Institute.

Manuscripts are prepared for publication, whether electronic or hard copy, by the Publications Officer in accordance with the Federal requirements for each medium. Before being published, a manuscript must be in final form.

The Bibliographic Data Sheet (NTIA Form 29) can be filled out by the author, the author's secretary, or the Publications Officer. An electronic version is included in the template. It is placed after the rest of the document but before Cover 3, preferably on a right-hand page, depending on the page count. It does not have a page number.

### **11.2 Manuscripts Published in Hard Copy**

All manuscripts must include four cover pages. Cover 1 (front) includes special artwork, available from the Publications Officer; the artwork for an NTIA Report is included in the template by default. Cover 2 (inside front) is blank. Cover 3 (inside back) is a list of publications in the NTIA Formal Publication Series. Cover 4 (back) is blank. Covers 1–4 do not have page numbers.

Longer manuscripts (90 pages or more) may require a spine. If desired, a separate file of spine copy may be prepared. Spine copy should include the title of the report (may be abbreviated due to space constraints), the report series and the report number.

The page count of documents to be printed in hard copy must be divisible by 4, including the four cover pages. If necessary, simply add blank pages at the end of the manuscript (either before or after the Bibliographic Data Sheet).

### **11.3 Publications Officer Responsibilities**

The Publications Officer prepares the various forms and physical or electronic files required by the U.S. Government Printing Office (GPO) for printing, based on information from authors. For electronic publication, the Publications Officer prepares the electronic file in accordance with applicable requirements for file format, metadata, accessibility, size, etc.



## BIBLIOGRAPHIC DATA SHEET

1. PUBLICATION NO. HB-14-504	2. Government Accession No.	3. Recipient's Accession No.
4. TITLE AND SUBTITLE ITS Publications Handbook Volume II: Style Guide		5. Publication Date March 2014
		6. Performing Organization Code NTIA/ITS.D
7. AUTHOR(S) ITS Editorial Review Board		9. Project/Task/Work Unit No.  9330012-000
8. PERFORMING ORGANIZATION NAME AND ADDRESS Institute for Telecommunication Sciences National Telecommunications & Information Administration U.S. Department of Commerce 325 Broadway Boulder, CO 80305		10. Contract/Grant Number.
		12. Type of Report and Period Covered
11. Sponsoring Organization Name and Address National Telecommunications & Information Administration Herbert C. Hoover Building 14 <sup>th</sup> & Constitution Ave., NW Washington, DC 20230		
14. SUPPLEMENTARY NOTES		
15. ABSTRACT (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.)  This is the third edition of a handbook intended to help Institute for Telecommunication Sciences (ITS) staff produce reports and papers in accordance with ITS, National Telecommunications and Information Administration (NTIA), Department of Commerce (DoC), and Federal Government standards. It is based on the "ITS Publications Handbook," last updated in 2008, and the "Quick Reference Guide to ITS Publications," published in 1993. Volume I, "Policies," describes policies applicable to the preparation and quality review of manuscripts for publication and discusses policy issues such as the use of commercial names in ITS publications. Volume II, "Style Guide," provides guidelines for the publication of documents so that their appearance is uniform, consistent, and appropriately formal. Templates and best practices formerly included in Volume III have been included in a set of procedures developed to support this handbook.		
16. Keywords (Alphabetical order, separated by semicolons)  Institute for Telecommunication Sciences, National Telecommunications and Information Administration, Style Guide; Technical Publications		
17. AVAILABILITY STATEMENT  <input checked="" type="checkbox"/> UNLIMITED.  <input type="checkbox"/> FOR OFFICIAL DISTRIBUTION.	18. Security Class. (This report) Unclassified  19. Security Class. (This page) Unclassified	20. Number of pages 61  21. Price:



# **NTIA FORMAL PUBLICATION SERIES**

## **NTIA MONOGRAPH (MG)**

A scholarly, professionally oriented publication dealing with state-of-the-art research or an authoritative treatment of a broad area. Expected to have long-lasting value.

## **NTIA SPECIAL PUBLICATION (SP)**

Conference proceedings, bibliographies, selected speeches, course and instructional materials, directories, and major studies mandated by Congress.

## **NTIA REPORT (TR)**

Important contributions to existing knowledge of less breadth than a monograph, such as results of completed projects and major activities. Subsets of this series include:

## **JOINT NTIA/OTHER-AGENCY REPORT (JR)**

This report receives both local NTIA and other agency review. Both agencies' logos and report series numbering appear on the cover.

## **NTIA SOFTWARE & DATA PRODUCTS (SD)**

Software such as programs, test data, and sound/video files. This series can be used to transfer technology to U.S. industry.

## **NTIA HANDBOOK (HB)**

Information pertaining to technical procedures, reference and data guides, and formal user's manuals that are expected to be pertinent for a long time.

## **NTIA TECHNICAL MEMORANDUM (TM)**

Technical information typically of less breadth than an NTIA Report. The series includes data, preliminary project results, and information for a specific, limited audience.

For information about NTIA publications, contact the NTIA/ITS Technical Publications Office at 325 Broadway, Boulder, CO, 80305 Tel. (303) 497-3572 or e-mail [info@its.bldrdoc.gov](mailto:info@its.bldrdoc.gov).