

INCH-POUND

MIL-DTL-24784C(NAVY)

3 November 2007

---

SUPERSEDING

MIL-DTL-24784B(SH)

15 February 2002

DETAIL SPECIFICATION

MANUALS, TECHNICAL:  
GENERAL ACQUISITION AND DEVELOPMENT REQUIREMENTS, GENERAL SPECIFICATION FOR



Comments, suggestions, or questions on this document should be addressed to: Commander, Naval Sea Systems Command, ATTN: SEA 05M3, 1333 Isaac Hull Avenue, SE, Stop 5160, Washington Navy Yard DC 20376-5160 or emailed to [CommandStandards@navy.mil](mailto:CommandStandards@navy.mil), with the subject line "Document Comment". Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <http://assist.daps.dla.mil>.

## MIL-DTL-24784C(NAVY)

## CONTENTS

1. SCOPE.....	1
1.1 Scope.....	1
2. APPLICABLE DOCUMENTS .....	1
2.1 General.....	1
2.2 Government documents .....	1
2.2.1 Specifications, standards, and handbooks .....	1
2.2.2 Other Government documents, drawings, and publications .....	2
2.3 Non-Government publications .....	3
2.4 Order of precedence.....	5
3. REQUIREMENTS .....	5
3.1 Specification sheets.....	5
3.1.1 Technical content requirements.....	5
3.1.1.1 Commercial off-the-shelf (COTS) equipment manuals.....	5
3.1.1.2 Operations station book (OSB).....	5
3.1.1.3 Technical repair standards (TRS) .....	5
3.1.1.4 Training aid booklet (TAB).....	5
3.1.1.5 Ship information book (SIB) .....	5
3.1.1.6 Combat system technical operations manual (CSTOM) .....	5
3.1.1.7 Hull, mechanical, and electrical (HM&E) manuals.....	5
3.1.1.8 Electronic, service test electronic, experimental electronic, and interior communications equipment manuals.....	5
3.1.1.9 Weapon systems and weapon equipment manuals .....	5
3.1.1.10 Illustrated parts breakdown (IPB).....	5
3.2 General.....	5
3.3 TM development products and reports .....	6
3.3.1 TM organization plan (TMOP) .....	6
3.3.1.1 Intended purpose .....	6
3.3.2 Book plan .....	7
3.3.3 IETM content plan .....	7
3.3.4 TM quality assurance products.....	7
3.3.5 Schedules and status reports.....	8
3.3.6 Cost reports .....	8
3.4 TM product development requirements .....	8
3.4.1 TM products .....	8
3.4.1.1 New TM .....	8
3.4.1.2 Supplements .....	8
3.4.1.3 Change package.....	8
3.4.1.4 Revisions .....	8
3.4.1.4.1 Superseding revision.....	9
3.4.1.4.2 Non-superseding revision .....	9
3.4.2 TM issues .....	9
3.4.2.1 Review draft copy (RDC).....	9
3.4.2.2 Preliminary TM (PTM) .....	9
3.4.2.3 Final TM (FTM).....	9

## MIL-DTL-24784C(NAVY)

3.4.3	TM digital data requirements .....	9
3.4.3.1	Digital data requirements for chapter-format TMs .....	9
3.4.3.1.1	XML .....	9
3.4.3.1.2	SGML .....	9
3.4.3.2	Digital data requirements for information package-format TMs/IETMs.....	10
3.4.4	TM digital data deliverables.....	10
3.4.4.1	XML/SGML source file .....	10
3.4.4.2	Graphic source files .....	10
3.4.4.3	Associated DTD .....	10
3.4.4.4	Project-specific entity files .....	10
3.4.4.5	Tagging guidelines document.....	10
3.4.4.5.1	MIL-DTL-24784 tagging guidelines document.....	10
3.4.4.5.2	NAVY ETM XML DTD and NAVSEA class 2 ETM DTD tagging guidelines document..	10
3.4.4.6	Style sheets .....	10
3.4.4.7	Filters .....	11
3.4.5	Delivery of the FTM in portable document format (PDF) .....	11
3.4.6	Publication and distribution.....	11
3.5	General development requirements.....	11
3.5.1	Source data .....	11
3.5.2	Maintenance coverage.....	11
3.5.3	Advertising .....	12
3.5.4	Copyrights and proprietary information credit line.....	12
3.5.5	Security classification markings.....	12
3.5.6	Energy efficiency requirements.....	12
3.6	Cover/title page requirements .....	12
3.6.1	Security classification .....	12
3.6.2	TM identification number .....	12
3.6.3	Volume/part identification number .....	12
3.6.4	Revision number .....	12
3.6.5	Title .....	12
3.6.5.1	Heading .....	12
3.6.5.2	Type of manual.....	13
3.6.5.3	Maintenance level(s).....	13
3.6.5.4	Prime title .....	13
3.6.5.5	Subtitle.....	13
3.6.6	Manufacturer .....	13
3.6.7	Contract number.....	13
3.6.8	Seal.....	13
3.6.9	Supersedure notice .....	13
3.6.10	Supplement notice .....	14
3.6.11	Volume notice .....	14
3.6.12	Disclosure notice.....	14
3.6.13	Distribution statement .....	14
3.6.14	Export control notice.....	14
3.6.15	Destruction notice .....	14
3.6.16	Copyright and proprietary information credit line .....	14
3.6.17	Authority notice .....	14
3.6.18	Publication date.....	14

## MIL-DTL-24784C(NAVY)

3.7 Style and format.....	15
3.7.1 Style of writing.....	15
3.7.1.1 Writing style principles .....	15
3.7.1.2 Standard English grammar .....	16
3.7.1.3 Vocabulary (permitted words).....	16
3.7.1.4 Word order .....	16
3.7.1.5 Use of “shall”, “will”, “should”, and “may”.....	16
3.7.1.6 Paragraphs .....	16
3.7.1.7 Sentences and phrases .....	16
3.7.1.8 Procedures .....	16
3.7.1.8.1 Writing style for procedures .....	16
3.7.1.8.2 Procedural step content.....	16
3.7.1.8.3 Procedure length .....	17
3.7.1.8.4 Indentations and spacing.....	17
3.7.1.8.5 Dual-level presentation.....	17
3.7.1.8.6 Lead in and introduction to procedure .....	17
3.7.1.9 List form.....	17
3.7.2 Level of writing.....	17
3.7.2.1 Readability.....	17
3.7.2.2 Sample selection.....	17
3.7.2.3 Raw data collection .....	18
3.7.2.4 Word count.....	18
3.7.2.5 Sentence count.....	18
3.7.2.6 Syllable count .....	18
3.7.2.7 Grade level calculations.....	19
3.7.2.7.1 Sample grade levels .....	19
3.7.2.7.2 OGL.....	19
3.7.3 References.....	20
3.7.3.1 Consolidation of material .....	20
3.7.3.2 Text references .....	20
3.7.3.2.1 Text reference placement.....	21
3.7.4 Use of terminology, nomenclature, numbers, and equations.....	21
3.7.4.1 Abbreviations and acronyms .....	21
3.7.4.2 Automatic electronic test and checkout terminology.....	21
3.7.4.3 Military terms .....	21
3.7.4.4 Nomenclature .....	22
3.7.4.5 Noun modifiers.....	22
3.7.4.6 Placard data .....	22
3.7.4.7 National stock numbers .....	22
3.7.4.8 Part numbers.....	22
3.7.4.9 Symbols.....	22
3.7.4.10 Metric practices .....	22
3.7.4.11 Equations .....	22
3.7.5 Safety and health requirements .....	22
3.7.5.1 Guidance and coordination.....	22
3.7.5.2 Health hazards .....	23
3.7.5.3 Hazardous materials warnings.....	23
3.7.5.3.1 Use and placement of hazardous materials warnings.....	23

## MIL-DTL-24784C(NAVY)

3.7.5.3.2 Hazardous material symbols .....	23
3.7.5.4 Safety warning symbols.....	23
3.7.5.5 Nuclear hardness .....	23
3.7.5.5.1 Nuclear hardness symbol .....	23
3.7.5.5.2 Nuclear hardness symbol explanation.....	24
3.7.5.6 Electrostatic discharge sensitive (ESDS) parts .....	24
3.7.5.6.1 ESD symbol .....	24
3.7.5.6.2 ESD symbol explanation.....	24
3.7.5.7 Environmental protection .....	24
3.7.5.8 Ozone depleting substances (ODS) .....	24
3.7.5.9 Dangers, warnings, cautions, and notes.....	24
3.7.5.9.1 When to use danger, warning, or caution statements.....	24
3.7.5.9.2 Wording and structure of dangers, warnings, and cautions .....	25
3.7.5.9.3 When to use note statements.....	26
3.7.5.9.4 Placement of danger, warning, caution, or note statements .....	26
3.7.5.9.5 Display of dangers, warnings, cautions, and notes .....	27
3.7.5.9.5.1 Dangers .....	27
3.7.5.9.5.2 Warnings .....	27
3.7.5.9.5.3 Cautions .....	27
3.7.5.9.5.4 Notes .....	27
3.7.5.10 Safety summary or safety precaution IP.....	27
3.7.5.11 Quality control of dangers, warnings, and cautions.....	28
3.7.6 Tabular material .....	29
3.7.6.1 Tables, charts, and graphs.....	29
3.7.6.2 Table head titles and rules .....	30
3.7.6.3 Tabular information used in text.....	30
3.7.6.4 Lists .....	30
3.7.7 Numbering.....	30
3.7.7.1 TM identification number.....	30
3.7.8 Graphics .....	30
3.7.8.1 Illustrations, drawings, and diagrams .....	30
3.7.8.2 Graphic types and development techniques.....	30
3.7.8.2.1 System/equipment illustration (frontispiece).....	31
3.7.8.2.2 Block diagrams .....	31
3.7.8.2.2.1 Power and grounding circuit FBDs .....	31
3.7.8.2.3 Requirements for preparing FBDs .....	32
3.7.8.2.4 Functional circuit diagrams (FCDs).....	33
3.7.8.2.4.1 Unit power and grounding FCD.....	34
3.7.8.2.5 Requirements for preparing FCDs .....	35
3.7.8.2.6 FBD and FCD drafting requirements.....	36
3.7.8.2.7 System functional diagrams (SFDs) .....	37
3.7.8.2.7.1 Digital SFDs.....	37
3.7.8.2.7.2 Power distribution SFDs .....	38
3.7.8.2.8 System control function diagrams.....	38
3.7.8.2.9 Control diagrams.....	38
3.7.8.2.10 Logic diagrams .....	38
3.7.8.2.10.1 Basic logic diagrams .....	38
3.7.8.2.10.2 Detailed logic diagrams.....	38

## MIL-DTL-24784C(NAVY)

3.7.8.2.10.3 Digital logic diagrams .....	38
3.7.8.2.11 Maintenance schematic diagrams .....	38
3.7.8.2.12 Mechanical schematic diagrams .....	40
3.7.8.2.13 Simplified electrical and electronic schematic diagrams .....	40
3.7.8.2.14 Hydraulic and pneumatic schematics.....	40
3.7.8.2.15 Single-function diagrams .....	40
3.7.8.2.16 System data function diagrams .....	40
3.7.8.2.17 Signal flow diagrams .....	40
3.7.8.2.17.1 Types of signal flow diagrams .....	41
3.7.8.2.17.1.1 Types of elements on signal flow diagrams.....	41
3.7.8.2.17.1.2 Cross-referencing in signal flow diagrams .....	43
3.7.8.2.18 Power distribution diagrams .....	43
3.7.8.2.19 Timing circuit diagrams .....	44
3.7.8.2.20 Piping diagrams .....	44
3.7.8.2.20.1 Simplified piping diagrams .....	44
3.7.8.2.20.2 System piping run diagrams.....	44
3.7.8.2.21 Interconnection diagrams.....	44
3.7.8.2.22 Cable run diagrams .....	44
3.7.8.2.23 Wiring diagrams and wire run list.....	44
3.7.8.2.24 Parts location illustrations.....	44
3.7.8.2.24.1 Exploded views .....	44
3.7.8.2.24.2 Sectional views and location drawings	45
3.7.8.2.24.3 Printed-circuit board.....	45
3.7.8.2.25 Line graphs .....	45
3.7.8.3 General graphic requirements.....	45
3.7.8.4 Illustration details .....	46
3.7.8.4.1 Lettering and line spacing .....	46
3.7.8.4.2 Border rules .....	46
3.7.8.4.3 Use of human figures.....	46
3.7.8.4.4 Credit lines.....	46
3.7.8.4.5 Callouts .....	46
3.7.8.4.5.1 Index numbers.....	47
3.7.8.4.5.2 Nomenclature .....	47
3.7.8.4.5.3 Leader lines and arrowheads.....	47
3.7.8.4.6 Legends.....	47
3.7.8.4.7 Reference designations .....	47
3.7.8.4.8 Zoning on diagrams .....	47
3.7.8.4.9 Notes for diagrams.....	47
3.7.8.4.9.1 General notes.....	47
3.7.8.4.9.2 Specific notes .....	47
3.7.8.4.10 Multi-sheet illustrations .....	47
3.7.8.4.11 Multi-section illustrations .....	47
3.7.8.4.12 Cartoons .....	48
3.7.8.4.13 Color in illustrations .....	48
3.7.8.4.14 Photographs and line drawings .....	48
3.7.8.4.14.1 Photographic details .....	48
3.7.8.4.14.1.1 Retouching.....	48
3.7.8.4.14.1.2 Prescreened photographs .....	48

## MIL-DTL-24784C(NAVY)

3.7.8.4.14.2 Line drawing details .....	48
3.7.8.4.15 Designations, diagrams, and symbols .....	48
3.7.8.4.16 Continuous tone artwork .....	48
3.7.8.4.17 Combination artwork .....	48
3.7.8.5 Changes to illustrations .....	48
3.7.8.6 Review of illustrations .....	48
3.7.8.7 Graphic format .....	48
3.7.8.7.1 Graphic format (raster) .....	49
3.7.9 Style and format for revisions .....	49
3.7.9.1 Renumbering and removal .....	49
3.7.9.2 Revision designator .....	49
3.7.9.3 Revision change markings .....	49
4. VERIFICATION .....	49
4.1 TMQA program and responsibilities .....	49
4.1.1 Written operating procedures .....	50
4.1.2 TMQA program organization .....	50
4.1.3 TMQA program functions .....	50
4.1.3.1 Guidance and quality planning conference .....	50
4.1.3.2 Quality program reviews .....	50
4.1.3.3 Quality reviews .....	50
4.1.3.3.1 Corrective action .....	51
4.1.3.3.2 Source data control .....	51
4.1.3.3.3 Task identification matrix or equivalent .....	51
4.1.3.3.4 Control of subcontractors and vendors .....	51
4.1.3.3.5 Sampling .....	51
4.1.3.3.6 Classification of defects (CD) .....	51
4.1.3.4 In-process reviews (IPRs) .....	52
4.1.3.4.1 IPR review location .....	52
4.1.3.4.2 Evaluation of the authoring system .....	52
4.1.3.4.3 Evaluation of the <b>IETM</b> and the display device .....	52
4.1.3.4.4 Evaluation of <b>IETM</b> navigation functions .....	52
4.1.3.4.5 Evaluation of the <b>IETM</b> functionality .....	52
4.1.3.4.6 Evaluation of <b>IETM</b> presentation techniques .....	52
4.1.3.4.7 Evaluation of world wide web applicability .....	52
4.1.3.4.8 Evaluation of source files .....	53
4.1.3.4.9 IPR records .....	53
4.1.3.4.9.1 Disposition of IPR findings .....	53
4.1.3.5 Validation .....	53
4.1.3.5.1 Engineering reviews .....	53
4.1.3.5.2 Validation performance .....	53
4.1.3.5.3 Support equipment .....	53
4.1.3.5.4 Validation of readability .....	54
4.1.3.5.5 <b>IETM</b> system validation .....	54
4.1.3.5.6 Disposition of validated data .....	54
4.1.3.5.7 Validation records .....	54
4.1.3.5.8 Validation certification .....	54
4.1.3.6 Verification .....	54

## MIL-DTL-24784C(NAVY)

4.1.3.6.1	Verification support requirements .....	54
4.1.3.6.2	Verification disposition records .....	54
4.1.3.6.3	Verification incorporation certification.....	54
4.2	TM quality assurance product development .....	55
4.2.1	TMQA program plan.....	55
4.2.1.1	Components of the TMQA program plan.....	55
4.2.1.1.1	Scope and applicability of the TMQA program plan .....	55
4.2.1.1.2	Function and structure of the QA organization.....	56
4.2.1.1.3	Description of the authoring system .....	56
4.2.1.1.4	Electronic display system .....	56
4.2.1.1.5	Word list .....	56
4.2.1.1.6	Changes to QA procedures .....	56
4.2.1.1.7	Preparing activity quality reviews.....	56
4.2.1.1.8	Source data management plan.....	56
4.2.1.1.8.1	Logistics management information (LMI).....	57
4.2.1.1.8.2	Drawings .....	57
4.2.1.1.9	Control of subcontractors and vendors .....	57
4.2.1.1.10	Sampling procedures and criteria.....	57
4.2.1.1.11	Classification of defects table .....	57
4.2.1.1.12	Validation approach summary .....	57
4.2.1.1.13	Verification support approach summary .....	57
4.2.2	Quality review records .....	57
4.2.3	Validation plan .....	57
4.2.3.1	Troubleshooting procedures list .....	58
5.	PACKAGING.....	58
5.1	Packaging.....	58
6.	NOTES .....	58
6.1	Intended use .....	58
6.2	Acquisition requirements .....	59
6.3	TM acquisition.....	60
6.4	Definitions .....	60
6.4.1	Accuracy .....	60
6.4.2	Adequacy.....	60
6.4.3	Assembly.....	60
6.4.4	Component .....	60
6.4.5	Comprehensibility .....	60
6.4.6	DTD .....	60
6.4.7	Entity file.....	60
6.4.8	Foldout .....	60
6.4.9	Functional division.....	60
6.4.10	IETM.....	60
6.4.11	Leading.....	61
6.4.12	Maintenance concept.....	61
6.4.13	Major function.....	61
6.4.14	Overhaul.....	61
6.4.15	PIN .....	61

## MIL-DTL-24784C(NAVY)

6.4.16 Set.....	61
6.4.17 SGML.....	61
6.4.18 Subassembly.....	61
6.4.19 Supplement.....	61
6.4.20 System.....	61
6.4.21 TM.....	61
6.4.22 TMCR .....	61
6.4.23 Unit.....	62
6.4.24 XML.....	62
6.5 Acronyms and abbreviations used in this specification .....	62
6.6 Subject term (key word) listing.....	67
6.7 Changes from previous issue .....	67
APPENDIX A .....	112
A.1. SCOPE.....	112
A.1.1 Scope.....	112
A.2. DEVELOPMENT OF PAGE-BASED CHAPTER-FORMAT TECHNICAL MANUALS .....	112
A.2.1 General.....	112
A.2.2 Development products .....	112
A.2.2.1 Book plan .....	112
A.2.2.1.1 Book plan coverage .....	112
A.2.2.1.2 Model manual .....	113
A.2.2.1.3 Milestone schedule .....	113
A.2.2.1.4 Book plan updating.....	113
A.2.2.1.5 Book plan and model manual acceptance.....	113
A.2.3 Divisions and arrangement.....	113
A.2.3.1 TM divisions .....	113
A.2.3.1.1 Volumes.....	114
A.2.3.1.2 Parts .....	114
A.2.3.1.3 Chapters.....	114
A.2.3.1.4 Sections.....	114
A.2.3.2 TM arrangement.....	114
A.2.3.2.1 Front matter .....	114
A.2.3.2.1.1 Cover/title page.....	114
A.2.3.2.1.1.1 Backbone and back cover.....	114
A.2.3.2.1.2 List of effective pages.....	114
A.2.3.2.1.2.1 List of effective pages for multi-volume manuals.....	115
A.2.3.2.1.3 Table of contents.....	115
A.2.3.2.1.4 List of illustrations .....	115
A.2.3.2.1.5 List of tables.....	115
A.2.3.2.1.6 Foreword.....	115
A.2.3.2.1.7 Safety summary .....	116
A.2.3.2.1.8 Frontispiece.....	116
A.2.3.2.2 Technical content.....	116
A.2.3.2.3 Appendices .....	116
A.2.3.2.4 Glossaries.....	116
A.2.3.2.5 Alphabetic index.....	117

## MIL-DTL-24784C(NAVY)

A.2.3.2.6 TMDER .....	117
A.2.4 Style and format .....	117
A.2.4.1 Page size, reproduction area, and margins.....	117
A.2.4.2 Column format .....	117
A.2.4.3 Text placement .....	117
A.2.4.4 Type style, capitalization, and vertical spacing .....	117
A.2.4.5 Margin data .....	117
A.2.4.5.1 Running heads and feet.....	117
A.2.4.5.1.1 Running heads.....	118
A.2.4.5.1.1.1 Security classification .....	118
A.2.4.5.1.1.2 TM identification number .....	118
A.2.4.5.1.2 Running feet.....	118
A.2.4.5.1.2.1 Page number.....	118
A.2.4.5.1.2.2 Security classification .....	118
A.2.4.5.1.2.3 Foldout figure number and title.....	118
A.2.4.6 Paragraph headings.....	118
A.2.4.6.1 Primary paragraph sideheads .....	118
A.2.4.6.2 Subordinate paragraph sideheads.....	118
A.2.5 References.....	118
A.2.5.1 Text references .....	118
A.2.5.2 Post maintenance action referencing .....	119
A.2.5.3 Enclosures .....	119
A.2.6 Use of terminology, nomenclature, numbers, and equations .....	120
A.2.6.1 Abbreviations and acronyms .....	120
A.2.7 Tabular material .....	120
A.2.7.1 Table titles .....	120
A.2.7.2 Continued table material.....	120
A.2.7.3 Footnotes in tables.....	120
A.2.8 Numbering .....	120
A.2.8.1 Cover and title pages .....	120
A.2.8.2 Front matter .....	120
A.2.8.2.1 List of effective pages.....	120
A.2.8.3 Volumes .....	120
A.2.8.4 Parts.....	120
A.2.8.5 Chapters.....	120
A.2.8.6 Sections .....	120
A.2.8.7 Paragraphs .....	121
A.2.8.8 Procedural steps.....	121
A.2.8.9 Pages, tables, and illustrations.....	121
A.2.8.10 Blank pages .....	121
A.2.8.11 Foldout figure numbers .....	121
A.2.8.12 Foldout page numbers .....	121
A.2.8.13 Footnotes .....	122
A.2.8.14 Glossary pages.....	122
A.2.8.15 Index pages.....	122
A.2.8.16 Appendix .....	122
A.2.9 Graphics .....	122
A.2.9.1 Graphic types.....	122

## MIL-DTL-24784C(NAVY)

A.2.9.1.1	Operational and procedural step illustrations.....	122
A.2.9.1.2	Fault logic diagrams .....	122
A.2.9.1.3	Flowcharts .....	122
A.2.9.2	General graphic requirements.....	123
A.2.9.2.1	Scale .....	123
A.2.9.2.2	Color in illustrations .....	123
A.2.9.2.3	Illustration placement .....	124
A.2.9.2.4	Turned illustrations .....	124
A.2.9.2.5	Apron notes.....	124
A.2.9.2.6	Foldout pages.....	125
A.2.10	Style and format for change packages.....	125
A.2.10.1	Change package content .....	125
A.2.10.1.1	Title page .....	125
A.2.10.1.2	List of effective pages.....	125
A.2.10.1.3	Change instruction sheets .....	125
A.2.10.1.4	Replacement pages .....	126
A.2.10.1.4.1	Additions.....	127
A.2.10.1.4.1.1	Numbering of added material.....	127
A.2.10.1.4.1.1.1	Multi-sheet illustration.....	127
A.2.10.1.4.1.1.2	Index number .....	127
A.2.10.1.4.2	Deletions .....	127
A.2.10.1.4.2.1	Deleted paragraphs, steps, illustrations, and tables .....	127
A.2.10.1.4.2.2	Deleted pages .....	127
A.2.10.1.4.2.3	Deleted index numbers.....	128
A.2.10.1.4.3	Change symbols for text and tables.....	128
A.2.10.1.4.4	Change symbols for illustrations.....	128
A.2.10.1.4.5	Change page designator .....	128
A.2.10.2	FTM.....	128
A.2.11	Style and format for revisions .....	128
A.2.11.1	List of effective pages .....	128
A.3	DEVELOPMENT OF IP-FORMAT INTERACTIVE ELECTRONIC TECHNICAL MANUALS .....	128
A.3.1	General.....	128
A.3.2	Development products .....	128
A.3.2.1	IETM content plan.....	128
A.3.2.1.1	IETM content plan coverage.....	129
A.3.2.1.2	Model manual.....	129
A.3.2.1.3	Milestone schedule .....	129
A.3.2.1.4	IETM content plan updating .....	130
A.3.2.1.5	IETM content plan and model manual acceptance .....	130
A.3.3	Divisions and arrangement.....	130
A.3.3.1	IETM divisions.....	130
A.3.3.1.1	Information modules (IMs).....	130
A.3.3.1.2	Information packages (IPs).....	130
A.3.3.2	IETM arrangement .....	130
A.3.3.2.1	Front matter .....	130
A.3.3.2.1.1	Title page .....	130
A.3.3.2.1.2	Revision summary <RevisionSummaryInfo>.....	131

## MIL-DTL-24784C(NAVY)

A.3.3.2.1.3 Acronyms and abbreviations list <AbbrevList> .....	131
A.3.3.2.2 Table of contents .....	131
A.3.3.2.3 List of illustrations .....	131
A.3.3.2.4 List of tables .....	131
A.3.3.2.5 List of multimedia .....	131
A.3.3.2.6 “How to use this IETM” information <HowToUseEtm> .....	131
A.3.3.2.7 Technical content.....	132
A.3.4 References.....	132
A.3.4.1 Text references .....	132
A.3.4.2 Frequently used maintenance tasks .....	133
A.3.4.3 Frequently used steps within the same maintenance task.....	133
A.3.4.4 Tasks performed by other work centers .....	133
A.3.4.5 Post maintenance action referencing .....	133
A.3.4.6 Maintenance procedure leading to IPB information.....	133
A.3.5 Use of terminology, nomenclature, numbers, and equations .....	133
A.3.5.1 Abbreviations and acronyms .....	133
A.3.6 Numbering .....	133
A.3.6.1 Paragraphs .....	133
A.3.6.2 Procedural steps.....	133
A.3.6.3 Tables, illustrations, and multimedia.....	133
A.4 DEVELOPMENT OF PAGE-BASED INFORMATION PACKAGE (IP)-FORMAT TECHNICAL MANUALS .....	133
A.4.1 General.....	133
A.4.2 Development products .....	133
A.4.2.1 Book plan .....	134
A.4.2.1.1 Book plan coverage .....	134
A.4.2.1.2 Model manual .....	134
A.4.2.1.3 Milestone schedule .....	134
A.4.2.1.4 Book plan updating.....	135
A.4.2.1.5 Book plan and model manual acceptance.....	135
A.4.3 Divisions and arrangement.....	135
A.4.3.1 TM divisions .....	135
A.4.3.1.1 Volumes.....	135
A.4.3.1.2 Information modules (IMs).....	135
A.4.3.1.3 Information packages (IPs).....	135
A.4.3.2 TM arrangement.....	135
A.4.3.2.1 Front matter .....	135
A.4.3.2.1.1 Cover/title page.....	136
A.4.3.2.1.1.1 Backbone and back cover.....	136
A.4.3.2.1.2 List of effective information packages/pages.....	136
A.4.3.2.1.2.1 List of effective information packages/pages for multi-volume manuals .....	136
A.4.3.2.1.3 Revision summary <RevisionSummaryInfo>.....	136
A.4.3.2.1.4 Table of contents.....	136
A.4.3.2.1.5 List of illustrations .....	136
A.4.3.2.1.6 List of tables.....	136
A.4.3.2.2 Technical content.....	137
A.4.3.2.2.1 IP title block.....	137

## MIL-DTL-24784C(NAVY)

A.4.3.2.3	Acronyms and abbreviations list <AbbrevList>.....	137
A.4.3.2.4	Alphabetical index IP <AlphaIndexIP>.....	137
A.4.3.2.4.1	Development of the alphabetical index IP.....	137
A.4.3.2.4.2	Alphabetical index IP for multi-volume TMs.....	138
A.4.3.2.5	TMDER.....	138
A.4.4	Style and format.....	138
A.4.4.1	Page size, reproduction area, and margins.....	138
A.4.4.2	Column format.....	138
A.4.4.3	Text placement.....	138
A.4.4.4	Type style, capitalization, leading, and vertical spacing.....	138
A.4.4.5	Margin data.....	138
A.4.4.5.1	Running heads and feet.....	138
A.4.4.5.1.1	Running heads.....	138
A.4.4.5.1.1.1	Security classification.....	138
A.4.4.5.1.1.2	TM identification number.....	139
A.4.4.5.1.1.3	IP number.....	139
A.4.4.5.1.2	Running feet.....	139
A.4.4.5.1.2.1	Page number.....	139
A.4.4.5.1.2.2	Security classification.....	139
A.4.4.5.1.2.3	Foldout figure number and title.....	139
A.4.4.6	Paragraph titles.....	139
A.4.4.6.1	Paragraph title format.....	139
A.4.4.7	Procedural steps.....	139
A.4.4.8	Footnotes.....	139
A.4.5	References.....	139
A.4.5.1	Text references.....	140
A.4.5.2	Frequently used maintenance tasks.....	141
A.4.5.3	Frequently used steps within the same maintenance task.....	141
A.4.5.4	Tasks performed by other work centers.....	141
A.4.5.5	Post maintenance action referencing.....	141
A.4.6	Use of terminology, nomenclature, numbers, and equations.....	141
A.4.6.1	<u>Abbreviations and acronyms</u> .....	141
A.4.7	Tabular material.....	141
A.4.7.1	Table titles.....	141
A.4.7.2	Continued table material.....	141
A.4.7.3	Footnotes in tables.....	141
A.4.7.4	Table format.....	142
A.4.8	Numbering.....	142
A.4.8.1	Cover and title pages.....	142
A.4.8.2	Front matter.....	142
A.4.8.3	Volumes.....	142
A.4.8.4	IP number.....	142
A.4.8.4.1	IP numbering system.....	142
A.4.8.5	Paragraphs.....	142
A.4.8.6	Procedural steps.....	142
A.4.8.7	Pages, tables, and illustrations.....	142
A.4.8.8	Blank pages.....	142
A.4.8.9	Foldout figure numbers.....	142

## MIL-DTL-24784C(NAVY)

A.4.8.10	Foldout page numbers .....	142
A.4.8.11	Footnotes .....	142
A.4.8.12	Glossary.....	143
A.4.9	Graphics .....	143
A.4.9.1	General graphic requirements.....	143
A.4.9.1.1	Scale .....	143
A.4.9.1.2	Color in illustrations .....	143
A.4.9.1.3	Illustration placement .....	143
A.4.9.1.4	Illustration titles .....	144
A.4.9.1.5	Legends.....	144
A.4.9.1.6	Apron notes.....	144
A.4.9.1.7	Multiple page notes.....	144
A.4.9.1.8	Foldout pages.....	144
A.4.10	Style and format for change packages.....	144
A.4.10.1	Change package content .....	144
A.4.10.1.1	Title page .....	144
A.4.10.1.2	List of effective information packages/pages .....	145
A.4.10.1.3	Change instruction sheets .....	145
A.4.10.1.4	Replacement pages .....	146
A.4.10.1.4.1	Additions.....	146
A.4.10.1.4.1.1	Numbering of added material.....	146
A.4.10.1.4.1.1.1	Multi-sheet illustration.....	146
A.4.10.1.4.1.1.2	Index number.....	146
A.4.10.1.4.2	Deletions .....	147
A.4.10.1.4.2.1	Deleted paragraphs, steps, illustrations, and tables .....	147
A.4.10.1.4.2.2	Deleted pages .....	147
A.4.10.1.4.2.3	Deleted index numbers .....	147
A.4.10.1.4.3	Change symbols for text and tables.....	147
A.4.10.1.4.4	Change symbols for illustrations.....	147
A.4.10.1.4.5	Change page designator .....	147
A.4.10.1.5	FTM.....	147
A.4.10.2	Style and format for revisions .....	147
APPENDIX B	.....	173
B.1	SCOPE.....	173
B.1.1	Scope.....	173
B.2	APPLICABLE DOCUMENTS.....	173
B.2.1	General.....	173
B.2.1.1	Non-Government publications.....	173
B.2.2	Order of precedence .....	173
B.3	IETM FUNCTIONALITY.....	173
B.3.1	Functionality matrix .....	173
B.3.1.1	Complexity factor column .....	179
B.3.1.2	Category column.....	179
B.3.1.3	Functionality/paragraph column.....	179
B.3.1.4	Requirement selection column .....	180

## MIL-DTL-24784C(NAVY)

B.3.2	Functionality matrix definitions .....	180
B.3.2.1	3D modeling .....	180
B.3.2.2	Change markings .....	180
B.3.2.3	Alerts .....	180
B.3.2.4	Animation .....	180
B.3.2.5	Assembly/disassembly.....	180
B.3.2.6	Audio .....	180
B.3.2.7	Audit trail.....	180
B.3.2.8	Block cycle update with urgent changes.....	181
B.3.2.9	Browse.....	182
B.3.2.10	CD-ROM .....	182
B.3.2.11	Context sensitive help (technical data help) .....	182
B.3.2.12	Diagnostics - software driven entry to IETM .....	182
B.3.2.13	Diagnostics - user determined entry to IETM.....	182
B.3.2.14	Dialog-driven interaction.....	182
B.3.2.15	Display of procedural steps in browse mode .....	182
B.3.2.16	Display of procedural steps options.....	182
B.3.2.17	DVD-ROM .....	182
B.3.2.18	Dynamic diagnostics.....	183
B.3.2.19	Exit .....	183
B.3.2.20	Filter by configuration.....	183
B.3.2.21	Filter by model series .....	183
B.3.2.22	Filter by modification .....	183
B.3.2.23	Filter by skill/maintenance level.....	184
B.3.2.24	Filter by unique identification code.....	184
B.3.2.25	Forward and back .....	184
B.3.2.26	Full revision.....	184
B.3.2.27	Fully formatted/book version .....	184
B.3.2.28	Global data annotation.....	184
B.3.2.29	Graphical navigation.....	184
B.3.2.30	Graphics selection.....	184
B.3.2.31	History of traversed links.....	184
B.3.2.32	Hot reference .....	184
B.3.2.33	Hot spotting .....	185
B.3.2.34	Information package specific printing .....	185
B.3.2.35	Internal references .....	
B.3.2.35.1	Link to separate parts data .....	185
B.3.2.35.2	Table of contents, lists of illustrations, tables and multimedia .....	185
B.3.2.36	Knowledge management .....	186
B.3.2.37	Locator graphics .....	186
B.3.2.38	Login .....	186
B.3.2.39	Maintenance data collection .....	186
B.3.2.40	Motion video .....	186
B.3.2.41	Near real time updates .....	186
B.3.2.42	Network connectivity .....	186
B.3.2.42.1	Network connectivity - context filtering .....	187
B.3.2.42.2	Network connectivity - update capability (full revision) .....	187
B.3.2.42.3	Network connectivity - update capability (partial) .....	187

## MIL-DTL-24784C(NAVY)

B.3.2.43	Network distribution	187
B.3.2.44	Next and previous	187
B.3.2.45	Operator debriefing	187
B.3.2.46	Pan, zoom, rotate, center	187
B.3.2.47	Parts ordering	187
B.3.2.48	Personal annotation	187
B.3.2.49	Photos	187
B.3.2.50	Print currently displayed window	187
B.3.2.51	Print linked data	187
B.3.2.52	Print screen	187
B.3.2.53	Prognostics	188
B.3.2.54	Public annotation	190
B.3.2.55	Redlining graphics	190
B.3.2.56	Redlining text	190
B.3.2.57	Resource scheduling	190
B.3.2.58	Search - across multiple databases/files	190
B.3.2.59	Search - context	190
B.3.2.60	Search - full text	190
B.3.2.61	Search - key word	191
B.3.2.62	Search - user defined Boolean	191
B.3.2.63	Simultaneous display of multiple content elements	191
B.3.2.64	Stand alone mode	192
B.3.2.64.1	Stand alone mode - context filtering	192
B.3.2.64.2	Stand alone mode - update capability (full revision)	192
B.3.2.64.3	Stand alone mode - update capability (partial)	192
B.3.2.64.4	Stand alone mode – update through a network	192
B.3.2.65	Supporting technical data	192
B.3.2.66	Suspend and resume	193
B.3.2.67	System simulation	193
B.3.2.68	System/subsystem navigation	193
B.3.2.69	Tear off window capability	193
B.3.2.70	Text selection	193
B.3.2.71	TMDER	193
B.3.2.72	User creation of bookmarks	194
B.3.2.73	User training	194
B.3.2.74	Viewer help	194
B.3.2.75	Voice-activated commands	195
B.3.2.76	Web browser viewable	195
B.3.2.77	Wire/fluid system tracing	195
<b>B.4</b>	<b>IETM DISPLAY AND PRESENTATION REQUIREMENTS</b>	<b>195</b>
B.4.1	Physical IETM screen layout	195
B.4.1.1	Outer shell	195
B.4.1.1.1	Control of the outer shell	195
B.4.1.1.2	Title bar	195
B.4.1.2	Inner shell	195
B.4.1.2.1	General screen	196
B.4.1.2.2	Guide post	199

## MIL-DTL-24784C(NAVY)

B.4.1.2.2.1 Guide post functions.....	200
B.4.1.2.3 Table of contents (TOC) panel.....	201
B.4.1.2.3.1 Drill-up/drill-down.....	201
B.4.1.2.4 Classification and distribution bar .....	201
B.4.1.2.5 User navigation panel .....	201
B.4.1.2.5.1 Subtitle bar .....	201
B.4.1.2.5.2 Main menu bar .....	201
B.4.1.2.5.2.1 Previous/next .....	202
B.4.1.2.5.2.2 TOC.....	202
B.4.1.2.5.2.3 History.....	202
B.4.1.2.5.2.4 Search .....	202
B.4.1.2.5.2.5 Print .....	203
B.4.1.2.5.2.6 Feedback.....	203
B.4.1.2.5.2.7 Exit .....	203
B.4.1.2.5.2.8 Help .....	203
B.4.1.2.5.3 Project specific bar .....	203
B.4.1.2.5.4 Main content area.....	203
B.4.1.2.5.5 Status bar.....	203
B.4.1.2.6 Additional standard icons .....	203
B.4.2 Screen sizes .....	213
B.4.3 Style and format on the display .....	213
B.4.3.1 Inner shell colors .....	213
B.4.3.2 Display of text .....	214
B.4.3.2.1 Character font .....	214
B.4.3.2.2 Custom developed fonts.....	215
B.4.3.2.3 Character spacing.....	215
B.4.3.2.4 Line dimensions .....	215
B.4.3.2.5 Text panes.....	215
B.4.3.2.5.1 Margins .....	215
B.4.3.2.5.2 Justification .....	215
B.4.3.2.5.3 Word wrapping.....	215
B.4.3.2.5.4 Paragraph titles.....	215
B.4.3.2.5.4.1 Paragraph title format .....	215
B.4.3.2.5.5 Procedural steps .....	216
B.4.3.2.5.6 Display of procedural steps for <b>linear IETMs</b> .....	216
B.4.3.2.5.7 Display of procedural steps for <b>non-linear IETMs</b> .....	216
B.4.3.2.5.8 Display of dangers, warnings, and cautions .....	216
B.4.3.2.5.9 Alerts.....	217
B.4.3.2.5.9.1 Use of common alerts .....	217
B.4.3.2.5.9.2 Display and acknowledgement of alerts .....	218
B.4.3.2.5.10 Display of notes.....	220
B.4.3.2.5.11 Security classification markings.....	221
B.4.3.2.5.11.1 Displayed data items including graphics (on screen or printed).....	222
B.4.3.2.5.12 Revisions .....	222
B.4.3.2.5.12.1 Display of change markings .....	222
B.4.3.2.5.12.1.1 Identifying additions .....	223
B.4.3.2.5.12.1.2 Identifying deletions .....	223
B.4.3.3 Tables .....	223

## MIL-DTL-24784C(NAVY)

B.4.3.3.1	Table format.....	223
B.4.3.3.2	Display of tables .....	223
B.4.3.3.3	Table titles.....	225
B.4.3.3.4	Column spacing .....	225
B.4.3.3.5	Highlighting .....	225
B.4.3.3.6	Selection of tables.....	225
B.4.3.3.7	Footnotes in tables .....	225
B.4.3.4	Graphics.....	225
B.4.3.4.1	Graphic file format.....	225
B.4.3.4.2	Oversized illustrations .....	225
B.4.3.4.3	Callouts .....	225
B.4.3.4.4	Legends.....	225
B.4.3.4.5	Scale.....	225
B.4.3.4.6	Display of graphics .....	225
B.4.3.4.6.1	Display of graphic overlays.....	225
B.4.3.4.6.2	In-line/out-line display of graphics .....	225
B.4.3.4.7	Graphics development .....	226
B.4.3.4.8	Color in graphics.....	226
B.4.3.5	Hot spots/links.....	226
B.4.3.5.1	Link/behavior/navigation.....	226
B.4.3.5.2	Hot spots (selectable elements).....	226
B.4.3.5.3	Links to graphics and tables.....	226
B.4.3.5.4	Links to multimedia .....	226
B.4.4	User interface .....	226
B.4.4.1	Session control.....	226
B.4.4.2	Bookmarks and annotations.....	227
B.4.4.3	Return user interface to default/initial state .....	227
B.4.4.4	Browsing.....	227
B.4.4.5	Dialog boxes.....	227
B.4.4.5.1	Dialog push buttons .....	228
B.4.4.5.1.1	Use of push buttons .....	228
B.4.4.5.1.2	Presentation of dialog push buttons.....	228
B.4.4.5.2	Dialog cursor movement.....	228
B.4.4.5.3	Radio buttons, check boxes, text input, pull-down menus, and other buttons .....	228
B.4.4.5.4	Dialog titles.....	228
B.4.4.5.5	Dialog box types .....	229
B.4.4.5.5.1	Fill-in-the-blank dialog box .....	229
B.4.4.5.5.2	Single choice dialog box .....	229
B.4.4.5.5.3	Multiple choice dialog box.....	230
B.4.4.5.5.4	Composite dialog box.....	230
B.4.4.6	Context filtering.....	231
B.4.4.7	Screen stacking .....	231
B.4.4.8	Response time.....	231
B.4.4.9	Searching .....	232
B.4.4.10	Technical manual deficiency/evaluation reports (TMDERs) .....	232
B.4.4.11	Interface to external references and systems .....	232
B.4.4.11.1	Instructions for interactions with IETM utility functions .....	232
B.4.4.12	Multimedia presentation .....	232

## MIL-DTL-24784C(NAVY)

B.4.4.12.1 Multimedia and other items/functions .....	232
B.4.4.12.2 Audio .....	232
B.4.4.12.2.1 Sound .....	232
B.4.4.12.2.2 Voice input/ouput (I/O).....	232
B.4.4.12.3 Graphics (photos, grayscale, etc. - other than traditional line-art) .....	232
B.4.4.12.4 Video.....	232
B.4.4.12.5 Animation .....	232
B.4.4.13 Re-purposing data and hardcopy output .....	233
B.4.4.13.1 IETM printing .....	233
B.4.4.13.1.1 Print on demand .....	233
B.4.4.13.2 Sharing data .....	233

## MIL-DTL-24784C(NAVY)

This specification is approved for use by the Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

## 1. SCOPE

1.1 Scope. This specification establishes the general acquisition and development requirements needed to prepare digital technical information for multi-output presentation of NAVSEA Technical Manuals (TMs) (see 6.4.21). The technical content and style and format requirements contained in this specification can be used to develop and assemble complete TMs for ships, shipboard systems (see 6.4.20), and equipment. The requirements apply to the output of paper TMs or, to the display of page-oriented linear and non-linear Interactive Electronic Technical Manuals (IETMs) (see 6.4.10) on an Electronic Display System (EDS).

## 2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4, or 5 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

## FEDERAL STANDARDS

FED-STD-313 - Material Safety Data, Transportation Data, and Disposal Data for Hazardous Materials Furnished to Government Activities

## DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-PRF-28001 - Markup Requirements and Generic Style Specification for Exchange of Text and Its Presentation

MIL-PRF-28002 - Raster Graphics Representation in Binary Format, Requirements for

MIL-PRF-49506 - Logistics Management Information

(See supplement 1 for list of specification sheets.)

## DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-1309 - Definitions of Terms for Testing, Measurement and Diagnostics

MIL-STD-1686 - Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices)

MIL-DTL-24784C(NAVY)

DEPARTMENT OF DEFENSE HANDBOOKS

- MIL-HDBK-502 - Acquisition Logistics
- MIL-HDBK-9660 - DOD Produced CD-ROM Products
- MIL-HDBK-28001 - Department of Defense Application of MIL-PRF-28001 Using Standard Generalized Markup Language (SGML)

(Copies of these documents are available online at <http://assist.daps.dla.mil/quicksearch/> or <http://assist.daps.dla.mil> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

DEFENSE LOGISTICS INFORMATION SERVICE CATALOGING HANDBOOKS

- H6 - Federal Item Name Directory (ITEM NAME)

(Copies of this document are available from the Defense Logistics Information Service, Battle Creek Customer Contact Center, 74 Washington Ave. N, Battle Creek, MI 49017-3084 or online at [www.dlis.dla.mil/hseries.asp](http://www.dlis.dla.mil/hseries.asp).)

DEPARTMENT OF DEFENSE DOCUMENTS

- DOD Directive 5230.25 - Withholding of Unclassified Technical Data from Public Disclosure
- DOD Instruction 6050.05 - DOD Hazard Communication (HAZCOM) Program

(Copies of these documents are available online at [www.dtic.mil/whs/directives/](http://www.dtic.mil/whs/directives/).)

- JCS Pub 1-02 - DOD Dictionary of Military and Associated Terms

(Copies of this document are available online at [www.dtic.mil/doctrine/doctrine.htm](http://www.dtic.mil/doctrine/doctrine.htm).)

DEPARTMENT OF THE NAVY DOCUMENTS

- OPNAVINST 4110.2 - Hazardous Material Control and Management (HMC&M) Program
- OPNAVINST 5100.23 - Navy Occupational Safety and Health (NAVOSH) Program Manual
- SECNAVINST 5510.36 - Department of the Navy (DON) Information Security Program (ISP) Instruction
- SECNAVINST 5720.44 - Public Affairs Policy and Regulations

(Copies of these documents are available from the Department of the Navy Issuances, SECNAV/OPNAV Directives Control Office (DNS-5), Washington Navy Yard, Bldg. 36, 720 Kennon Street, SE Rm. 203, Washington Navy Yard, DC 20374-5074 or online at <http://doni.daps.dla.mil/default.aspx>.)

DON Policy on Digital Product/Technical Data

Guidance on Acquisition and Conversion of Product/Technical Data to Digital Form

(Copies of these documents are available from Carderock Division, Naval Surface Warfare Center, 9500 MacArthur Blvd., West Bethesda, MD 20817-5700 or online at [www.dt.navy.mil/tot-shi-sys/des-int-pro/tec-inf-sys/gui-acq-con/index.html](http://www.dt.navy.mil/tot-shi-sys/des-int-pro/tec-inf-sys/gui-acq-con/index.html).)

MIL-DTL-24784C(NAVY)

NAVAL SEA SYSTEMS COMMAND (NAVSEA) PUBLICATIONS

- NAVSEA OP 1700 - Standard Fire Control Symbols
- N0002400003 - Navy Installation and Maintenance Book
- NAVSEA SL160-AA-LST-010 - Baseline Wordlists for NAVSEA Technical Manuals

(Copies of these documents are available from the Naval Logistics Library, 5450 Carlisle Pike, Mechanicsburg, PA 17055 or online at <https://nll1.ahf.nmci.navy.mil/>.)

FEDERAL REGISTER – EXECUTIVE ORDERS

- Executive Order 12196 - Occupational Safety and Health Programs for Federal Employees
- Executive Order 12856 - Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements

(Copies of these documents are available from the National Archives and Records Administration, 8601 Adelphi Road, College Park, MD 20740-6001 or online at [www.archives.gov/federal-register/executive-orders](http://www.archives.gov/federal-register/executive-orders).)

UNITED STATES GOVERNMENT PRINTING OFFICE

United States Government Printing Office (GPO) Style Manual

(Copies of this document are available from the U.S. Government Printing Office, 732 N. Capitol Street, NW, Washington, DC 20401 or online at [www.gpoaccess.gov/stylemanual/browse.html](http://www.gpoaccess.gov/stylemanual/browse.html).)

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

- NIST Special Publication 811 - Guide for the Use of the International System of Units (SI)

(Copies of this document are available from the NIST Weights and Measures Division, Laws and Metric Group, 100 Bureau Drive, Stop 2600, Gaithersburg, MD 20899-2600 or online at <http://nvl.nist.gov/>.)

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)

- OSHA Public Law 91-596 - Occupational Safety and Health Act of 1970
- 29 CFR 1910.1200 - Hazard Communication

(Copies of these documents are available from the U.S. Department of Labor/OSHA, OSHA Publications, PO Box 37535, Washington DC 20013-7535 or online at [www.osha.gov](http://www.osha.gov).)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- ANSI Z535.3 - Criteria for Safety Symbols
- ANSI Z535.6 - American National Standard for Product Safety Information in Product Manuals, Instructions, and Other Collateral Materials

(Copies of these documents are available from the National Electrical Manufacturers Association, 1300 North 17<sup>th</sup> Street, Suite 1847, Rosslyn, VA 22209 or online at [www.nema.org](http://www.nema.org).)

MIL-DTL-24784C(NAVY)

AMERICAN SOCIETY FOR QUALITY

- ANSI/ISO/ASQC - Model for Quality Assurance in Final Inspection and Test (DoD adopted)  
Q9003

(Copies of this document are available from the American Society for Quality, 600 North Plankinton Ave., Milwaukee, WI 53203 or online at [www.asq.org](http://www.asq.org).)

ASME INTERNATIONAL

- ASME Y14.38 - Abbreviations and Acronyms (DoD adopted)
- ASME Y32.18 - Symbols for Mechanical and Acoustical Elements as Used in Schematic Diagrams

(Copies of these documents are available from ASME International, 22 Law Drive, PO Box 2900, Fairfield, NJ 07007-2900 or online at [www.asme.org](http://www.asme.org).)

ASTM INTERNATIONAL

- ASTM D3951 - Standard Practice for Commercial Packaging (DoD adopted)

(Copies of this document are available from ASTM International, 100 Barr Harbor Dr., PO Box C700, West Conshohocken, PA 19428-2959 or online at [www.astm.org](http://www.astm.org).)

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC. (IEEE)

- IEEE 315 - Graphic Symbols for Electrical and Electronics Diagrams (DoD adopted)
- IEEE 945 - Recommended Practice for Preferred Metric Units for use in Electrical and Electronics Science and Technology (DoD adopted)
- IEEE 991 - Standard for Logic Circuit Diagrams (DoD adopted)

(Copies of these documents are available from the Institute of Electrical and Electronics Engineers, Inc., 445 Hoes Lane, PO Box 1331, Piscataway, NJ 08855-1331 or online at [www.ieee.org](http://www.ieee.org).)

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

- ISO 8879 - Information Processing -- Text and Office Systems -- Standard Generalized Markup Language (SGML) (DoD adopted)
- ISO/IEC 8632 - Information Technology -- Computer Graphics -- Metafile for the Storage and Transfer of Picture Description Information

(Copies of these documents are available from ISO, 1, rue de Varembe, CH-1211 Geneva 20, Switzerland or online at <http://www.iso.org>.)

SAE INTERNATIONAL

- SAE AS1290 - Graphic Symbols for Aircraft Hydraulic and Pneumatic Systems (DoD adopted)
- SAE J1780 - Hydraulic System Diagrams and Associated Tables for Marine Vehicles

(Copies of these documents are available from SAE World Headquarters, 400 Commonwealth Drive, Warrendale, PA 15096-0001 or online at [www.sae.org](http://www.sae.org).)

WORLD WIDE WEB CONSORTIUM (W3C)

Extensible Markup Language (XML) 1.0 W3C Recommendation

(Copies of this document are available online at <http://www.w3.org/TR/REC-xml/>.)

## MIL-DTL-24784C(NAVY)

WebCGM 1.0 Second Release W3C Recommendation

(Copies of this document are available online at <http://www.w3.org/TR/REC-WebCGM/>.)

Scalable Vector Graphics (SVG) 1.1 Specification W3C Recommendation

(Copies of this document are available online at <http://www.w3.org/TR/SVG/>.)

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for related specification sheets), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

### 3. REQUIREMENTS

3.1 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheet. In the event of any conflict between the requirements of this specification and the specification sheet, the latter shall govern.

3.1.1 Technical content requirements. The following paragraphs identify the specification sheets that provide the technical content requirements necessary for the development of the types of NAVSEA TMs described in 3.1.1.1 through 3.1.1.10 (see 6.2). The specification sheets contain some technical content requirements that may not apply to all types of NAVSEA TMs. Selective application and tailoring of requirements shall be accomplished as appropriate.

3.1.1.1 Commercial off-the-shelf (COTS) equipment manuals. Manuals available off-the-shelf from commercial sources which include operation, maintenance, and other instructions to support equipment in the commercial market shall be acquired and evaluated in accordance with MIL-DTL-24784/4.

3.1.1.2 Operations station book (OSB). The OSB for design, construction or major modification shall be developed in accordance with MIL-DTL-24784/5.

3.1.1.3 Technical repair standards (TRS). A TRS shall be developed for Hull, Mechanical, and Electrical (HM&E), electronic and ordnance equipment in accordance with MIL-DTL-24784/7.

3.1.1.4 Training aid booklet (TAB). A TAB shall be developed in accordance with MIL-DTL-24784/10.

3.1.1.5 Ship information book (SIB). A SIB shall be developed in accordance with MIL-DTL-24784/11.

3.1.1.6 Combat system technical operations manual (CSTOM). Combat system information concerning design, detailed intersystem interface data, testing, maintenance, and capabilities in fleet user-oriented language and format shall be developed in accordance with MIL-DTL-24784/22.

3.1.1.7 Hull, mechanical, and electrical (HM&E) manuals. A manual shall be developed for HM&E systems, equipment or single components (see 6.4.4) in accordance with MIL-DTL-24784/22.

3.1.1.8 Electronic, service test electronic, experimental electronic, and interior communications equipment manuals. A manual shall be developed for electronic, service test electronic, experimental electronic, and Interior Communication (IC) equipment in accordance with MIL-DTL-24784/22.

3.1.1.9 Weapon systems and weapon equipment manuals. A manual shall be developed for weapon systems as well as separate independent weapon equipment in accordance with MIL-DTL-24784/22.

3.1.1.10 Illustrated parts breakdown (IPB). IPBs shall be developed in accordance with MIL-DTL-24784/23.

3.2 General. The range and depth of subject matter coverage and the method of delivering information required by all potential users (electronic display or hard copy) must be considered for new, changed, or revised TMs. Special attention shall be given to the fleet, overhaul, and training community's need to have certain long-line diagrams (oversized schematics, timing circuit diagrams, test setup diagrams, wiring diagrams, etc.) delivered as a separately packaged hardcopy supplement (see 6.4.19) or re-authored to be easily viewed on screen and printed. Specific style, format, functionality, and presentation requirements for TMs required by this specification are provided in the following:

## MIL-DTL-24784C(NAVY)

- a. Appendix A - Specific Development Requirements for Page-Based Chapter-Format Technical Manuals, Information Package-Format Interactive Electronic Technical Manuals, and Page-Based Information Package-Format Technical Manuals.
- b. Appendix B - Functionality and Presentation Requirements for Interactive Electronic Technical Manuals.

This specification contains some requirements that may not be applicable to the preparation of all TMs. Selective application and tailoring of requirements shall be accomplished as appropriate. The applicability of some requirements is also designated by one of the following statements: unless otherwise specified by the acquiring activity or as/when specified by the acquiring activity.

3.3 TM development products and reports. The following paragraphs establish the requirements for TM development data products and associated management reports.

3.3.1 TM organization plan (TMOP). When specified by the acquiring activity (see 6.2), a TMOP shall be developed and shall present the preparing activity's TM development plan for ship and major system acquisitions. The TMOP shall explain the purpose and scope of each TM, and the interfaces and overlaps between TMs. The TMOP shall include a schedule for TM production and integration. The TMOP shall include the following:

- a. Part-1 of the TMOP shall describe the preparing activity's approach to satisfying the TM requirements of the contract. It shall identify each TM, (such as; operator manual, maintenance manual, SIB, and TRS) the preparing activity, and shall describe the scope and inter-relationships of all TMs planned for the ship. Specific requests for deviations to requirements in Technical Manual Contract Requirements (TMCRs) (see 6.4.22) shall be highlighted. No changes to requirements cited in TMCRs are permitted, unless specifically authorized by the acquiring activity.
- b. Part-2 of the TMOP shall describe the preparing activity's plans and procedures for the development of TMs, for the control and use of source data, and for the validation of all preparing activity-furnished TMs, including permanent change pages and revisions.
- c. Part-3 of the TMOP shall identify, by graphic or other means, each TM planned for the ship and the specific TMCR to be employed in its development or acquisition shall be identified.

3.3.1.1 Intended purpose. The TMOP shall clearly define the intended purpose of each TM, delineate the scope of each TM, and explain the interface and overlap between and among TMs. The TMOP shall include the following information:

- a. Description of general plan for evolving TMs. A description of the scope of the TM program for the system or equipment under consideration. This shall include a summary of any assumptions, conditions, or limitations affecting TM development.
- b. Method of use of data. A detailed description of procedures, which shall assure that all pertinent design, operation, and maintenance data is adequately, accurately, and clearly reflected in the applicable TMs.
- c. Method for achieving standardization. A detailed account of procedures to achieve maximum standardization in writing style, artwork, nomenclature, abbreviations, and symbols.
- d. Integration and coordination between contractors. Pertinent information concerning agreements with major suppliers of equipment. An explanation of the methods to be used to relate and control the integrating associate contractors or subcontractors.
- e. Deliverable TM-product review and approval process. As applicable, this section shall describe the general procedures for preparation of TM book plans and IETM content plans, review draft copy, preliminary copy, and final copy (hard-copy or digital form). This section shall also include a description of approval procedures (preparing activity internal and with the Government). Reference to the "time-phasing chart" (see h below) is suggested to illustrate understanding of expected approval-cycle delays.
- f. Validation and verification program procedures and planning information. A strategy to produce a validation plan by the TM-developer and scheme to review and comment on verification plans prepared by the acquiring activity. It shall include the following:
  - (1) Specific reference to already prepared plans.
  - (2) Key milestones reflected in the "time-phasing chart."

## MIL-DTL-24784C(NAVY)

- (3) A short description of TM-concerns [e.g., reading grade level/comprehensibility (see 6.4.5), appropriate range and depth of subject matter, etc.].
- g. Method of progressive transition. A synopsis of the major steps required for progressive transition of the TM data from the conceptual phase through definition phase to the acquisition phase and including training support. This section shall include a synopsis of the process for incorporating approved engineering changes into the affected TMs.
- h. Time phasing chart. A bar chart, PERT (Program Evaluation Review Technique) chart, Gantt chart, or graphic flow diagram to portray, by year and month, an effort that correlates TM-events to program phasing of training, support, equipment, and all other support systems and acquisition program-related milestones. These events shall be appropriately sequenced into the plan to coincide with acquisition milestone phases of the system or equipment.
- i. TM block diagram. A presentation (block diagram, manual tree, flowchart, etc.) of specific TM coverage proposed for the prime articles, components, support equipment, product end items, and training equipment. The type such as commercial TM, equipment TM, system manual, TRSs, and numbers of these TMs shall be indicated. This part of the plan shall include a brief description of the contents of each manual or groups of manuals shown in the graphic presentation. These descriptions shall be keyed to and arranged in the same sequence as the presentation and shall include:
- (1) Specific reference to particular Naval Systems Data Support Activity (NSDSA)-prepared TMCR. Anticipated need to request a waiver from stated requirements for non-compliance shall be highlighted (and justified). Understanding of deletion-tailoring limitations shall be described.
  - (2) Any special features or innovations of this TM-project.
  - (3) Projected requirements of new presentation techniques based upon peculiarities of the system or equipment configurations and maintainability design. (As an example; a better/clearer means of presenting technical subject matter for digital-theory electronics.)
- j. Other. The completed TMOP shall also include statements relative to the following topics (linked to appropriate sections):
- (1) Production lead-time.
  - (2) Proposed delivery schedule.
  - (3) Cost reduction or cost avoidance proposals.
  - (4) In-process review efforts (use of the Fleet and/or Naval Education and Training Center representatives during in-process reviews).
  - (5) Illustration preparation and control.
  - (6) Control of classified information.
  - (7) Method of handling changes and revisions and incorporating data affecting one or multiple, interrelated manuals.
  - (8) The method used to identify specific oversized schematic diagrams, timing circuit diagrams, test set-up diagrams, or wiring diagrams to be delivered as hard-copy supplements needed to support the training command, fleet users, regional maintenance centers, and overhaul facilities.

3.3.2 Book plan. When specified by the acquiring activity (see 6.2), a TM book plan shall be developed in accordance with Appendix A.

3.3.3 IETM content plan. When specified by the acquiring activity (see 6.2), an IETM content plan shall be developed in accordance with Appendix A.

3.3.4 TM quality assurance products. When specified by the acquiring activity (see 6.2), the following TM quality assurance (TMQA) products shall be developed in accordance with 4.2:

- a. TMQA program plan.
- b. Quality review records.
- c. Validation plan.

## MIL-DTL-24784C(NAVY)

- d. Validation records (see 4.1.3.5.7).
- e. Validation certification (see 4.1.3.5.8).
- f. Verification disposition records (see 4.1.3.6.2).
- g. Verification incorporation certification (see 4.1.3.6.3).

3.3.5 Schedules and status reports. A TM schedule and status report shall be supplied as specified by the acquiring activity at the frequency determined by the contract (see 6.2). The report shall be in a narrative format and indicate the information necessary to provide a comprehensive management level analysis of all development activities.

3.3.6 Cost reports. TMs should be acquired in a cost-effective manner. When specified by the acquiring activity (see 6.2), cost and pricing data shall be obtained for each new, revised, or changed manual. A separate analysis shall be provided together with supporting documentation for each manual developed. The cost of TMs shall be limited to the effort and material needed to produce the manual from source data.

3.4 TM product development requirements. The following paragraphs establish the requirements for the various TM products, issues, and digital data requirements.

3.4.1 TM products. The acquiring activity shall specify the TM products to be developed and delivered as defined below.

3.4.1.1 New TM. New TMs shall be developed to cover new equipment or systems or, when an existing manual is inadequate in technical content, format, and style to support the modified equipment or system. (For example, a new TM is required for a major modification to an existing equipment/system, when a hard copy TM exists but the acquiring activity requires an Information Package [IP]-format IETM).

3.4.1.2 Supplements. Supplements may be developed for classified information, safety instructions, or operational information. When specified by the acquiring activity (see 6.2), supplements shall conform to the style and format requirements of the manual being supplemented. Supplements shall contain the minimum amount of information required to protect security and maintain continuity of thought. Government approval is required for each supplement. The following are examples of when a supplement could be used:

- a. Where classified information will comprise 10 percent or less of the manual's content and could be concentrated in one area of the manual, such information shall normally be prepared as a classified supplement to the manual, permitting the basic manual to be issued at a lower classification or as an unclassified manual.
- b. When it is necessary to segregate or provide proprietary information, configuration-unique information (e.g., coverage for an engineering development model for testing), operational information, or other types of data either unavailable or inadequately covered in the basic manual. Where the information contained in the supplement is required only by a limited user community, independent to the overall hardware population.
- c. When it is necessary to have a hard-copy set of discrete long-line drawings, a supplement can be developed to complement an IETM (i.e., intended exclusively for electronic display).

3.4.1.3 Change package. When specified by the acquiring activity (see 6.2), a change package shall be developed. The change package shall not affect more than 25 percent of the total pages in the published manual. The change package shall be in the form of corrected replacement or added pages and shall conform to the format and style of the basic manual. Changes shall incorporate all approved information, Advance Change Notices (ACNs), and corrections resulting from outstanding technical deficiencies.

3.4.1.4 Revisions. When specified by the acquiring activity (see 6.2), a superseding or non-superseding revision shall be developed in accordance with requirements specified in 3.7.9. Revisions shall incorporate current information from previously issued changes to the existing manual. Revisions shall be such that the TM is issued in its entirety as a revised manual as opposed to being assembled by the user.

## MIL-DTL-24784C(NAVY)

3.4.1.4.1 Superseding revision. A superseding revision shall be acquired when the current manual is adequate in format and style, but does not completely cover the system or equipment because of a production or field change or modification made to the system or equipment after the manual was issued. A superseding revision shall incorporate configuration modifications and corrections resulting from all previous and outstanding changes and deficiencies to the existing manual. The superseding revision shall be developed in accordance with the style, format, and content of the basic manual. The revision shall be assigned a revision number and include a supersedure notice.

3.4.1.4.2 Non-superseding revision. A non-superseding revision shall be acquired when a new manual is needed to cover a different configuration of a system or equipment for which there is a high degree of commonality and the basic issue is not to be superseded. The revision shall be developed in accordance with the style, format, and content of the basic manual. The revision shall incorporate corrections resulting from all previous changes and outstanding deficiencies. Non-superseding revisions shall be classified as “original” and have a unique Government TM identification number. The non-superseding revision shall not include a supersedure notice.

3.4.2 TM issues. The acquiring activity shall specify the TM issues to be developed and delivered as defined below (see 6.2).

3.4.2.1 Review draft copy (RDC). RDCs shall be developed for review and coordination for technical accuracy (see 6.4.1) and adequacy (see 6.4.2) to evaluate the preparing activity’s progress and assess compliance with applicable specifications and terms of the contract. RDCs shall identify areas of the manual (format or technical content) that are not completed. RDCs shall be submitted for acceptance prior to development of the preliminary or final TM.

3.4.2.2 Preliminary TM (PTM). PTMs shall be developed for review and coordination for technical accuracy and adequacy to evaluate the preparing activity’s progress and assess compliance with applicable specifications and terms of the contract. A PTM shall be developed for interim use to make the technical information available for test, verification, training, and operational use pending receipt and distribution of the final manual. PTMs shall be submitted for acceptance prior to development of the final TM.

3.4.2.3 Final TM (FTM). A final TM shall be developed that is ready for reproduction and publication as an authenticated TM including all necessary changes made as a result of reviews, validation, verification, and Government conditions of acceptance or approval. The FTM delivery shall include a final reproducible copy (historically known as “camera ready copy”), and associated digital data (see 3.4.3) comprising the final run-time version (the complete TM as it will be used by the end user), as specified in the contract or order.

3.4.3 TM digital data requirements. TMs shall be acquired, authored, and developed as specified in the following paragraphs.

3.4.3.1 Digital data requirements for chapter-format TMs. As specified by the acquiring activity (see 6.2), chapter-format TMs shall be acquired, authored, and developed in either:

- a. The Extensible Markup Language (XML) (see 6.4.24) in accordance with the World Wide Web Consortium (W3C) Extensible Markup Language (XML) 1.0 Recommendation, or
- b. The Standard Generalized Markup Language (SGML) (see 6.4.17) in accordance with ISO 8879.

3.4.3.1.1 XML. When the acquiring activity specifies that a chapter-format TM shall be delivered in XML, the TM shall be acquired, authored, and developed in accordance with the Navy ETM XML DTD. Unless otherwise specified (see 6.2), the latest version of the DTD shall be used. The Navy ETM XML DTD, its associated entity files, and data dictionary may be obtained from the Navy XML/SGML Repository (<http://navycals.dt.navy.mil/xml-sgm-rep/index.html>).

3.4.3.1.2 SGML. When the acquiring activity specifies that a chapter-format TM shall be delivered in SGML, the TM shall be acquired, authored, and developed in accordance with the NAVSEA Class 2 ETM DTD. Unless otherwise specified (see 6.2), the latest version of the DTD shall be used. The NAVSEA Class 2 ETM DTD, its associated entity files, and data dictionary may be obtained from the Navy XML/SGML Repository (<http://navycals.dt.navy.mil/xml-sgm-rep/index.html>).

## MIL-DTL-24784C(NAVY)

3.4.3.2 Digital data requirements for information package-format TMs/IETMs. Information Package (IP)-format TMs/IETMs shall be acquired, authored, and developed in XML in accordance with the MIL-DTL-24784 DTD. Unless otherwise specified (see 6.2), the latest version of the DTD shall be used. The MIL-DTL-24784 DTD, its associated entity files, data dictionary, tagging guidelines, and style sheet may be obtained from the acquiring activity or from the Navy XML/SGML Repository (<http://navycals.dt.navy.mil/xml-sgm-rep/index.html>).

3.4.4 TM digital data deliverables. TM digital data delivery to the Government shall consist of the following:

- a. XML/SGML source file(s).
- b. Graphic source files.
- c. Associated DTD (i.e., the set of MIL-DTL-24784 DTD files used, Navy ETM XML DTD, NAVSEA Class 2 ETM DTD) (see 6.2).
- d. Any project-specific entity files.
- e. Any project-tailored or developed tagging guidelines document.
- f. Any project-tailored or developed style sheets and filters.

All of the above are necessary to manage, maintain, edit, and re-author the documents. The associated DTDs, project-specific entity files, project-tailored or developed tagging guidelines, and project-tailored or developed style sheets and filters shall be provided to the acquiring activity and the Navy XML/SGML Repository (<http://navycals.dt.navy.mil/xml-sgm-rep/index.html>).

3.4.4.1 XML/SGML source file. The XML/SGML source file consists of the TM text with the embedded XML/SGML tags.

3.4.4.2 Graphic source files. Graphic source files shall be in accordance with approved graphic formats identified in 3.7.8.7 and 3.7.8.7.1.

3.4.4.3 Associated DTD. The DTD associated with the specification used to develop the TM. A DTD states what tags and attributes are used to describe content in an XML or SGML document, where each tag is allowed, and which tags can appear within other tags.

3.4.4.4 Project-specific entity files. Entity files are files associated with the source file that may be referenced by the DTD. Project-specific entities can be developed when there is project-specific standard text in the document that will be used or shared among instances of a class of documents. Other entity files, such as those provided in the ISO character entity sets, are used to provide special characters (e.g., the degree symbol and mathematical symbols) in the documents. The acquiring activity will identify the entity files to be used with the DTD (see 6.2), and the preparing activity shall provide any project-specific entity files developed to the acquiring activity.

3.4.4.5 Tagging guidelines document. The tagging guidelines document describes the rules for applying an XML/SGML tag to actual data or document content. It is a practical guide to authors in applying the markup to real document content and describes the preferred way to markup (tag) the document in accordance with the DTD.

3.4.4.5.1 MIL-DTL-24784 tagging guidelines document. The acquiring activity will identify the tagging guidelines document to be used for the MIL-DTL-24784 DTD (see 6.2). These guidelines can be tailored to provide more specific tagging guidance for a class of documents. Any project-tailored tagging guidelines developed by the preparing activity shall be provided to the acquiring activity.

3.4.4.5.2 NAVY ETM XML DTD and NAVSEA class 2 ETM DTD tagging guidelines document. The acquiring activity will identify the tagging guidelines document to be used (see 6.2); otherwise, the TM developer shall develop them in a format acceptable to the acquiring activity. Any tagging guidelines developed by the preparing activity shall be provided to the acquiring activity.

3.4.4.6 Style sheets. Since an XML/SGML source file contains no formatting information, final copy preparation requires the use of formats called style sheets to determine what style/format to apply to a TM written in accordance with the DTD. The acquiring activity will identify the specific style sheet to be used (see 6.2); otherwise, the preparing activity shall develop style sheets in accordance with Appendices A and B, as applicable. Any style sheets that are tailored or developed by the preparing activity shall be provided to the acquiring activity.

## MIL-DTL-24784C(NAVY)

3.4.4.7 Filters. Filters are translation programs or software that convert one encoded data stream, such as XML or SGML text, into another data stream with codes that can be readily interpreted and processed by the user's equipment and software. Filters may be developed to translate or "filter" an XML/SGML file into a Hypertext Markup Language (HTML) or Extensible Hypertext Markup Language (XHTML) file. This may be done when the acquiring activity wants to store and manage data in XML/SGML but have HTML or XHTML as the final method of delivery/presentation to the end user. Any filters developed by the preparing activity shall be provided to the acquiring activity.

3.4.5 Delivery of the FTM in portable document format (PDF). When specified by the acquiring activity (see 6.2) that the FTM shall be delivered in PDF, the following shall apply when preparing the PDF deliverable:

- a. As a minimum, the TM shall be delivered in an indexed Portable Document Format (iPDF) and shall include linked bookmarks and a linked Table of Contents.
- b. The TM title page shall be the first page displayed in the iPDF TM.
- c. Bookmarks shall be generated as specified below.
  - (1) The first bookmark shall be labeled "TITLE" and shall link to the TM title page. The "TITLE" bookmark shall appear even in the absence of any other links within the iPDF TM.
  - (2) As applicable, a bookmark entry for the list of effective pages shall be labeled "List of Effective Pages".
  - (3) As applicable, a bookmark entry for revision summary shall be labeled "Revision Summary." The titles of revised IPs listed in the revision summary shall be linked to the IP containing the revised information.
  - (4) A bookmark entry for table of contents shall be labeled "Table of Contents." All chapter and section or IP bookmark entries shall be sequenced according to the table of contents.
  - (5) A bookmark entry for the list of illustrations and list of tables shall be labeled as such and shall be placed in the table of contents.
  - (6) All glossaries and appendices shall be bookmarked and labeled as such.
  - (7) A bookmark entry for Technical Manual Deficiency/Evaluation Reports (TMDERs) shall be labeled "TMDER".
  - (8) As applicable, each bookmark shall be linked to its appropriate destination and/or shall serve as a "drop-down" (indented) menu.
- d. Bookmarks shall be collapsed into their respective sections.
- e. The entire title page and bookmarks shall be visible in the "fit in window" view, when opening the TM.
- f. All blank pages shall be included in the digital file and shall be identical in size to the other pages in the manual. However, the blank pages for the reverse side of foldouts shall not be included.
- g. When specified by the acquiring activity (see 6.2), the following additional document functionality shall be provided:
  - (1) Hot spotting.
  - (2) Links within paragraphs, steps, and tables to internal references.

3.4.6 Publication and distribution. TMs shall be published in formats suitable for distribution and use based upon availability of the requisite hardware and software in the user community.

3.5 General development requirements. The following requirements are applicable to all TM types.

3.5.1 Source data. The primary source data for TMs should be engineering drawings and applicable Logistics Management Information (LMI) products (see 4.2.1.1.8.1).

3.5.2 Maintenance coverage. Unless otherwise specified by the acquiring activity (see 6.2), each type of TM shall contain, in detail, the maintenance coverage prescribed for the applicable maintenance level(s) based on the maintenance concept or approved maintenance plan.

## MIL-DTL-24784C(NAVY)

3.5.3 Advertising. TMs shall contain no advertising unless the contract specifies that the equipment manufacturer shall be identified on the cover/title page.

3.5.4 Copyrights and proprietary information credit line. TMs shall not contain copyrighted material except as specified in the Federal Acquisition Regulations (FAR) and Defense Federal Acquisition Regulation (DFAR) Supplement. When copyrighted material is to be included in a TM, the developer shall obtain prior written permission from the copyright owner or authorized agent for its use. The signed, written permission shall be delivered together with the final TM in accordance with the contract. The written permission shall contain a statement declaring whether or not a copyright credit line is required. When it is necessary to include copyright and proprietary material, it shall be clearly identified and the following warning statement shall be included on the title page:

“This document contains copyright or proprietary materials. Infringement of copyright or proprietary material may violate existing Federal laws and statutes and result in criminal penalties, imprisonment, or removal from office”.

3.5.5 Security classification markings. The overall security classification assigned to a TM shall agree with the highest classification assigned to any portion within. The security classification markings for classified TMs, titles of parts, chapters, information packages, appendixes, paragraphs, illustrations, tables, and their contents shall be identified in accordance with SECNAVINST 5510.36. The handling and production of classified material shall be in accordance with SECNAVINST 5510.36 (see 6.2). For guidance on security classification and handling restrictive markings on Compact Disk-Read Only Memory (CD-ROM), refer to MIL-HDBK-9660.

3.5.6 Energy efficiency requirements. When specified, TMs covering products that directly consume energy in normal operations, and that commonly have a method of expressing energy efficiency, shall include their energy efficiency.

3.6 Cover/title page requirements. The following requirements are applicable to all TM types. Manuals shall have either a cover or a title page and contain the information indicated by figure 1. If there is both a cover and title page, the date shall be omitted from the cover page. Spacing between the information should be such as to result in an attractive, well balanced cover/title page.

3.6.1 Security classification. The security classification assigned by the acquiring activity shall be as specified in 3.5.5, when the manual itself is classified.

3.6.2 TM identification number. The acquiring activity shall furnish the TM identification number(s). If the manual will be jointly used by more than one Service, the acquiring Service's TM identification number shall be listed first. Each Service's number shall be prefixed with the word Army, Navy, Marine Corps, or Air Force as appropriate. All numbers shall appear above the ruled line, near the right margin, except for Naval Sea Systems Command numbers, which shall be on the left margin.

3.6.3 Volume/part identification number. Required for multi-volume/multi-part sets only, the number shall be located below the TM identification number.

3.6.4 Revision number. When applicable, a revision number shall be furnished by the acquiring activity to indicate the revision level of the TM.

3.6.5 Title. The title is required to provide all information necessary to relate the manual to its subject and content, such that readers can discern the applicability of the manual and can discriminate between manuals of similar applicability. The TM title as indicated by the applicable content specification shall consist of the following:

- a. Type of manual.
- b. Maintenance level (if restrictive).
- c. Prime title (type and model).
- d. Subtitle (as applicable).

3.6.5.1 Heading. When applicable, the following words shall appear in the upper center portion of the page.

- a. “REVIEW DRAFT COPY”, “DRAFT” or “FINAL DRAFT”.

## MIL-DTL-24784C(NAVY)

## b. "PRELIMINARY".

3.6.5.2 Type of manual. Required to define the specific type of manual (for example: Operator's Manual, Maintenance Manual or IPB).

3.6.5.3 Maintenance level(s). The level(s) of maintenance, as appropriate, shall be placed beneath the manual type. When only one maintenance manual is being acquired to support a weapon, equipment or hardware, no level shall be specified unless restrictive, since it shall be the only manual available for repair and maintenance at any designated maintenance level (Organizational, Intermediate or Depot).

3.6.5.4 Prime title. The nomenclature of the system/equipment, type, model, part number, or subject (blocks, serial numbers or registration numbers, if appropriate) shall be positioned below the words identifying the manual type or maintenance level, if applicable. When specified by the acquiring activity, the national stock number and identification of other equipment covered in the manual shall be indicated. The classification of the system/equipment nomenclature shall be indicated, as specified in DOD Directive 5200.1 or DOD Directive 5220.22 if the manual itself is classified. The prime title shall be the same on all volumes and parts of a multi-volume or part TM set (see 6.4.16).

3.6.5.5 Subtitle. A subtitle shall be used and located immediately below the prime title to indicate the contents of every separately bound volume and part of a TM.

3.6.6 Manufacturer. When specified by the acquiring activity, the identification of the manufacturer of the equipment shall appear below the equipment nomenclature or subtitle

3.6.7 Contract number. When specified by the acquiring activity, the original contract number shall be included and carried forward on all subsequent cover/title pages. If the contract number for a change or revision is different from the original number, the number applicable to the change or revision shall be indicated on the cover/title page in addition to the original number. No more than two contract numbers, the original and the latest, need appear.

3.6.8 Seal. The Navy seal with the command identifier is placed below the contract number(s) (see example below). The seal shall be 1¼ to 1½ inches in diameter and be a well-balanced, 4-tiered, black and white circle figure. The inner space contains a stylized spread-wing eagle perched on an anchor within a scribed circle. The next outer tier contains the words "UNITED STATES NAVY" in all capital letters located in the upper quadrant. Two, five-point (one point up) stars bisect the tier (one on either side). The lower quadrant contains the words "SEA SYSTEMS COMMAND" in all capital letters. The outer perimeter is bounded by a stylized/symbolic circular rope frame.

Example Navy seal with Naval Sea Systems Command as the command identifier:



3.6.9 Supersedure notice. When a manual supersedes a previous issue, or another manual, a supersedure notice shall be included. Superseded issues/manuals shall normally be listed individually, unless several alphabetically or numerically sequenced issues/manuals are superseded, then they shall be grouped. When specified by the acquiring activity, the FTM that supersedes a PTM shall include a supersedure notice. The applicable portions of the following supersedure notice shall be used:

"THIS (MANUAL, CHANGE, OR REVISION) SUPERSEDES (APPLICABLE MANUAL, CHANGE, REVISION NUMBER OR PORTIONS OF) DATED (DATE OF SUPERSEDED DOCUMENT), INCLUDING (SUPERSEDED SUPPLEMENT NUMBERS)."

## MIL-DTL-24784C(NAVY)

3.6.10 Supplement notice. A supplement notice is used to show dependent and supporting TMs when one cannot be used without the other. They apply to supplements, supplemental or partial manuals, and basic manuals. Dependency is shown by such statements as “INCOMPLETE WITHOUT SWXXX-XX-XXX-XXX” or “USE WITH SWXXX-XX-XXX-XXX”. Supporting TMs are depicted by such statements as “THIS PUBLICATION SUPPLEMENTS SWXXX-XX-XXX-XXX”. Cross-reference notes to supplements, or to augmented manuals, shall be placed on the cover/title page initially, or at time of change or revision.

3.6.11 Volume notice. When specified by the acquiring activity, the cover/title page of each volume shall contain a statement that the applicable volume is incomplete without the other volumes in the set.

3.6.12 Disclosure notice. When specified by the Government, a special disclosure notice shall be placed on the cover/title page.

3.6.13 Distribution statement. All TMs shall have a distribution statement placed on the cover/title page. Each TM and modification thereto shall be marked in accordance with SECNAVINST 5510.36 to denote its availability for distribution, release, and disclosure without additional approvals and authorizations. The appropriate distribution statement will be provided by the Government. Unless otherwise specified by the acquiring activity (see 6.2), Distribution Statement C shall be placed on the cover/title page of each manual, manual supplement, manual revision, or change as follows:

**“DISTRIBUTION STATEMENT C: DISTRIBUTION AUTHORIZED TO US GOVERNMENT AGENCIES AND THEIR CONTRACTORS; (FILL IN REASON); (DATE OF DETERMINATION). OTHER REQUESTS FOR THIS DOCUMENT SHALL BE REFERRED TO (INSERT NAME OF CONTROLLING DOD OFFICE)”**.

3.6.14 Export control notice. A determination shall be made in accordance with DOD Directive 5230.25 whether the TM contains export-controlled technical data. When required, the following export control notice shall be placed on the cover/title page of each manual, manual supplement, revision, or change:

**“WARNING: THIS DOCUMENT CONTAINS TECHNICAL DATA WHOSE EXPORT IS RESTRICTED BY THE ARMS EXPORT CONTROL ACT (TITLE 22, U.S.C. SEC 2751, ET SEQ.) OR THE EXPORT ADMINISTRATION ACT OF 1979, AS AMENDED, TITLE 50, U.S.C., APP 2401 ET SEQ. VIOLATIONS OF THESE EXPORT LAWS ARE SUBJECT TO SEVERE CRIMINAL PENALTIES. DISSEMINATE IN ACCORDANCE WITH PROVISIONS OF DOD DIRECTIVE 5230.25”**.

3.6.15 Destruction notice. In compliance with SECNAVINST 5510.36, all TMs marked with distribution statements B, C, D, E, F, or X shall be marked with the following destruction notice:

**“DESTRUCTION NOTICE: DESTROY BY ANY METHOD THAT WILL PREVENT DISCLOSURE OF CONTENTS OR RECONSTRUCTION OF THE DOCUMENT”**.

3.6.16 Copyright and proprietary information credit line. When applicable, a copyright and proprietary information credit line shall be included as specified in 3.5.4.

3.6.17 Authority notice. The authority notice indicates the authority under which the manual is acquired and issued/published. The authority notice will be provided by the Government and shall read similar to “PUBLISHED BY DIRECTION OF COMMANDER, NAVAL SEA SYSTEMS COMMAND”. Manuals to be jointly used shall show a joint authority notice.

3.6.18 Publication date. The publication date of the manual shall be the cutoff date from which no further changes to the manual are permitted without issuing a formal change. This is normally the “approved date”; that is, the date the Government accepts the manual subject to the inclusion of specified comments. If the Government does not advise the contractor the exact date to use, the publication date shall be the date at which the last material to be included was received (copy freeze date). The publication date shall be shown as the day, month, and year in that sequence (for example, 15 MARCH 2006).

## MIL-DTL-24784C(NAVY)

3.7 Style and format. The style and format requirements contained in MIL-DTL-24784B were traditionally used to produce and distribute chapter-formatted TMs to the end user in a page-oriented paper form. This revised specification adds requirements for specific TM types to be produced in an Information Package (IP) format for electronic display or for page-oriented printing. General (common) style and format requirements that apply to all TM types are provided in the following paragraphs. Specific style, format, and presentation requirements for TMs required by this specification are provided in Appendices A and B.

3.7.1 Style of writing. The following paragraphs provide general requirements applicable to all TM types.

3.7.1.1 Writing style principles. TMs written to this specification shall conform to the following writing style principles:

- a. Technical content shall be presented in language free of vague and ambiguous terms, using the simplest words and phrases that will convey the intended meaning. All essential information shall be included, either by direct statements or by reference. To ensure comprehensibility, technical information shall:
  - (1) Describe the system, components, identifying special or outstanding features.
  - (2) Describe what functions are performed, including inputs, outputs, interface with other systems, and emphasize end results.
  - (3) Describe how the functions are performed, including associated principles of operation.
  - (4) Describe at what point in an overall system process the function is performed.
  - (5) Describe the location of the component or part.
  - (6) Associate explanatory text to the graphic.
  - (7) Directly support the immediate task of the user.
  - (8) Minimize the need for reading, studying, and conceptualizing skills.
  - (9) Present descriptive text in a logical order (for example, in operational sequence or in signal flow sequence) and include summary headers for individual paragraphs whenever needed for clarity.
  - (10) Keep descriptive text consistent in terminology, style, and format throughout the TM. Technical words shall be used only when no other wording will convey the intended meaning. Whenever possible, limit words to those that are short and familiar to the target audience. Concrete and specific language shall be used to reduce vagueness.
- b. The United States Government Printing Office Style Manual shall be used as a general guide for capitalization, punctuation, compounding of words, numerals in the text and spelling of non-technical words. Punctuation shall be used in a manner that aids in reading and prevents misreading.
- c. Hyphenation shall not be used to display normally non-hyphenated words on successive lines.
- d. Nomenclature shall be consistent within a manual and throughout parts lists, parts breakdowns, and other directly related manuals.
- e. Quotation marks and underscoring shall not be used for emphasis.
- f. Use of synonyms to provide variety in technical writing can lead to confusion. If there are several synonyms for a concept or object, only one shall be selected and used consistently throughout the manual. For example, words with more than one meaning that will fit the context in which they are used, such as “replace” for “reinstall,” shall not be used.
- g. When it is necessary to indicate time, begin sentences with “when” clauses. Example: “When power supply voltage stabilizes...”
- h. Headings shall be descriptive of the contents of the division they head; “General” and “Miscellaneous” shall not be used unless no other title will suffice. Headings shall be limited to 10 words or less.
- i. Statements that explain applicability for individual items of equipment shall use specific serial number(s), block designation(s), specific model designation(s) or similar identification. Such terms as “on later equipment” and “on early serial numbers” shall not be used.

## MIL-DTL-24784C(NAVY)

- j. TMs shall make no reference to age, sex, race, or national origin. Use sex neutral terms, except avoid use of the word “person” (terms such as “midshipman” and “workman” are considered sex neutral). Terms such as male and female connectors, pins, and so forth, are acceptable.

3.7.1.2 Standard English grammar. Rules of grammar for standard American English shall be used. Colloquial, substandard, and slang expressions shall not be used. Infinitives may be split and sentences may be ended with prepositions in cases where not doing so sounds awkward or stilted and is likely to distract the user’s attention from comprehending the content. Third person indicative mood shall be used for description and discussion. First person pronouns shall be used, to avoid indefinite passive construction.

3.7.1.3 Vocabulary (permitted words). Permitted word lists for preparation of TM textual and procedural steps are contained in SL160-AA-LST-010/TM-WORDS. Words initially used by the TM developer, and identified during the preparing activity’s quality assurance (QA) process, not on these lists, shall be eliminated and replaced with the “permitted” words, unless the comprehensibility of a given passage requires the use of a “non-permitted” word. In such a case, the exception shall be submitted to the Government for approval of any “non-permitted” word. Terminology shall be used consistently throughout the TM; e.g., the same word for a given tool must be used throughout the TM.

3.7.1.4 Word order. Sentences and clauses shall be written using simple word order (subject, verb, object) to the extent possible. Modifiers, including prepositional phrases, shall be as close as possible to the word modified. These word order requirements shall be relaxed only to the extent necessary to avoid ambiguity or distortion of meaning.

3.7.1.5 Use of “shall”, “will”, “should”, and “may”. Use “shall” whenever a manual expresses a provision that is binding. Use “should” and “may” whenever it is necessary to express non-mandatory provisions. “Will” may be used to express a declaration of purpose. It may be necessary to use “will” in cases where simple futurity is required.

3.7.1.6 Paragraphs. Text shall be divided into primary paragraphs and subordinate paragraphs. Paragraphs may also be divided into procedural steps. Procedural steps may be further divided if necessary. Limit paragraphs to a single idea. The average paragraph should not exceed six sentences. The desired paragraph length is three to four sentences. Each paragraph shall have a topic entry or sentence. All material in the paragraph shall relate to and develop the topic sentence.

3.7.1.7 Sentences and phrases. Sentences shall be short and concise. Limit sentences to a single thought; use no compound or complex sentences. Sentences shall be rewritten when extensive punctuation is necessary for clarity. Sentence length shall not exceed an average of 20 words. If a sentence has more than one clause and is more than 20 words in length, it shall, whenever possible, be rewritten as two or more simple sentences. Eliminate long, complex sentences and paragraphs by using lists. Complicated phrases shall be avoided.

3.7.1.8 Procedures. Step-by-step procedures for removal, disassembly, repair, and inspection of the repairable items shall be developed as required. A procedure shall present only that information necessary for completing a task or preventing error. Instructions shall be limited to areas where the sequence of operations is not standard shop practice or where special techniques are required for access to a part requiring repair. Instructions on the tagging, labeling, and match marking of parts shall be included in the procedure. A procedure shall specify when examinations and inspections must be performed prior to or during disassembly.

3.7.1.8.1 Writing style for procedures. Sentences directing the actions of the user shall be in the active voice, second person, and imperative mood. If more than one person is involved, the directions shall be in the active voice, third person, and indicative mood. Procedural steps shall be in positive form (“Close the container” rather than “Do not leave the container open”) unless the meaning demands the negative form. Procedural steps shall start with an active (transitive) verb; lubricate, remove, tighten, and so forth. Articles may be eliminated when it is necessary to abbreviate procedural text.

3.7.1.8.2 Procedural step content. A procedural step shall be limited to a single operation or to repetitions of a single operation with the following exceptions:

- a. If simultaneous operations are required, they shall be listed together in the same step.

## MIL-DTL-24784C(NAVY)

- b. If the step is a major step in a dual-level presentation, the major step shall express the action with a single verb; for instance, "Turn equipment ON".
- c. If the step represents a detailed procedure, as in b above, but the procedure is so basic that the details should rarely be needed by the intended users, or if the procedure is very frequently repeated, such as turn on, turn off, and calibration procedures, the step shall refer to the procedure with a single verb and cite a reference to the detailed steps. For instance, "Turn equipment ON (see 3-46 for details)".
- d. Verification of the result of an operation may be included in the step.

3.7.1.8.3 Procedure length. Each separate procedure shall be limited to a maximum of 10 steps.

3.7.1.8.4 Indentations and spacing. Procedural steps in a paragraph structure shall begin two spaces below the preceding text and shall be indented two spaces from the left margin. Procedural steps in each level of substep shall begin two spaces below the preceding step and shall be indented an additional two spaces.

3.7.1.8.5 Dual-level presentation. If users of a procedure are expected to vary widely in experience and capability, the Government may direct that certain procedures be presented in a dual-level format. In this format, detailed steps appropriate for inexperienced users shall be listed under major steps. The major steps, without reference to the detailed steps, shall be sufficient to support the performance of experienced users. Dual-level, step-by-step procedures shall be provided in any of the following cases:

- a. When accomplishment of the required action would not be obvious to a journeyman mechanic unfamiliar with the peculiar equipment covered by the manual.
- b. When a peculiar or special action is required.
- c. When safety-related or precautionary procedures are required to prevent personnel injury or equipment damage.
- d. When the required action involves an area with a known history of failure due to improper procedures.
- e. When, because of complexity of a particular procedure, it is necessary to maintain the continuity of the manual.
- f. When verification of the manual demonstrates the need for a step-by-step procedure to satisfactorily complete the required action.

3.7.1.8.6 Lead in and introduction to procedure. Procedural steps shall not be prefaced by a lead-in that duplicates the procedure title/heading. Prior to the listing of procedural steps, introductory information shall be provided to help the user carry out the procedure without interruption.

3.7.1.9 List form. Long complex sentences and paragraphs shall be eliminated through the use of lists. If any series of three items or more appears in a sentence, the sentence shall be written so the items shall appear in explicit list form.

3.7.2 Level of writing. The following paragraphs provide general requirements applicable to all TM types.

3.7.2.1 Readability. The reading grade level (RGL) shall be nine. TMs shall be written to the capability of the target audience for which they are intended. The method employed to determine readability of narrative material is optional. Computation of RGL may be automated providing the results meet the requirements of this specification. Non-narrative material, such as procedural steps, is not subject to RGL. The overall grade level (OGL) shall not exceed the appropriate RGL by more than one grade level. The grade level (GL) of each sample shall not exceed the appropriate RGL by more than three grade levels.

3.7.2.2 Sample selection. Samples of text shall be analyzed for readability. Select samples as follows:

- a. Count the number of pages or panes of text in the manual. The count shall include all full and partial pages or panes that contain text in the form of consecutive sentences. The count shall not include pages or panes containing only illustrations, tables, lists, and so forth. Record the number of text pages or panes.
- b. The basic number of samples is determined by using table I.

## MIL-DTL-24784C(NAVY)

TABLE I. Determining basic number of samples.

Number of text pages or test panes	Divisor divided by "N"	Basic number of samples	
		Min	Max
90 and above	10	9	30
54 to 89	9	6	9
32 to 53	8	4	6
1 to 31	6	2	4

- c. Divide the number of text pages or text panes by the appropriate divisor, "N". Round off the quotient to the next lowest whole number. For example: quotients of 17.3 and 17.7 shall both be rounded off to 17. This quotient shall equal the basic number of samples to be analyzed.
- d. For manuals that contain fewer than 12 pages or text panes, randomly select two samples and mark them for analysis.
- e. For manuals that are 12 pages or text panes or more, randomly select a number between one and "N". The number selected shall be marked as the first page or pane of text to be analyzed. Starting at the selected page or text pane, mark every "Nth" page or pane of text to the end of the TM. The marked pages or text panes shall identify starting points for the basic samples to be analyzed.
- f. Mark the pages or text panes to verify that at least one sample has been selected for each chapter or topic of the TM. If any chapter or topic has been missed, randomly select one text page or text pane from that chapter or topic and add it to the basic samples to be analyzed.

3.7.2.3 Raw data collection. For each sample marked, raw data shall be collected. Data collection shall consist of counts of the numbers of words, sentences, and syllables in each sample. The size of each sample is based on the number of words to be analyzed. Samples shall start at the beginning of the first full paragraph on each marked sample page or text pane. If a sample falls on a page or text pane containing procedural instructions, start the sample at beginning of first full sentence on the page or text pane. Headings, captions, and paragraph titles shall not be counted in the sample.

3.7.2.4 Word count. For each sample, count the number of words as follows:

- a. For each sample, count all words up to the end of the sentence containing the 200th word. If the marked sample page or text pane contains fewer than 200 words, the sample can be extended to the next page or pane of text; but, do not extend the sample into a new chapter, topic, or text pertaining to a completely new subject.
- b. Count as a word all numbers, letters, symbols, and groups of letters surrounded by white spaces. Hyphenated words and contractions count as one word. For example, each of the following would count as one word: couldn't; GFE; that is; 32,008; 19-inch; +250F; left-hand. Therefore, a sentence like "The left-hand MLG door shouldn't open more than 250." consists of 9 words.
- c. Record the number of words in each sample.

3.7.2.5 Sentence count. For each sample, count the number of sentences as follows:

- a. Count all sentences in sample including the sentence that contains the 200th word.
- b. Count as a sentence each unit of thought that can be considered grammatically independent of another sentence or clause. A period, question mark, exclamation point, and semicolon usually denote independent clauses and thus mark the end of a sentence.
- c. Record the number of sentences in each sample.

3.7.2.6 Syllable count. For each sample, count the number of syllables as follows:

- a. For most words, count syllables the way the word is normally pronounced aloud. For example: "at" is one syllable, "maintain" is two syllables, "area" is three syllables, "panoramic" is four syllables, and "recuperated" is five syllables.

## MIL-DTL-24784C(NAVY)

- b. Count all numbers as one syllable. For example: 5.1, 65, and 300 all count as one syllable each. However, if a numeric expression contains several numbers separated by hyphens, count each number as a syllable. For example: the expression 9-1025-240-10 is counted as four syllables.
- c. Acronyms and abbreviations are counted as one syllable unless they actually spell out a word of more than one syllable. For example: Hz and DVM each count as one syllable but TRADOC and ARRCOM each count as two syllables.
- d. Count as one syllable all words that are included in a baseline word list for Navy TMs (see SL160-AA-LST-010/TM-WORDS) and all expanded versions of those lists that are authorized for TM acquisitions.
- e. Record the number of syllables in each sample.

3.7.2.7 Grade level calculations.

3.7.2.7.1 Sample grade levels. Calculate the GL of each sample as follows:

- a. Calculate the average sentence length (L). Divide the number of words in the sample (V) by the number of sentences in the sample (T):  $(L = V/T)$ . Round off quotient to the nearest one hundredth.
- b. Calculate the average number of syllables per word (D). Divide the number of syllables (C) in the sample by the number of words (V) in the sample:  $(D = C/V)$ . Round off quotient to the nearest one hundredth.
- c. Calculate the GL of each sample by the following formula. Round off each GL to the nearest integer.

$$GL = 0.39(L) + 11.8(D) - 15.59$$

3.7.2.7.2 OGL. The OGL of a TM is calculated as follows:

- a. Add the total number of words (W) from all samples combined. Record total.
- b. Add the total number of sentences (S) from all samples combined. Record total.
- c. Add the total number of syllables (P) from all samples combined. Record total.
- d. Calculate the average sentence length (A). Divide total number of words (W) by total number of sentences (S):  $(A = W/S)$ . Round off quotient to the nearest one hundredth. Record quotient.
- e. Calculate the average number of syllables per word (B). Divide total number of syllables (P) by total number of words (W):  $(B = P/W)$ . Round off quotient to the nearest one hundredth. Record quotient.
- f. Calculate the OGL of the manual by the following formula. Round off the OGL to the nearest integer.

$$OGL = 0.39(A) + 11.8(B) - 15.59$$

Sample computations to demonstrate use of formulas:

Sample	Total words	Total number of sentences	Total number of syllables
1	250	30	500
2	220	35	475
3	245	28	420
4	223	22	400
5	256	32	510
6	215	27	398
7	219	26	395
8	230	30	400
9	225	29	380
10	226	28	370
TOTALS: 10	W = 2309	S = 287	P = 4248

## MIL-DTL-24784C(NAVY)

$$\begin{array}{lll} A = W/S & A = 2309/287 & A = 8.05 \\ B = P/W & B = 4248/2309 & B = 1.84 \end{array}$$

$$\text{OGL} = 0.39(A) + 11.8(B) - 15.59$$

$$\text{OGL} = 0.39(8.05) + 11.8(1.84) - 15.59$$

$$\text{OGL} = 3.14 + 21.71 - 15.59$$

$$\text{OGL} = 9$$

3.7.3 References. The following are general requirements applicable to all TM types. See Appendix A for unique requirements. References shall be kept to a minimum and shall be limited to Government approved documents such as military specifications and standards, TMs, drawings, engineering change data, and other approved material which will enhance the clarity and support the repair requirements and processes delineated in the manual.

3.7.3.1 Consolidation of material. To the extent possible, all information required to complete a single task shall be put in one location in the manual. Information and artwork shall be repeated or reused as necessary to fulfill this requirement. The need for the user to refer to other parts of the manual or to other information sources during performance of a task shall be minimized.

3.7.3.2 Text references. The text shall reference to:

- a. Only models or types covered by the manual. To facilitate coverage of modified or additional models or types at a later date, references shall be held to a minimum consistent with clarity.
- b. Other TMs or volumes as follows:
  - (1) Where the reference is to the entire content of another TM, the reference shall be only to the title of the TM and the TM identification number.
  - (2) Other TM identification numbers including exact paragraph or task title, when applicable. Reference shall be made only to publications in the publication system(s) of the Service(s) intended to use the publications and are authorized at user level.
  - (3) Reference shall not be made to coverage contained in a higher maintenance level manual from a lower maintenance level manual.
  - (4) Reference shall not be made to coverage contained in other than NAVSEA manuals, except when the manual has been formally assigned a NAVSEA TM identification number.
  - (5) When reference is made to a classified supplement and the discussion is incomplete without the data contained in the supplement, the classified supplement shall be listed in the documentation and references area. The reference shall include the classification of the classified supplement.
- c. When commercial documents are the only suitable reference material available, approval shall be requested from the Government. Strong justification shall be provided.
- d. Government specifications and standards by the basic number unless it is essential to reference a specific revision to the specification or standard. Government specifications and standards shall not be referenced for completion of maintenance tasks. When the preparing activity cannot find the Government specification number, the preparing activity shall request this information from the Government, furnishing complete information concerning the material's composition, properties, characteristics, applications, manufacturer's specification number, and so forth.
- e. Temperature readings as calibrated on the equipment. If other than Fahrenheit, the equivalent in Fahrenheit shall follow in parentheses. General temperature references, such as room temperature, shall normally be given in degrees Fahrenheit.

## MIL-DTL-24784C(NAVY)

- f. Speed, distance, and other instrument readings, as calibrated on the equipment.
- g. Switch positions and panel markings exactly as marked on the equipment. However, symbols on panel markings such as the symbol for “ohm”, “infinity”, and so forth, may be spelled out, when they cannot be produced by the composing equipment.
- h. Measurements in U.S. standard units (ounces, pounds, gallons, inches, feet, knots, miles, and so forth) except instances in which metric measurements are required. When the metric system is used on the equipment, conversion to U.S. standards shall follow in parentheses. If the content specification so requires, conversion of U.S. measurements to metric measurements shall be indicated.
- i. Materials such as lubricants, cleaning fluid, or fuel by Government specification number (if applicable).
- j. Illustrations within the same manual or another volume of the same manual.
- k. Illustrations by detailed view identification for clarity.
- l. Tables within the same manual or another volume of the same manual.
- m. Paragraphs within the same manual or another volume of the same manual. Other subordinate paragraphs of the same primary paragraph as “above” or “below”.
- n. Series of items as follows:
  - (1) By the basic number followed by “-series” when all numbers in the series are included. For example: “SE211-FA-MMA-010 series” includes TM identification numbers ending with 010, 020, 030, etc.
  - (2) By the basic number followed by “series” (without dash) when the basic number is immediately followed by a letter or is succeeding a higher number. For example: 781 series could include 781A, 781K, etc.; DD Form 1570 series could include DD Form 1571, 1575, 1577, etc.

3.7.3.2.1 Text reference placement. Placement of references shall conform to the following:

- a. When a reference applies to one item within a sentence, place the reference parenthetically immediately after the item being referenced.
- b. When a reference applies to an entire sentence, place the reference parenthetically at the end of the sentence with a period outside the parenthesis or, show the reference in a complete sentence.
- c. When a reference applies to an entire paragraph or paragraphs, place the reference parenthetically within the lead in sentence.

3.7.4 Use of terminology, nomenclature, numbers, and equations. The following are general requirements applicable to all TM types.

3.7.4.1 Abbreviations and acronyms. When abbreviations or acronyms are used as markings on the equipment, the same abbreviations and acronyms shall be used in the TM. An excellent rule to follow is; “when in doubt, spell it out.” Abbreviations and acronyms that are accepted as words, (radar, sonar, laser, and so forth), need not be spelled out. When a phrase is being abbreviated or made an acronym, the first letter of each word shall be capitalized and elements shall not be separated by periods. Abbreviations and acronyms used shall be in accordance with ASME Y14.38M, except that abbreviations may be plural (s) or possessive (’s) after the first use. New abbreviations and acronyms shall not be created for words or terms that already have abbreviations and acronyms established in ASME Y14.38M.

3.7.4.2 Automatic electronic test and checkout terminology. Terms used for automatic electronic test and checkout shall be in accordance with MIL-STD-1309.

3.7.4.3 Military terms. Military terms used shall be in accordance with Joint Chiefs of Staff (JCS) Pub No. 1-02, or any dictionary or glossary of military terms of the appropriate Service.

## MIL-DTL-24784C(NAVY)

3.7.4.4 Nomenclature. In each section supporting a single user task, official nomenclature shall be used for the first reference to a hardware item. Official nomenclature shall be used wherever the use of a shortened name might be ambiguous. Nomenclature of identical systems, subsystems, equipment, support equipment, components, and parts of the end item shall be consistent throughout the manual. The official designation of equipment shall be expressed in specific terms such as model number, type, serial number range, or similar terms. The preparing activity shall develop nomenclature lists for associate preparing activities and sub-preparing activities to ensure consistency throughout the manual. The correct nomenclature shall be derived from one of the following sources (listed in the order of precedence):

- a. "AN" nomenclature,
- b. Nameplate nomenclature, nomenclature appearing on the equipment in the form of decals, engraved legends or other markings,
- c. Cataloging Handbook H6 assigned nomenclature, or
- d. Nomenclature on the drawing from which the item was manufactured.

3.7.4.5 Noun modifiers. Noun modifiers shall be added to the description of parts as required to assure positive identification, such as cotter pins/taper pins. These modifiers need not appear on the preparing activity's graphic. Noun modifiers, once added for clarity, shall be used throughout the technical data.

3.7.4.6 Placard data. If all or a portion of the name of a control or display appears as a label (placard) on the equipment, that portion shall be written exactly as on the label, except that the placard data shall be written in all capital letters to distinguish it from surrounding text, for example, "POWER switch" or "MAIN PWR circuit breaker." It is also permissible to spell out the word for a symbol that cannot be reproduced by the equipment used to prepare the data.

3.7.4.7 National stock numbers. National stock numbers shall not appear in descriptive text but may be included in the parts data information.

3.7.4.8 Part numbers. Part numbers shall not be used in text or on illustrations except when necessary for clarity.

3.7.4.9 Symbols. When new or unusual graphics symbols are required, they shall be identified at each occurrence. It is permissible to spell out symbols that cannot be reproduced on the equipment on which the data is being prepared.

3.7.4.10 Metric practices. Metric practices, measurement units, symbols, and so forth, shall be in accordance with NIST Special Publication 811 and IEEE 945.

3.7.4.11 Equations. Use of equations shall be held to a minimum as required to ensure comprehensibility by the user. When specified for use in SGML TMs conforming to MIL-PRF-28001, MATHPAC 911001, in accordance with MIL-HDBK-28001, shall be used for preparing equations. Use of some equations may be limited by MATHPAC and the output system.

3.7.5 Safety and health requirements. Unless otherwise indicated, the requirements identified in the following paragraphs are applicable to all TM types. Refer to Appendix B for IETM unique requirements.

3.7.5.1 Guidance and coordination. The following paragraphs identify standard practices for the inclusion of Occupational Safety and Health (OSH) guidance in the text of TMs, as well as requirements for the inclusion of dangers, warnings, and cautions associated with the operation, maintenance, or overhaul (see 6.4.14) of shipboard systems and equipment. ANSI Z535.3 provides general criteria for the design, evaluation, and use of safety symbols to identify and warn against specific hazards and provide information to avoid personnel injury. The effective inclusion of safety and health guidance shall be accomplished by the coordinated effort of system experts, safety professionals, technical writers, and the potential user. Careful consideration of environmental factors, equipment design or layout, human nature, and other human factors will help ensure the overall integrity of the task procedures. Questions arising from this process shall be referred to the appropriate Safety Office and the Government acquiring activity. Existing contractual or Command requirements shall be included.

## MIL-DTL-24784C(NAVY)

3.7.5.2 Health hazards. Procedures prescribed for the operation of equipment shall be consistent with the safety standards established by OSHA Public Law 91-596 and Executive Order 12196. When exposure to hazardous chemicals or other adverse health factors or use of equipment cannot be eliminated, guidance pertaining to the exposure shall be included in the safety summary, safety precaution IP, or a warning.

3.7.5.3 Hazardous materials warnings. The hazardous materials warnings shall be developed from information provided by chemical manufacturers in material safety data sheets (MSDS) required by 29 CFR 1910.1200. MSDSs used within DoD must be entered into the Hazardous Materials Information System (HMIS) addressed in DoD 6050.05. DoD 6050.05 contains MSDSs submitted under the provisions of FED-STD-313. Additional information related to hazardous material requirements is provided in OPNAVINST 5100.23 and OPNAVINST 4110.2.

3.7.5.3.1 Use and placement of hazardous materials warnings. Hazardous materials warnings shall be presented in the standard danger or warning format without a symbol, or in conjunction with a symbol, or a combination of symbols. The acquiring activity shall approve the use of symbols other than those presented in Figure 2. Hazards that result from a combination of materials shall clearly be identified to indicate that mixing or combining the materials creates the hazard. The safety summary or safety precaution IP shall include the applicable symbols used within the TM, their related explanation and the complete danger or warning applicable to all hazardous materials addressed in the TM (see 3.7.5.10.f).

- a. Format for hazardous materials warnings with symbols. Hazardous materials warnings with symbols consist of the signal word DANGER or WARNING (see 3.7.5.9.2), the symbol(s), and a full description of the hazardous material, and the precautions to be taken.
- b. Abbreviated format for hazardous materials warnings with symbols. For commonly used substances only (e.g., dry cleaning solvent, hydraulic fluids, paints, etc.), an abbreviated format may be used for hazardous materials warnings. The abbreviated format consists of the signal word DANGER or WARNING, the symbol(s), and the nomenclature and specification or part number (e.g., ISOPROPYL ALCOHOL, TT-I-735) of the hazardous material. The full hazardous materials warning shall be placed in the safety summary or safety precaution IP.

3.7.5.3.2 Hazardous material symbols. Symbols shall be used to save space in TMs while still conveying a clear message of the hazard to the user. Since the symbol presents a visual image of the hazard rather than a more abstract message, recognition should be much faster than with a worded warning. Figure 2 contains a list of commonly used hazardous material symbols. The safety summary or safety precaution IP shall include the applicable symbols used within the TM along with their related explanation (see 3.7.5.10).

3.7.5.4 Safety warning symbols. Figure 3 contains a list of safety warning symbols that may be included in the text of dangers, warnings, or cautions to provide quick recognition of the safety hazard by the user. The safety summary or safety precaution IP shall include the applicable symbols used within the TM and their related explanation (see 3.7.5.10).

3.7.5.5 Nuclear hardness. If equipment to be operated, maintained or overhauled has nuclear survivability requirements (that is, over pressure and burst, thermal radiation, electromagnetic pulse, or transient radiation effects on electronics), applicable cautions shall be incorporated into TMs to ensure that hardness of equipment is not degraded during operation and maintenance.

3.7.5.5.1 Nuclear hardness symbol. All Hardness Critical Processes (HCP) shall be marked with the symbol:

HCP

The symbol shall be prepared in the same style and size as the applicable paragraph title. The symbol shall not be included in the paragraph title in the table of contents. Use of the symbol is as follows:

- a. When the entire procedure and all subordinate paragraphs and steps relate to establishing nuclear hardness, the symbol shall be inserted immediately following the paragraph number or title (as applicable).

For example: “2.1.6 HCP **LRU REPAIR.**”

## MIL-DTL-24784C(NAVY)

- b. When all subordinate paragraphs and steps do not contribute to establishing nuclear hardness, only those which do contribute shall be annotated with the symbol.
- c. Maintenance actions which could degrade hardness, but which are not directly involved in establishing nuclear hardness, shall not be annotated with the symbol, but shall be preceded by a caution.

3.7.5.5.2 Nuclear hardness symbol explanation. When applicable, the foreword, safety summary, safety precaution IP, or introduction shall include the symbol and an explanation and, other pertinent information as necessary to emphasize the uniqueness of hardness features. The nuclear hardness symbol explanation shall state that all paragraphs, procedures, and steps identified by the symbol shall be followed as written to ensure nuclear hardness is not degraded. This explanation shall be preceded by a CAUTION heading.

3.7.5.6 Electrostatic discharge sensitive (ESDS) parts. If equipment to be handled or maintained contains ESDS parts, components or circuits, applicable cautions and symbols shall be incorporated into TMs to ensure ESDS parts are not damaged or degraded during handling or maintenance.

3.7.5.6.1 ESD symbol. All paragraphs that address handling or maintenance that could damage ESDS parts shall be identified by the following symbol indicating a sensitive electronic device:



The symbol shall be prepared in the same style and size as the applicable paragraph title. The symbol shall not be included in the paragraph title in the table of contents. Use of the symbol is as follows:

- a. When the entire procedure and all subordinate paragraphs and steps describe handling or maintenance which could damage ESDS parts, the ESD symbol shall be inserted immediately following the paragraph number or title (as applicable).

For example: “2.2.4  LRU REPAIR.”

- b. The specific step(s) in the procedure addressing handling or operation that could damage ESDS parts shall be labeled by placing the ESD symbol between the step number and the text.
- c. Maintenance actions that could damage ESDS parts, but are not directly related to handling or maintenance of ESDS parts, shall not be annotated with the ESD symbol, but shall be preceded by a caution.
- d. Illustrations, drawings, and schematics shall be marked with the ESD symbol in accordance with MIL-STD-1686.

3.7.5.6.2 ESD symbol explanation. When applicable, the foreword, safety summary, safety precaution IP, or introduction shall include the ESD symbol and an explanation of the ESD symbol. Other pertinent information shall be included as necessary to emphasize the uniqueness of ESDS parts. The ESD symbol explanation shall state that the ESD symbol requires that all ESDS parts be handled according to ESDS device handling procedures in MIL-STD-1686. This explanation shall be preceded by a CAUTION heading.

3.7.5.7 Environmental protection. All TMs that require the use, transportation, handling, storage, or disposal of fuels, toxic and hazardous substances, chemicals, ordnance and munitions, and so forth, shall meet the requirements of the Federal Environmental Protection Standards.

3.7.5.8 Ozone depleting substances (ODS). The continued use of ozone depleting substances (ODS) has been prohibited by Executive Order 12856. Including information on the use of ODS materials in NAVSEA TMs is prohibited. A listing of these substances may be obtained from the acquiring activity.

3.7.5.9 Dangers, warnings, cautions, and notes.

3.7.5.9.1 When to use danger, warning, or caution statements. Procedures or practices that, if not correctly followed, will or could result in death or injury to personnel, damage or destruction of equipment, or improper system operation, shall be highlighted by danger, warning, or caution statements. The danger, warning, or caution, statement shall be preceded by the appropriate signal word “DANGER”, “WARNING”, or “CAUTION”. Guidance on when to use the signal word and associated statements for dangers, warnings, and cautions is as follows:

## MIL-DTL-24784C(NAVY)

- a. **DANGER.** Use the signal word “DANGER” to highlight a statement or some other notification about an operating or maintenance procedure, practice, or condition that, if not strictly observed **WILL** result in death or serious injury, or threatens the primary mission of the ship. The use of the signal word “DANGER” shall be limited to the extreme situations.
- b. **WARNING.** Use the signal word “WARNING” to highlight a statement or some other notification about an operating or maintenance procedure, practice, or condition that, if not strictly observed, **COULD** result in death, injury, or long-term health hazards.
- c. **CAUTION.** Use the signal word “CAUTION” to highlight statement or other notification about an essential operating or maintenance procedure, practice, or condition that, if not strictly observed, could result in damage to or destruction of equipment, or loss of mission effectiveness.
- d. DANGERS, WARNINGS, or CAUTIONS are not to be used for environmental protection concerns or security information.
- e. Specific direction as to which specific procedures require the use of DANGERS, WARNINGS, or CAUTIONS should be obtained from many sources including: Logistic Support Analysis Record (LSAR), LMI, system safety analysis, engineering analysis, maintenance analysis, and operating and support hazard analysis. The responsible safety office also should be requested to review TM procedures for compliance with safety concerns.
  - (1) Risk assessment, and the related issue of whether or not additional emphasis is required, is somewhat subjective. Decisions concerning these issues should be based on as much information as possible including historical mishap data from related systems, research, and the experience of all those involved in the TM development process. Often, the latter is the best indicator of the need for additional comment.
  - (2) DANGERS, WARNINGS, and CAUTIONS should be used for those unique conditions, steps or processes that require additional emphasis because of the inherently dangerous nature of the task or the potential for a “surprise” not otherwise readily obvious from the procedure.
  - (3) A WARNING should be used to advise of injury or occupational illness potential, but only based on the reasonable likelihood that the reader’s health or safety will be impacted in such a manner as to cause immediate concern and a disabling injury or occupational illness will result if the task procedure or stated precaution are not closely followed.
    - (a) Injury is defined as a traumatic bodily harm caused by a single or 1-day exposure to an external force, toxic substance (usually associated with accidents and spills in work places where the specific agent is not normally in the environment), or physical agent which will result in restricted duty, lost time, or worse.
    - (b) The occupational illness is defined as any abnormal physical condition or disorder, other than one resulting from an injury (as defined above), caused by repeated exposure to chemical, biological, or physical agents associated with the occupational environment which will result in restricted duty, lost time, or worse.

3.7.5.9.2 Wording and structure of dangers, warnings, and cautions. A danger, warning, or caution shall consist of the following in conformance with ANSI Z535.6:

- a. A signal word panel consisting of the safety alert symbol (for DANGERS and WARNINGS only) and the signal word DANGER, WARNING, or CAUTION. (The safety alert symbol is used to indicate a potential personal injury hazard. It is composed of an equilateral triangle surrounding an exclamation mark.)
- b. A safety warning symbol or hazardous material symbol(s) (if used).
- c. A concise statement of the hazard.
- d. Minimum precautions.
- e. The possible result if the danger, warning, or caution is disregarded, unless obvious.

## MIL-DTL-24784C(NAVY)

For example:



Cleaning with compressed air can create airborne particles that may enter eyes or penetrate skin. Pressure shall not exceed 30 psig. Wear goggles. Do not direct compressed air against skin.

- f. Following the format of statement first, precaution second, and result third is often the most clear and concise method. Brevity is important. If the possible result is obvious, it need not be included.
- g. A precaution is a short statement of hazard mitigation that tells the reader to take care, for example “use eye protection”, or “keep arms and hands clear”. Certain precautions may reference other publications or direct people to consult with another agency (for example, “...consult Bioenvironmental Engineering”). However, guidance of this nature shall be considered for inclusion in a safety summary or safety precaution IP.
- h. Danger, warning, or caution statements shall never contain procedures critical to the effective and safe completion of the task.
- i. Negatively worded statements (for example, “Failure to adhere...” or “Do not use...”) are acceptable and sometimes the best way to convey the message.
- j. Multi-paragraph or excessively long danger, warning, or caution statements are discouraged. Lengthy statements are a good indication that the task procedures are not written with the needed safety steps or procedures included.
- k. Pay strict attention to the definitions of “shall,” “will,” “should,” and “may” in this specification. The use of these words must be consistent with exposures or conditions that require comparable danger, warning, or caution statements.

3.7.5.9.3 When to use note statements. A note statement shall be used when it is necessary to add, emphasize, or clarify essential information of special importance or interest. A note shall not be used to convey safety information that should otherwise be contained in a danger, warning, or caution statement. The signal word “NOTE” shall be used to identify note statements.

3.7.5.9.4 Placement of danger, warning, caution, or note statements. Placement of danger, warning, caution, or note statements shall be as follows:

- a. Dangers, warnings, and cautions shall precede the text but follow the paragraph heading to which they apply. Notes shall normally be placed before the applicable text; however, the note may follow the applicable text, if required for clarity. The same danger, warning, caution, or note need not be repeated within a procedure as long as the emphasis and impact of the danger, warning, caution, or note is not lost because of a break in the procedures.
- b. There is no stated maximum on the number of unrelated dangers, warnings, cautions, or notes that can be placed on a page or screen display. Under no conditions should they be so numerous as to obscure the procedures. Properly written procedures should eliminate the need for consecutive warnings. Sandwiching short procedures between dangers, warnings, and cautions should be avoided.
- c. When a danger, warning, caution, or note consists of two or more paragraphs, the signal word DANGER, WARNING, CAUTION, or NOTE shall not be repeated (nor shall they be numbered) above each paragraph.
- d. If it is necessary to precede a paragraph by a combination of dangers, warnings, cautions, or notes they shall appear in this order: DANGER, WARNING, CAUTION, and NOTE.
- e. When multiple dangers, warnings, or cautions apply to the same block of technical information, it is permissible to group them under one signal word, but they shall be visually distinct from one another and the signal word corresponding to the greatest risk level shall be used.

## MIL-DTL-24784C(NAVY)

3.7.5.9.5 Display of dangers, warnings, cautions, and notes. The signal word panel for dangers, warnings, cautions, and notes shall be as shown below in conformance with ANSI Z535.6. The use of color shall be as specified in 3.7.5.9.5.1 through 3.7.5.9.5.4 in conformance with ANSI Z535.6. If a TM is to be printed with a limited number of colors or in black and white, the color used for the statement text may be used in the signal word panel. Safety warning symbols or hazardous material symbols (if used) shall be placed immediately after the signal word panel and before the statement. **For page-based TMs**, all lines on danger, warning, caution, and note statements should be block indented approximately two inches from both the left and right margins unless the statement is short, then it may be centered below the signal word panel. When the right margin is unjustified, indentations shall be from the maximum allowable width of typed text.



3.7.5.9.5.1 Dangers. When used in a signal word panel, the signal word “DANGER” shall be in white letters on a safety red background. The signal word panel shall include the safety alert symbol.

3.7.5.9.5.2 Warnings. When used in a signal word panel, the signal word “WARNING” shall be in black letters on a safety orange background. The signal word panel shall include the safety alert symbol.

3.7.5.9.5.3 Cautions. When used in a signal word panel, the signal word “CAUTION” shall be in black letters on a safety yellow background. The safety alert symbol shall not be used with CAUTION.

3.7.5.9.5.4 Notes. When used in a signal word panel, the signal word “NOTE” shall be in white letters on a safety blue background.

3.7.5.10 Safety summary or safety precaution IP. All TMs shall have a safety summary or safety precaution IP in accordance with this specification (see Appendix A). Figure 4 is an example of the content and format of a safety summary. Detailing the significance and use of danger, warning, and caution statements used in the TM, should be considered common to all safety summaries or safety precaution IPs. See 3.7.2.1 of MIL-DTL-24784/22 for additional content requirements for the safety precaution IP. The following information may be required depending upon the type of hazard found in the TM:

- a. Specific safety warning symbols used within the TM and their explanations shall be included.
- b. Any safety-related topic should be considered for inclusion: mechanized material handling equipment; overhead lifting devices; wood or metal working machine use and guarding; and so forth. General precautions related to storage, and so forth, can also be included.
- c. Provide general safety or health precautions and instructions (high voltage warning, warning against servicing alone, and resuscitation statement), but they must be tailored to the TM. General safety information provides notice of general safe practice or rules related to health, first aid, and sanitation and housekeeping.

## MIL-DTL-24784C(NAVY)

- (1) Live circuitry guidance is probably not applicable to a TM containing procedures for corrosion control. This does not preclude the possibility however, of a WARNING in the text of that TM if the text establishes the likelihood of exposure to injurious current.
  - (2) It would be appropriate to include live circuitry guidance in the safety summary or safety precaution IP of a maintenance manual. However, WARNINGS inserted in the text prior to every point of potential current exposure would not be required, as long as the procedures identify the proper controls, for example, "discharge capacitor XXXX," or "...turn off power and tag out (lock out) switch." It is reasonable to assume a trained maintenance technician is fully aware of the hazards of live circuitry; emphasis beyond a safety summary or safety precaution IP would be needed only in the event that the equipment, procedures, or work environment presented an unusual situation to the technician.
- d. Inclusion of general guidance does not preclude the need for a DANGER, WARNING, or CAUTION if the text calls out a non-routine use or application.
- (1) For example, in a TM containing procedures for cleaning parts, general guidance in the safety summary or safety precaution IP related to air pressures (30 psig), chip guarding, eye protection, and so forth, would suffice as long as the task procedures include the minimum required controls (pressure regulation, and so forth) as procedural steps. A CAUTION may still be required, however, if the text specifies 15 psig for a delicate piece of equipment that would be damaged if the technician proceeded under the general guidance included in the safety summary or safety precaution IP.
  - (2) Many industrial hygiene and occupational health concerns can be addressed in the same manner. In TMs that frequently call for routine solvent applications, WARNINGS would not be needed throughout the text as long as the minimum required controls are called for in the task procedures. General guidance regarding solvents could be included in the safety summary or safety precaution IP. Additional emphasis would then be required only if a procedure calls for a non-routine application, such as heating the solvent, or an unusual, potentially more toxic solvent. In that event, a DANGER or WARNING could be used depending on the ability of the process to cause immediate safety or health concerns. This approach can be used for many of the occupational health concerns associated with commonly used substances, for example, hydraulic fluids, oils, fuels, paints, thinners, adhesives, sealants, and so forth.
- e. DANGERS, WARNINGS, or CAUTIONS should not simply be extracted from the text and inserted verbatim in a safety summary or safety precaution IP. An acceptable approach would be to provide a general summary of guidance, classed by exposure. DANGERS, WARNINGS, or CAUTIONS must still be placed in the text, however, based on the risk associated with the steps or procedure.
- f. Warnings and dangers applicable to hazardous materials and related information shall be included in the safety summary or safety precaution IP. When exposure to hazardous chemicals or other adverse health factors or use of equipment cannot be eliminated, guidance pertaining to the exposure shall be included.
- (1) When applicable include a statement that symbols are used to save space in the manual while still conveying a clear message of the hazard to the technician using the manual. Since the icon presents a visual image of the hazard rather than a more abstract message, recognition should be much faster than with a worded warning.
  - (2) Include a general warning that when a hazardous chemical spill or other adverse health condition cannot be safely contained or eliminated by available maintenance personnel, emergency and damage control procedures (which are not part of the TM) or damage control personnel, if available, shall be consulted.
  - (3) Introductory information shall be included followed by a list of the hazardous materials symbols used in the TM and their related explanations. The complete warnings including appropriate hazardous material symbols, the nomenclature and specification of the hazardous material, and personnel protective equipment requirements shall be included.
- g. Excessively long safety summaries or safety precaution (IPs) are discouraged.

3.7.5.11 Quality control of dangers, warnings, and cautions. The Government will recommend rewrite of dangers, warnings, and cautions under the following conditions:

## MIL-DTL-24784C(NAVY)

- a. When any part of a procedure, danger, warning, caution, safety summary, or safety precaution IP is not consistent with existing OSHA and Service safety requirements or is detrimental to existing Service safety and health programs.
- b. When danger, warning, or caution statements are misused outside of the intent of this specification.
- c. When danger, warning, or caution statements contain procedural steps. Minimum protective equipment requirements or minimum precautions are allowable.
- d. When danger, warning, or caution statements are excessively long.
- e. When danger, warning, or caution statements are so numerous on a page or screen display that necessary task procedural steps are visually obscured.
- f. When safety summaries or safety precaution IPs are used to the exclusion of dangers, warnings and cautions in the text unless indicated by the nature and type of hazard associated with the text, or when otherwise used outside of the intent of this specification (that is, they shall provide tailored, general guidance).
- g. When dangers, warnings, or cautions are extracted from the text verbatim and inserted in the safety summary or safety precaution IP.
- h. When statements detailing the significance and use of danger, warning, and caution statements are not provided in the safety summary or safety precaution IP.
- i. When the wording of dangers, warnings, or cautions varies throughout the text even though the same or very comparable conditions are being emphasized.
- j. When a procedure lacks required emphasis because of its inherently dangerous nature or a step requires additional emphasis because of its critical safety impact.
- k. When dangers, warnings, or cautions contain vague precautionary statements such as “avoid all contact”, or rely too frequently on references to other TMs or outside agencies. In these cases, inclusion in a safety summary or safety precaution IP shall be recommended as appropriate.
- l. When danger, warning, or caution statements contain general safety precautions.

3.7.6 Tabular material. The following are general requirements applicable to all TM types. Refer to Appendices A and B for unique requirements.

3.7.6.1 Tables, charts, and graphs. Reference data (other than illustrations, drawings, diagrams) shall be presented in tabular, chart, or graph form. Any other type of data that lends itself to tabular, chart, or graph form may also be so presented. Charts shall be presented as tables or illustrations; whichever is most appropriate. Graphs shall be considered illustrations. Figure 5 provides an example of a typical table. Tables shall conform to the following:

- a. Center the word “Table”, the table number, followed by a period and two spaces, and the title followed by a period, above the head rule.
- b. Initial cap the word “Table” the first word and each principal word in the table title.
- c. Single space entries within the table.
- d. Align related entries in different columns.
- e. Align entries within columns as follows:
  - (1) For decimal data, decimal points shall be aligned.
  - (2) For mathematical notation, multiplication signs shall be aligned.
  - (3) All other numeric data shall be aligned flush right.
  - (4) Alphabetic or alphanumeric data shall be aligned flush left.
- f. Indent carryover lines two spaces.
- g. Specify units of measurement in row or column headings.

## MIL-DTL-24784C(NAVY)

3.7.6.2 Table head titles and rules. The first letter of the first word and of each principal word of table column and row head titles shall be capitalized; the remaining letters shall be lowercase. Carry-over lines of tabular material shall be indented two spaces unless adequately spaced between entries. Tables shall be vertically ruled as required for clarity. A horizontal rule shall be placed at the beginning (head) and at the end (foot) of a table and following column heads. The closing rule is omitted at the foot of a continued table; the opening rule is omitted at the head of the continuation of the table. For preprogrammed tables, with columns ruled for continued tables, the opening rule may be included at the head of the continuation of the table.

3.7.6.3 Tabular information used in text. When a small amount of tabular information is required, and does not require referencing from adjacent text, it may be included within a paragraph as a list.

3.7.6.4 Lists. Lists may be used in lieu of tables, when appropriate. Three types of lists are identified below. Lists may be unnumbered, numbered sequentially, or lettered alphabetically. They may have an optional title.

- a. Definition list. The definition list shall consist of the term and the definition. The definition list may have the headers, "Term" and "Definition" above the appropriate sections of the list.
- b. Random list. The random list shall consist of one or more items in a random order.
- c. Sequential list. The sequential list shall consist of one or more items in a specified order, such as alphabetic, numeric, or alphanumeric.

3.7.7 Numbering. The following are general requirements applicable to all TM types. Refer to Appendix A for unique requirements.

3.7.7.1 TM identification number. The TM identification number assigned by the Government shall be located on each page or display screen. If the TM is jointly used, each Service's number shall be prefixed with the word Army; Navy (NAVSEA), (NAVAIR), (SPAWAR); Marine Corps; or Air Force as applicable. The acquiring activity's TM identification number shall be placed above the using activity's TM identification number. The using activity's numbers shall be in alphanumeric sequence following the acquiring activity's number. For example:

ARMY	TM 11-1510-204-34
NAVY (NAVAIR)	AI-F18AA-WRM-070
NAVY (SPAWAR)	EE211-FA-MMA-010/SPS-40
MARINE CORPS	TM-12345/1
AIR FORCE	TO 21M-LGM30G-12
NAVY (NAVSEA)	SE211-FA-MMA-010/SPS-10A

3.7.8 Graphics. The following are general requirements applicable to all TM types. Refer to Appendices A and B for unique requirements.

3.7.8.1 Illustrations, drawings, and diagrams. Style and techniques shall be of a quality such as to produce artwork that clearly, adequately, and economically portray the information to be illustrated. Text and illustrations shall complement each other to communicate the required information. Nomenclature shall be consistent throughout the manual. Illustrative material shall be used to:

- a. Describe an item or idea if this can be done more efficiently and effectively by graphic methods.
- b. Clarify text; present phases difficult to describe by text alone.
- c. Call attention to details.
- d. Furnish graphic identification of parts and tools.

3.7.8.2 Graphic types and development techniques. Requirements for graphic types discussed in this specification for use in NAVSEA TMs are provided herein. See 3.7.8.3 for general graphic requirements.

## MIL-DTL-24784C(NAVY)

3.7.8.2.1 System/equipment illustration (frontispiece). A frontispiece shall illustrate the system, equipment, or repairable item covered in the manual (see figure 6). For installations consisting of more than one unit (see 6.4.23) or assembly (see 6.4.3), a pictorial illustration representing the equipment or all units comprising the equipment shall be included. If two units of the equipment differ between models, the alternate units shall be shown side-by-side (if clarity is not sacrificed) and designated by applicable model numbers. If more than two units differ, two frontispieces shall be furnished. The illustration shall show the major units of the equipment, relative size of each unit, basic interconnections between units, and their relationship with other equipment.

3.7.8.2.2 Block diagrams. A system of functional block diagrams (FBDs) shall be used to depict the functional divisions (see 6.4.9) of the system/equipment. The diagrams shall depict the system/equipment in an integrated manner; that is, a master FBD shall show each function of the equipment; primary FBDs shall show the functional divisions of the equipment; and secondary or lower-level FBDs shall show further functional subdivisions of complex sub-functions. The lowest level of FBD shall be directly referenced to functional circuit diagrams (FCDs) (see 3.7.8.2.4) or to the hardware reference designator where the function is performed. See 3.7.8.2.3 and 3.7.8.2.6 for additional requirements.

- a. Master FBD. The master FBD depicts the system/equipment functions and major signal paths within the system/equipment (see figure 7). Each major block on the master FBD shall represent a major functional element and shall be identified by functional and hardware boundary lines, and descriptive names. These functional elements shall be connected by signal path and control lines, also identified with descriptive names. Each block on the master FBD shall contain a reference to a primary FBD and the paragraph number (as applicable) or a link to the paragraph that describes the block (not the keyed text paragraph).
- b. Primary FBD. Primary FBDs (see figure 8) shall contain system/equipment function and sub-function information. The functional divisions shall be interconnected by signal path and control lines, each identified with a descriptive name and proper line weight (line weights shall be as specified in 3.7.8.2.6). The primary FBD shall illustrate the interconnection of sub-functional elements in order to describe how the functions work within the system/equipment. Primary FBDs may show system/equipment boundaries if appropriate to the function being shown. They shall provide a reference to secondary diagrams and the paragraph number (as applicable) or a link to the paragraph that describes the block (not the keyed text paragraph). The secondary diagrams may be FBDs or FCDs. If there are no secondary diagrams for reference, the reference shall be made directly to the hardware by reference designation. A direct relationship shall be maintained in regard to the number and nomenclature of interface lines between a primary FBD and other interfacing primary FBDs.
- c. Secondary FBD. When the functional divisions represented on the primary FBD are sufficiently large, further division of the functions is sometimes necessary. The secondary FBD provides the transition between the major functional elements on the primary FBD and the FCDs, or to actual hardware by reference designator where the function depicted is performed. The sub-functional segments illustrated on the secondary FBD shall often be further subdivided to effectively depict equipment operation. In this case, the secondary FBD provides the transition between the primary FBD and lower levels of FBDs (see figure 9). The secondary and lower-level FBDs are generated by dividing the functional elements into discrete segment (sub-function) blocks. Each block shall be identified by a descriptive name. The blocks shall reference the paragraph number (as applicable) or a link to the paragraph that describes the block (not the keyed text paragraph). These segments shall be interconnected in the same manner as the major blocks on the primary FBD; that is, with signal path and control lines identified by names and having the proper line weights. Each sub-functional block shall be identified by a descriptive name. A direct relationship shall be maintained in regard to the number and nomenclature of interface lines between a secondary FBD and other interfacing secondary FBDs. The lowest-level FBD block shall contain a reference to an FCD, or to the hardware reference designator where the function depicted is performed (see figure 10).

3.7.8.2.2.1 Power and grounding circuit FBDs. The following paragraphs describe the preparation of power and grounding circuit FBDs.

## MIL-DTL-24784C(NAVY)

- a. System/equipment power FBD. The system/equipment power FBD shall show the distribution of primary power from the power source to the various units comprising the system/equipment. The FBD shall be a part of the master FBD and shall reference the associated unit power and grounding FBDs and FCDs. Power conversion and distribution within the system/equipment units shall be shown by a separate power FBD for each unit unless the power circuits within the unit do not warrant a separate FBD because of their simplicity.
- b. Unit power FBD. The unit power FBD shall show the distribution of primary power and control power from the primary power source and associated interface units to the power elements within each unit (see figure 11). The FBD shall represent the power elements as functional blocks and shall show power conversion, power control monitoring and indicating between the unit power elements. The diagram shall be laid out in a logical left-to-right sequence to clearly define the power operations within the unit. Each functional block shall contain a reference to an FCD. This FBD shall be the last sheet(s) of the FBDs.

3.7.8.2.3 Requirements for preparing FBDs. A clear and complete referencing system is required for use on FBDs because of the interrelationship between FBDs and FCDs, and the interconnection between sheets of FBDs. The referencing system shall include all or a portion of the following reference information.

- a. Signal names.
  - (1) Signal names on FBDs shall be descriptive names. The Automated Interface Listing (AIL) (the wire lists for the system cabling), or their equivalent, shall be used as the source of signal names between units. Engineering schematics and cabling wire lists shall be used as the source of signal names internal to a unit.
  - (2) Power-on reset signals on the data FBDs shall be shown entering from external to the function. No function block for power reset shall be shown on the data FBDs. The generation of the power-on reset shall be shown on the power and grounding FBDs.
  - (3) All signal lines between functional blocks on the FBDs shall be identified by descriptive signal names. Signal lines that interface from one FBD sheet to another FBD sheet shall have the identical signal name on each sheet. Signal lines that are identified on different level FBDs (a signal level shown both on the primary FBD and on the secondary FBD) shall be identified by the same signal name.
  - (4) Reference designations shall not be used as signal names except in cases where no other name exists.
  - (5) The FBD number, sheet, and zone shall be used to identify signal origins and destinations when referencing from one FBD to another.
- b. Signal referencing for FBDs.
  - (1) Signal referencing on the same sheet. An on-sheet reference to show a continuous line between two points shall be shown by a circle enclosing double capital letters with a lead arrow indicating direction (see figure 12). Letters to start with AA, then AB, AC, and so forth. Zone reference shall not be used.
    - (a) Signal lines shall show signal name on flow line before the reference symbol.
    - (b) An inverted triangle symbol shall not be used except for an A or B (primarily found on the power FCDs) to indicate grounds.
  - (2) Signal referencing between two or more functional parts. To show a continuous line between two points on different sheets of a functional breakdown (a function broken into Parts 1 of 2, 2 of 2, and so forth), an irregular pentagon shall be used. Double capital letters starting with BA then BB, BC, and so forth, shall be enclosed within this symbol. Zone references shall be indicated. See figure 13.
  - (3) Signal referencing between units. Referencing between units shown on the diagram shall be accomplished at equivalent levels (that is, primary levels shall interface, second levels shall interface; however, a primary level shall not interface with a second level). See figure 14.
  - (4) Grouping of signals. Brackets may be used when all of a group of signals come from or go to the same zone or destination

## MIL-DTL-24784C(NAVY)

- c. Keyed text. The FBDs may be prepared with or without keyed text. Each block on the FBD shall contain a circled number. The circled number corresponds to a brief paragraph (referred to as “keyed text”) that describes the purpose and function of that block. The circled numbers shall start with the circle number 1 in the first block at the top left of the FBD and progress in a logical manner (either by data flow, or top-to-bottom and left-to-right) on the FBD until all blocks are numbered. The “keyed text” paragraph shall be located on a page facing the FBD to which it applies or be linked from the FBD. See figure 15.
- d. Diagram type. The diagram type (FBD or FCD) shall be included above the title block of the drawing or on sheet 1 only. The title block shall appear only on sheet 1. Sheets 2 and on shall not contain the diagram type block or the title block.
- e. Equipment names. Equipment name or reference designation shall be used to identify hardware boundaries on the FBDs.
- f. Function names. Each functional area of each unit shall be identified by a descriptive name. These functional areas shall then be further broken into sub-functions, each being assigned a descriptive name. Once a function name has been assigned, the identical name shall always appear whether it appears on an FBD or on an FCD to identify the functional boundary. No two functional areas may be assigned the same name.
- g. Diagram (drawing) numbers. In systems with fully implemented unit numbers, all FBDs shall be numbered FBDXXXX, where XXXX is equal to the unit number (that is: 1001, 1002, 1107, and so forth), except for the master FBD or FCD. The master FBD or FCD shall be numbered FBD0000 or FCD0000. For those cases where one FBD (or FCD) is used for multiple and identical units, the lowest unit number shall be used (that is, units 1071 and 1072 shall be FBD1071). In other systems, FBDs shall be numbered chronologically.
- h. Sheet numbers. FBDs or FCDs having multiple sheets shall be assigned sheet numbers starting with the number one (1). The drawing sheet number and zone number shall be used to identify signal interconnections between sheets of the same FBD or FCD.
- i. Zone numbers.
  - (1) The zone number and sheet number shall be used to identify signal interconnections between sheets of an FBD and when referencing between FBDs or from FBDs to FCDs and vice versa. Sheet and zone numbers shall be as shown on figure 16.
  - (2) Zone number references shall call out the drawing coordinates of the referenced detailed signal name rather than call out the drawing coordinates of the symbol itself.
- j. Reference designations. Reference designations shall be used to correlate circuit symbols to actual hardware locations. All hardware boundaries, logic symbols, electrical symbols, and analog symbols shall be identified by the reference designations assigned to the hardware being depicted.

3.7.8.2.4 Functional circuit diagrams (FCDs). An FCD shows in symbolic form, the interrelationship of the circuits required to perform a function. The FCD consists of symbols representing circuit modules and electrical parts complete with physical location and interconnection information. FCDs shall be prepared for control and indicator circuits, analog logic, and power and grounding circuits. See figure 17 example of an analog logic FCD. An explanation of power and grounding FCDs is given in 3.7.8.2.4.1. If FCDs are required for a unit having all three types of the above circuits, all circuits shall be shown on the same drawing numbered FCD. See 3.7.8.2.5 and 3.7.8.2.6 for additional requirements.

- a. Schematics. Schematics are not required for unit wiring or similar interconnecting hardware devices because complete interconnecting information appears on the FCDs. Components such as switches, relays, terminating resistors, and so forth, mounted directly on the cabinet shall be shown in schematic form on the FCD using the rules for detailed FCDs (see e below).

## MIL-DTL-24784C(NAVY)

- b. Layout techniques. An FCD shall be prepared for each function defined on the lowest level of FBD where it is necessary to show circuits that are not located on pluggable modules and for the power and grounding circuits. Layout of the symbols on the FCD shall provide a left-to-right functional flow. Circuit symbols shall be functionally divided by thin lines in direct relationship to a functional block on a related FBD, and the functional division on the FCD shall be identified by the same function name. If the equipment is sufficiently complex, an FCD may consist of multiple sheets; then, functional flow shall be left-to-right from sheet to sheet. All inputs and outputs of the function depicted on the FCD shall be identified by signal names. Inputs shall be referenced to the source FCD and outputs shall be referenced to the destination FCD. For smaller systems or equipments, an FCD sheet may contain more than one function and possibly the entire equipment.
- c. Analog functions. In analog functions, the FCD details the operating elements (emitter followers, amplifiers, and so forth) within the function using special block symbols or schematic symbols. The special block symbols shall be used to detail replaceable circuit elements or modules that are used as building blocks in the analog equipment.
- d. Schematic symbols. Schematic symbols shall be used to detail circuits of assemblies or modules having replaceable parts. The resulting FCD may have both symbolic and electrical schematic characteristics with functional grouping techniques applied. Schematic representations on the FCD shall be formed using the rules set forth for detailed FCDs.
- e. Detailed FCDs. Detailed FCD drawing techniques shall be used, where necessary, to show cabinet-mounted components such as switches, relays, termination resistors, and so forth, and for detailing circuits of assemblies or modules having replaceable parts. Separate detailed FCDs are required for the unique repairable circuits used as building blocks for analog equipment; one detailed FCD is required for each type of building block.
  - (1) Layout techniques. Detailed FCDs present all circuit information, including component values, test points, and sensors (see figure 18). Circuit parts shall be grouped functionally and arranged to make signal flow obvious from left-to-right and top-to-bottom. Emphasis shall be placed on arranging the circuit parts to enhance functional understanding. One technique that simplifies the circuit presentation is to completely separate each power and ground connection. Common ground or return points should not be tied together merely to conserve symbols.

3.7.8.2.4.1 Unit power and grounding FCD. Unit power and grounding FCDs shall show the generation and distribution of power to all assemblies within the unit. All cable, connector, and pin numbers shall be shown except those listed on sheet 1 as unused. Cabinet-mounted parts shall be shown in schematic form. All power supplies and regulators that are packaged as complete assemblies shall be shown in symbolic form. Lowest level replaceable assemblies shall not be further detailed in detailed FCD form. Since a power and grounding FCD is a schematic diagram rather than a wiring diagram, it does not show routing of wires, but it shall show the continuities that exist. Several types of circuit returns may exist in the system: (1) ground, (2) chassis or frame connection, and (3) common connections. Each of these grounds shall be shown by using symbols where it shall simplify the FCDs. See figure 19.

- a. Prime power inputs shall be shown on the left of the FCD and signal flow shall be left-to-right. Grounds shall be shown by using the symbols illustrated in IEEE 315. The layout of circuit parts shall follow a logical arrangement and be consistent with other unit-oriented power and grounding diagrams; for example, primary AC distribution, power control and indication, interlocks, gate monitoring and gate distribution. Unnecessary long lines shall be shortened to conserve space. The hardware boundaries can be distorted where necessary, to preserve smooth signal flow. Crossed lines and “doglegs” shall be kept to a minimum.

## MIL-DTL-24784C(NAVY)

- b. Each relay and switch element or contact set shall be identified. If the switch is a front panel control, and it is accessible during normal equipment operation, the nomenclature of the switch exactly as it appears on the front panel shall be placed adjacent to the switch symbol. When multi-section switches or relays have more than one element or contact set, the sets or elements shall be identified individually but with some alphanumeric relationship. Contact sets shall be aligned if possible, but not at the expense of disturbing functional flow. Relays and switches shall not necessarily have their contact sets in the same functional area; often they function in different circuits. When this occurs, the various sets of contacts and actuating elements shall be connected by a dashed line (if on different FCD sheets, sheet and zone references shall be used to connect the dashed line) to illustrate mechanical linkage. Spare contact sets of switches and relays shall not be shown on the body of the diagram.

3.7.8.2.5 Requirements for preparing FCDs. A clear and complete referencing system is required for use on FCDs because of the interrelationship between FBDs and FCDs, and the interconnection between sheets of FCDs. The referencing system shall include the following reference information, as applicable:

- a. Signal names.
  - (1) Major or important signal paths on an FCD shall be identified by descriptive signal names. All signal lines that interface between FCD sheets shall be identified by descriptive signal names. The signal name shall be identical on all FCD sheets. No signal name shall be used for more than one signal path.
  - (2) Reference designations shall not be used as signal names except in cases where no other name exists (primarily on power FCDs).
  - (3) The FBD or FCD number, sheet, and zone shall be used to identify signal origins and destinations when referencing from one FCD to another or from an FCD to an FBD.
- b. Signal referencing. Signal referencing for FCDs shall be in accordance with 3.7.8.2.3.
- c. General format items. The following shall, at a minimum, be located on the FCD first sheet.
  - (1) Notes that apply specifically to that FCD.
  - (2) Special abbreviations (that is, P/O).
  - (3) A note to explain the position (energized/de-energized, on/off) of any relays or switches shown on the FCD.
  - (4) All assemblies shall reference an internal schematic when necessary for troubleshooting and maintenance.
  - (5) Power and logic FCDs shall carry specific signal names on the flow lines. If signal names are not readily available, then the signal name may indicate a hardware destination point (for example, K3-82).
- d. Diagram type, equipment and function names. Diagram type, equipment names, and function names shall be in accordance with 3.7.8.2.3.
- e. Key codes. In certain applications, both digital and analog modules shall be assigned key codes. Most key codes consist of three letters (KDM, KDN, and so forth). The logic or analog symbol on the FCD shall contain the key code for the circuit module (or portion of the circuit module) depicted. These key codes permit the users to locate a text description of circuit operations located in the TM.
- f. Numbers. Diagram (drawing) numbers, sheet numbers, and zone numbers shall be in accordance with 3.7.8.2.3.
- g. Reference designations. Reference designations shall be in accordance with 3.7.8.2.3.

## MIL-DTL-24784C(NAVY)

- h. Test points. All monitored and non-monitored test points shall be incorporated in all FCDs. These test points shall be shown as part of the circuitry they are testing and shall indicate the following information and parameters:
- (1) Test point number.
  - (2) Test point operational connector pin (if applicable).
  - (3) Circuitry associated with test point (for example, divider network).
  - (4) Test point symbology in accordance with IEEE 315.

3.7.8.2.6 FBD and FCD drafting requirements. Requirements for line weights, methods of depicting interconnecting lines, and symbol sizes in the preparation of FBDs and FCDs are as follows:

- a. Line weights. Hardware or functional boundaries and boundary titles shall be prepared as described in the following paragraphs.
  - (1) Hardware boundary. A hardware boundary shall be a long-dash, short-dash light line (0.005 inch or equivalent point size). The length of the long-dash in relation to the length of the short-dash should be drawn so that the long-dash does not give the impression of a solid line. The hardware boundary title shall be positioned as illustrated on figure 20.
  - (2) Functional boundary. A functional boundary shall be a solid medium line (0.01 inch or equivalent point size). The functional boundary title shall be positioned as illustrated on figure 21.
- b. Interconnecting lines. Interconnecting (data, signal, and control) lines shall be prepared in the following manner (see figure 22):
  - (1) Line bends shall be 90 degrees, unless a particular junction requires a different bend. Bend corners shall not be rounded.
  - (2) Data lines shall be single, solid heavy lines (0.02 inch or equivalent point size).
  - (3) Signal and control lines shall be single, solid medium lines (0.01 inch or equivalent point size).
  - (4) Signal lines that contain closely related information may be grouped into one line. However, care must be exercised to not group signal lines indiscriminately. Grouping of signal lines into one line is called a highway.
  - (5) Highways shall be solid medium lines (0.01 inch or equivalent point size) for signal and control, and heavy lines (0.02 inch or equivalent point size) for data.
    - (a) Any changes in the flow direction of the basic highway shall be indicated by square corners [see figure 22(a)(1)].
    - (b) Any input or output of a highway shall be indicated by a 45-degree connecting line. The direction of the angle implies flow direction [see figure 22(a)(2)].
    - (c) The end points (a highway may have several) of a highway are indicated by square corners [see figure 22(a)(3)].
    - (d) A highway does not necessarily contain a uniform number of signals over its entire length. Therefore, when a highway is identified by a name, that name applies to its entire length.
    - (e) Each individual signal contained within a highway shall be identified with a detailed signal name.
    - (f) The signal names used as inputs to a highway may be different from the highway signal name; for example, BIT 5 and BIT 4 may be individual inputs to a highway having a signal name of INTERFACE REG SET OUTPUT. There shall be a logical relationship between the input and highway signal names [see figure 22(b)].
    - (g) The signal names used as outputs to a highway may be different from the highway signal name; for example, BIT 9 and BIT 6 may be individual outputs to a highway having a signal name of ADDRESS. There shall be a logical relationship between the highway signal name and the output [see figure 22(c)].

## MIL-DTL-24784C(NAVY)

- (h) Highway inputs and outputs to logic symbols are illustrated on figure 22(d). The input shall contain the input signal name and input pin number; the output shall contain the output pin number and signal name.
  - (i) Highway fan-outs and fan-ins shall have the highway signal name indicated above the signal line and the highway output or input signal names with its appropriate sheet and zone reference below the signal line [see figure 22(e)].
- c. Symbols. Symbols shall be prepared in the following manner:
- (1) FBD rectangular blocks shall be drawn as medium lines (0.01 inch or equivalent point size) and, insofar as possible, conform to a 2-to-1 aspect ratio. Minimum block size shall be 0.05 inch by 1 inch. The block nomenclature shall be positioned for ease of reading.
  - (2) FCD logic symbols shall be drawn as medium lines (0.01 inch or equivalent point size). Other symbols depicting assemblies shall be drawn rectangular and to the minimum size which will allow inputs and outputs to be depicted. Include all reference data within the symbol. All like symbols shall be drawn to the same size. FCD logic symbol nomenclature shall be positioned as illustrated on figure 23 to ease reading.
  - (3) On-drawing and off-drawing connectors and miscellaneous symbols shall be drawn as medium lines (0.01 inch or equivalent point size) and in accordance with the dimensions depicted on figure 24).

3.7.8.2.7 System functional diagrams (SFDs). SFDs shall be developed to provide complete coverage of a system in all modes of operation (see figure 25). They are to serve as illustrations supporting the detailed functional description and as system troubleshooting reference drawings. Each diagram shall show the generation, transmission, switching, and use of one or more functions on a system basis. An SFD shall show signal flow across equipment interfaces and include those circuits that significantly modify the signal. One-lining, which is the superimposition of two or more wires or circuit elements, shall be used where no loss of clarity is involved. All test points needed for system troubleshooting and all devices such as dials and indicators that are monitored during system testing shall be shown. The correct voltage, waveform, reading, or other condition for each shall be indicated as appropriate. When space on the diagram is insufficient, particularly in the case of test point data for multiple problems or setups of a system test, these data may be provided on associated tabulation sheets. Wiring tabulation sheets that are keyed to the diagrams shall be used when necessary to list ship's cable and associated wire designations, plus all pertinent terminal board, terminal, and pin and jack numbers entering and leaving subsystems and equipment. An SFD, such as a data functional and control functional, which schematically portray data-gathering paths and control paths through the system, will be largely redundant with the content of equipment manual diagrams, but somewhat greater detail is expected in the individual equipment diagrams. The tabulation sheets associated with each SFD shall be compiled as a table and appropriately located to enable the best possible use of the SFD. Tabulation sheets may also be identified as sheets of an SFD, bearing the same figure number and title (as applicable) of the SFD. In this case, tabulation sheets shall be located immediately ahead of the associated SFD and shall be the first, second, in sequence, sheet of the SFD.

3.7.8.2.7.1 Digital SFDs. Digital SFDs shall depict, by logic symbols and supplementary notations, the details of signal flow and control existing in a system involving two-state devices. Logic symbology on the SFDs will be in accordance with IEEE 991. Digital SFDs shall illustrate the processing of variable signal inputs and resultant outputs and shall portray signal flow for major output functions and logical functions such as units, modules, and subassemblies. Where multiple output signals are time shared through groups of identical units, such as, gates, clamps, inverters, and counters, one time-shared signal flow line shall be arbitrarily chosen to illustrate the signal flow. Where identical digital units are grouped, only the one through which the arbitrarily chosen main signal path goes shall be shown in detail. The depth of detail shown on digital functional diagrams depends on the complexity of the equipment and shall be as determined by the Government upon receipt of the initial submittal of samples.

## MIL-DTL-24784C(NAVY)

3.7.8.2.7.2 Power distribution SFDs. Power distribution SFDs shall be provided for each power system used to supply power to subsystems or equipment. These SFDs shall show ships power from the generators, or other originating source, through the interconnecting switchboards and weapon control switchboards to the subsystems and equipment. Distribution of each control or reference power system shall be illustrated from source to the equipment and to subunits of the equipment. Depict such signal flow as receive, transmit, RHI display, PPI display, bearing data, antenna rotation, and elevation data. The diagrams shall show all circuit breakers, control relays, transformers, meters, fuses, indicators, and lamps. Interconnections between sheets or zones shall be cross-referenced. Wiring tabulation sheets shall list initiating and receiving units, terminal numbers, interconnecting cables, and wire numbers for each diagram. Junction box or connection box numbers shall be listed as required (see figure 26).

3.7.8.2.8 System control function diagrams. System control function diagrams shall be provided for all system control circuits. The control function diagrams shall be at the system level but shall be constructed in accordance with 3.7.8.2.9. The diagrams shall show essential fault isolation test points or comparable indicators, and shall include appropriate references to equipment manuals.

3.7.8.2.9 Control diagrams. Control diagrams shall be included for all control circuits (see figure 27). Control circuits shall be grouped according to energizing voltage, control function, mode of operation, or physical limits of the cabinet or assembly, as applicable. Supporting information required to clarify the use of the diagram shall be provided in the general notes. The functional name and reference designation for each relay, switch, lamp, and so forth, shown shall be included. All relay energizing circuits shall be shown with all tie points and terminals and with switches and relay contacts in their operating positions. All terminal connections, switches, interlocks, contacts, or other relays in series with the energizing path, plus lamps or indicators (electrically connected in the energizing or indicating status of contact closures), shall be shown. The following note shall appear on all control diagrams: "All switches and relay circuits are shown in operating positions." In cases of multiple operating positions, switch and relay positions shall be explained by a specific note on the diagram.

3.7.8.2.10 Logic diagrams. Logic diagrams shall be provided for digital devices and digital circuitry of electronic equipment in accordance with IEEE 991. Distinctive shapes shall be utilized. Internal and external data shall be included. Logic diagrams shall cover digital functions such as input-output control, memory control, data transfer, clock-pulse generation and distribution, and so forth. Emphasis shall be placed on functional development and presentation rather than on hardware groupings. See figure 28.

3.7.8.2.10.1 Basic logic diagrams. Basic logic diagrams shall depict logic functions with no reference to physical implementations. Basic logic diagrams shall consist primarily of logic symbols that are used to simplify logic relationships to make them comprehensible. Non-logic functions are not normally shown.

3.7.8.2.10.2 Detailed logic diagrams. Detailed logic diagrams shall depict all logic functions and non-logic functions, socket locations, pin numbers, test points, and other physical elements necessary to describe the physical and electrical aspects of the logic. The symbols shall be connected by lines that represent signal paths. The diagrams shall illustrate signal priority based upon the function of the equipment.

3.7.8.2.10.3 Digital logic diagrams. Digital logic diagrams shall illustrate logical functions of modules, nests, and assemblies. Design or engineering drawings shall be used as source data to develop digital logic diagrams. Diagrams shall illustrate combinational, storage, delay, and sequential functions to define processing of variable signal input(s) and resultant output(s). Graphic symbols for logic diagrams shall be in accordance with IEEE 315.

3.7.8.2.11 Maintenance schematic diagrams. Maintenance schematic diagrams (see figure 29) shall include unit-to-unit interconnection diagrams, intra-unit interconnection diagrams, and unit, assembly, and subassembly (see 6.4.18) schematic diagrams. Complete coverage of the equipment shall be provided by these diagrams. Maintenance schematic diagrams shall be prepared as follows:

- a. The schematic diagram for each unit shall be drawn so that, together with the interconnecting diagrams, all circuit elements are included and all circuits can be traced from unit to unit.
- b. Schematic diagrams may be zoned by alphanumeric coordinates in accordance with 3.7.8.4.8. For diagrams containing more than 100 parts, the location of all circuit elements by zones shall be included in a table located on the apron or included as a link. When a part is drawn in sections at different locations, list as many coordinates as necessary to locate all sections.

## MIL-DTL-24784C(NAVY)

- c. Major and minor signal paths shall be represented by different line weights. The heavier line weight shall show the major signal path. Whenever possible, signal flow shall be from left to right and from top to bottom. Arrowheads denoting the direction of signal flow shall be placed on the signal flow lines.
- d. The use of ground and voltage buses is discouraged except in the power supply. However, voltage bus connections can be shown by broken lines directly beneath the connection. As a substitute for ground buses, individual grounds shall be used and appropriate notes shall be included to indicate sources. If separate AC, DC, and signal grounds are actually used in the equipment, they shall be shown by keyed symbols.
- e. All significant voltages at buses, tube pins, transistor elements, and so forth, shall be shown except when this data can be presented best in a voltage chart (see j below). Indicate whether the voltage is AC or DC; DC voltages shall be shown by polarity. Where critical voltages occur within the equipment, tolerances for those voltages shall be shown in the illustrations.
- f. The functional names of all operating controls and adjustments shall be conspicuously marked on the schematic. For example:

VERT CENT

BIAS ADJ

In addition, any operating front panel markings on the equipment shall be set off in a rectangular box. For example:

RF GAIN

AGC ADJ

The functional name of all stages (tubes, transistors, and so forth) also shall be included.

- g. The function, source, and destination of all input and output circuits shall be identified and indicated by figure number.
- h. Power and signal frequencies shall be designated in hertz (Hz). Resistance values, if more than 1 ohm, shall be noted for all wire-wound devices such as motors, relay coils, and transformers.
- i. Rated current and voltage values of primary and secondary windings of power transformers shall be indicated.
- j. A resistance and voltage chart for a schematic diagram shall be provided on the apron or on preceding page size pages, or provided as a link. This chart shall give the normal resistance and voltage to ground (or other points of significance) for each tube socket pin. In addition, list all conditions that affect the resistance or voltage values given, such as control settings, equipment connections, tubes removed from sockets, and so forth. If semiconductors (transistors, diodes, and so forth) are employed in circuits, adequate caution notices shall be included to prevent damage to these devices when making resistance measurements in the circuit. No intra-element resistance measurements (that is, between emitter, base, and collector) are required to be made on transistors. Also, resistance of power supply buses and other points of significance shall be indicated.
- k. Each schematic diagram shall be identified by the reference designation number, located in the lower right-hand corner of the image area.
- l. Schematic diagrams shall be presented in alphanumeric order corresponding to the referenced designation of units, assemblies, subassemblies, and so forth. When two or more identical assemblies, or modules are used, redundant schematic diagrams need not be repeated. However, a table that cross-references the reference designation to the figure number of the common schematic diagram shall be provided immediately preceding the schematic diagram. For identification purposes schematic diagrams covering more than one unit, assembly, or module shall include all the reference designations of the unit, assemblies, and modules to which they refer and shall be located on either the apron, a convenient location of the illustration, or provided as a link.

## MIL-DTL-24784C(NAVY)

- m. Circuit elements shall be grouped functionally and arranged to make signal flow obvious from left to right and top to bottom. Circuit elements shall not be arranged to fill up white space or to maintain tube or transistor alignment. Circuit elements shall be arranged in textbook form for the convenience of the user. Layout shall not be distorted to achieve fit.
- n. Breaks in lines shall be used as frequently as possible to avoid cluttered diagrams. Add necessary notes or text to explain how to use break symbols, where to find mating ends of broken lines on drawings, and so forth.

3.7.8.2.12 Mechanical schematic diagrams. These diagrams shall show sufficient detail to explain the operational sequence and arrangements of a mechanical device including the electrical control circuits. Nomenclature, symbols, Part Identification Number (PIN) (see 6.4.15), and necessary descriptive data shall be shown as required. Gears, shafts, clutches, levers, mechanically-driven switches, motors, synchros, and so forth, shall be shown in functional arrangement. Gear ratios or number of teeth and direction of rotations, and so forth, shall be given. Symbols used on these diagrams shall conform to ASME Y32.18.

3.7.8.2.13 Simplified electrical and electronic schematic diagrams. These diagrams (see figures 30 and 31) shall show, by means of graphic symbols, the electrical connections and functions of a specific circuit arrangement. These diagrams shall be arranged functionally to show the operation of the circuits in the same manner as illustrated in the IETM for Navy Installation and Maintenance (N0002400003).

3.7.8.2.14 Hydraulic and pneumatic schematics. Hydraulic system diagrams (see figure 32) shall be developed in accordance with SAE J1780. Where necessary, hydraulic and pneumatic schematics shall be prepared as orthographic diagrams and pattern coded to show hydraulic and pneumatic devices, and associated mechanical and electrical devices and actuating mechanisms, using standard symbols where possible. The illustration shall be developed for color symbolization only if such patterns are not adequate and if the acquiring activity authorizes use of color (see 3.7.8.4.13). A series of hydraulic schematics shall show mechanical actions and sequential functions of parts through a complete cycle. Arrows shall be used to show directional flow.

3.7.8.2.15 Single-function diagrams. Single-function diagrams (see figure 33) for nonprogrammable devices which result in a unique output function may be prepared to the requirements of signal flow diagrams (see 3.7.8.2.15).

3.7.8.2.16 System data function diagrams. System data function diagrams shall show in detail the system information needed to isolate faults within signal or data flow paths. Data function diagrams shall include tolerance values and shall contain references to equipment publications where necessary. All inputs required to develop the output shall be shown. The data function diagrams shall be constructed in accordance with 3.7.8.2.17.

3.7.8.2.17 Signal flow diagrams. Signal flow diagrams (see figure 34) shall consist of detailed block diagrams illustrating the functional development of each major function (see 6.4.13) from its origin to its measurable output. The flow path shall begin with one or more initial inputs (or appropriate interface conditions) and proceed through each unit, assembly, and subassembly influencing the signal flow. Each hardware level block shall reference a schematic diagram to isolate the faulty part. All items shown on the signal flow diagram shall be identified by their reference designations. The following shall apply.

- a. Titles of diagrams shall correspond to the signal flow described.
- b. Diagrams shall depict such signal flow as: receive, transmit, RHI display, PPI display, bearing data, antenna rotation, elevation data, and so forth.
- c. All test points necessary to isolate the trouble to the lowest level of hardware block shall be shown. Include test parameters required to define satisfactory operation. Where signal flow diagrams depict signal flow in more than one mode of operation, data for all modes shall be presented on the apron or provided as a link. Apron notes (or a linked table) shall also include test data for test equipment setup. All inputs and outputs shall have signal description information.
- d. References shall be made to the functional description, troubleshooting procedures, corrective actions, and so forth, as appropriate, by paragraph number (as applicable) or a link to the paragraph. Normally these references shall be included with the notes.

## MIL-DTL-24784C(NAVY)

- e. The display of more than one function or mode of operation on one diagram shall be allowed only if clarity is not sacrificed and the functions are relatively simple.
- f. Screwdriver adjustments, dial adjustments, and adjustable controls shall be shown.
- g. The reference designations shall be placed in each hardware block. Reference to the figure number of the schematic diagram shall be placed adjacent to the reference designation.
- h. All input and output signals, connectors, and terminals in the signal path shall be shown. Identify the signal, and show all lead numbers, connector numbers, and terminal identifiers.
- i. All built-in controls and monitoring devices shall be shown. Do not show external test equipment, unless it is a permanent part of the equipment.
- j. Hull grounds, chassis grounds, signal grounds, and power grounds shall be shown.
- k. All leads of components such as motors, generators, synchros, and so forth, shall be identified.
- l. All relay coils that are energized by the signal shall be shown.
- m. All relay contacts and relay terminals in the flow path shall be shown and identified. All relay contacts shall be depicted in operational mode. References to control diagrams on which the relay coils appear shall be shown adjacent to the relay contacts.
- n. All switches that affect signal flow shall be shown and identified. Switch terminals and panel markings corresponding to the switch positions shall also be shown.
- o. Mechanical couplings of all controls, switches, potentiometers, synchros, and so forth, shall be shown.
- p. Signal paths shall be identified by weighted lines and arrowheads.
- q. Test instruction procedures and test data shall be shown on the apron of the diagrams or provided as a link.

3.7.8.2.17.1 Types of signal flow diagrams. Signal flow diagrams shall be either a physical dependency type or a functional dependency type.

- a. Major subdivisions on the physical dependency type shall be shown as either cabinet, chassis, or unit limits indicated by broken lines.
- b. Functional dependency type, as it relates to functional dependency boxes are shown in solid lines.
- c. The method selected shall remain consistent for all signal flow diagrams in the manual. When the cabinet or chassis limit method is used, both diagrams shall refer to schematic diagrams but they shall not necessarily group test and testable points together.
- d. The determination of descriptive limits, physical or functional dependency, shall result from the maintenance analysis.

3.7.8.2.17.1.1 Types of elements on signal flow diagrams. The following functional elements such as connections, monitoring devices, and test points with values, are to be shown on signal flow diagrams, as applicable.

- a. All adjustable parts or subassemblies. Identify any screwdriver setting, dial setting, or adjustable knob.
- b. Amplifiers. Identify all leads or terminals that are part of the depicted signal flow.
- c. Chassis and cabinet (unit) limits. Show the enclosures where the functional elements are installed. Identification of cabinets, major assemblies, and chassis within a cabinet, including unit designations, shall be placed in the upper left-hand corner of each outline. Reference to schematics shall be placed immediately below the unit designation.
- d. Coaxial cable and waveguides. Label the signal being transmitted and show significant functions.
- e. Inter-cabinet and intra-cabinet connections. Label all connections other than soldered joints. Identify the lead, connector, or terminal number of both sides of the connection. Where the location of the connection in an equipment is obvious from adjacent unit limits, it need not be indicated beside the connection; but, where it is not obvious, added information identifying the physical location of the connection shall be placed adjacent to the symbol.

## MIL-DTL-24784C(NAVY)

- f. Dials and meters. Show dials and meters, that are a physical part of the equipment as required by engineering layout, as quick-look features with the panel nomenclature within the quick-look box. Meters that have to be plugged in to take a measurement shall be excluded.
- g. Fire control symbols and mathematical quantities. Identify all applicable quantities defined in NAVSEA OP 1700 by the corresponding standard fire control symbols. The preparing activity's symbols, where different, or mathematical quantities shall be entered beneath the standard symbols.
- h. Grounds. Differentiate between hull ground, chassis ground, and common returns. Use appropriate symbols and identifiers, which shall be specifically identified in apron notes, identified on the graphic itself, or provided in a link.
- i. Hand-set values for static tests. Indicate hand-set values by use of a rectangular box tied with a dashed line to the generation path signal to indicate the mechanical connection. The rectangular box shall contain the panel nomenclature of the dial, indicator knob, and the hand-set values below the nomenclatures. If more than two values are to be shown, see n below.
- j. Motors and generators (electrical). Do not show any internal parts of electrical motors and generators, but identify all leads.
- k. Potentiometers. Give the range of the potentiometer if it is restricted to less than full travel. Show mechanical coupling if motor-driven.
- l. Relay coils and solenoids. Give the reference designation or other specific identifiers. Identify coil terminals.
- m. Relay contacts. Identify the energizing bus above and give the relay reference designation below. Identify associated terminals. All contacts shall be depicted assuming the relays in de-energized condition, unless otherwise specifically and clearly noted.

## NOTE

When relay pin or terminal identification is difficult because of a specialized type of relay, a relay pin identification diagram shall be provided that presents a schematic bottom view of the relay(s) shown on the signal flow diagram. The pin or terminal identification diagram shall be located on the apron of the signal flow diagram if space permits, otherwise the information shall be placed on a separate sheet ahead of the signal flow diagram, on the graphic itself, or provided in a link

- n. Readout values for static tests. If only one or two problems are used, show values in a box representing the test point or dial (see i above). If more than two problems are used, indicate the panel nomenclature of the readout device in the box and place the values for the respective problems in a table on the apron as a specific note or provide as a link.
- o. Scale factors. Show scale factors where applicable, such as, at outputs of computing amplifiers, computing potentiometers, and resolvers. For transformers where scale factor values are involved, show the relative values at both the primary and secondary windings.
- p. Switches. Identify switch terminals. Identify actuating condition for other than manually actuated switches, including pressure limits for hydraulically or pneumatically actuated switches.
- q. Summing network. Identify leads or terminals of summing networks. Show impedance value or ratio to unit impedance for each input lead, as applicable.
- r. Terminal boards. Identify the terminal board. Show only the terminals that apply to the circuit. Identify leads or terminal numbers, as applicable.
- s. Testable points. Identify all applicable testable points. Give the same information for a testable point as required to be illustrated for a built-in test point jack.
- t. Transformers. Indicate both primary and secondary sides; identify all leads or terminals.
- u. Synchros and resolvers. Identify the functional type of synchro. Identify all leads. Show mechanical coupling if motor-driven. Indicate relative speeds when multi-speed synchros are used.

## MIL-DTL-24784C(NAVY)

- v. Valves. Illustrate fluid transmission from valve ports in path of signal flow. Give pressure limits for pressure control of bypass valves.
- w. Pumps or compressors. Illustrate pump in operation giving flow rate. Also indicate pressure, if pressure control is integral with the pump.
- x. Mechanisms. Illustrate mechanisms, as required to show continuity and sequence of mechanical actions, contributing to the output function.
- y. Flasks or accumulators. Indicate working pressure range of flasks and accumulators. Also give allowable overall leakage rate, if applicable.
- z. Motors and actuators (hydraulic or pneumatic). Include as required.
- aa. Fixed resistors, capacitors, and coils. Fixed resistors, capacitors, and coils shall be shown if their presence contributes significantly to modification of the signal. These components need not be identified by reference designation or value unless they reveal a test point; in which case, a validated waveform or voltage shall be provided.

3.7.8.2.17.1.2 Cross-referencing in signal flow diagrams. Cross-referencing in signal flow diagrams shall be in accordance with the following. Where substantial portions of circuitry or mechanism are common to two or more output functions, or in different modes of operation for the same output function, the common portion of generation paths shall be shown on one diagram and cross-referencing used for referring to the common points from other signal flow diagrams.

- a. Each signal break, whether a point of coincidence between diagrams or between sheets of the same diagram, shall be identified by the name of the signal or by specific connecting terminals to permit cross-referencing. Except where lines cross from one sheet to the following sheet, signal flow diagram zones shall be included in the reference and referenced points need not be brought out to either end of the sheet.
- b. Since the signal flow diagrams are read in either direction, a TO or a FROM notation shall be given at each signal break. For each end of a break, the choice of TO or FROM shall be in accordance with the direction of flow in that path.
- c. In those instances where referencing is required and the signal does not have a name, a common referable point or a connecting terminal between changing sheets, use an upper case letter inside a circle to indicate where the signal path stops on one sheet and picks up on another. The reference notes shall include the circled letter.
- d. In those instances when a signal flow between the point of origin and final output become modified by an interfacing equipment, depict the logic treatment of that signal within the interfacing equipment.

3.7.8.2.18 Power distribution diagrams. Power distribution diagrams shall depict the distribution of primary AC power, secondary AC power, and DC power from the terminal board, breaker, or fuse box to the various assemblies, subassemblies or modules of the equipment (see figure 35). Normally, a separate diagram shall be developed for each voltage level used within the equipment. The following rules apply in the preparation of power distribution diagrams:

- a. Show and identify motors, transformers, regulators, power supplies, assemblies, subassemblies, and modules.
- b. Show and identify all power line devices such as fuses, circuit breakers, switches, and relay contacts.
- c. Show and identify all connections including plugs, jacks, and terminal boards in the distribution path.
- d. Use dot and dash lines to set off hardware boundaries such as units, assemblies, and subassemblies. Identify each unit, assembly, and subassembly by reference designation. Include a figure reference to the schematic diagram covering the unit, assembly, and subassembly.
- e. Reference all relay contacts to the appropriate control diagrams. All relay contacts shall be shown in the operating condition.
- f. Include voltages and tolerances, as required.
- g. Show and identify all metering circuits and indicators.
- h. Show all grounds, commons, neutrals, and return lines.

## MIL-DTL-24784C(NAVY)

- i. Display the power path from left to right and from top to bottom, whenever practicable.
- j. Mark the functional names of all “main line” switches and circuit breakers. In addition, set off any power control markings engraved or stenciled on the equipment in a rectangular box, for example:

MAIN POWER

- k. Show all relay coils in series with the main power distribution path. Relay control circuits shown on control diagrams need not be repeated on distribution diagrams.

3.7.8.2.19 Timing circuit diagrams. Timing circuit diagrams (see figure 36) shall be provided for all significant timing relationships. These diagrams shall show the exact timing relationships and the origins of all timing signals (conventional and digital).

3.7.8.2.20 Piping diagrams. Piping diagrams (see figure 37) shall be developed for fluid cooling, air, gas, steam, oil, and hydraulic systems. Symbols for hydraulic systems shall be in accordance with SAE AS1290. These diagrams shall show, when significant, flow rate, temperature, pressure, and all devices that measure, control, or modify the flow.

3.7.8.2.20.1 Simplified piping diagrams. These diagrams (hydraulic, pneumatic, or fluid) shall show the interconnection of components by piping, tubing, or hose and, sequential flow in the system. Pumps, heat exchangers, valves, gauges, and so forth, shall be clearly identified.

3.7.8.2.20.2 System piping run diagrams. Isometric diagrams shall be used to indicate the location of all system piping runs between compartments and areas. Each piping run diagram shall indicate by deck, compartment, and frame identification the location of all pipes, valves, fittings, tanks, and so forth.

3.7.8.2.21 Interconnection diagrams. Interconnection block diagrams (see figure 38) shall be presented with each equipment or component shown as a block. All cables running between equipments shall be identified by cable number. The number of active and spare leads in each cable shall be included. The illustrations shall also indicate all junction boxes, switchboards, and so forth, into which interconnection cables enter or leave.

3.7.8.2.22 Cable run diagrams. Isometric diagrams shall be used to indicate the location of all cable runs between compartments or areas. Each cable run diagram shall indicate by deck, compartment, and frame identification the location of all cables shown on the interconnecting diagrams (see figure 39).

3.7.8.2.23 Wiring diagrams and wire run list. Wiring diagrams (see figure 40) and wire run lists shall be arranged functionally. When wiring diagrams are included in a manual, wire run lists shall not be included.

3.7.8.2.24 Parts location illustrations. Illustrations shall be included to provide positive and rapid location of parts. Types of parts location illustrations include exploded views, sectional views, engineering drawings, and illustrations of printed-circuit boards, as applicable.

3.7.8.2.24.1 Exploded views. Exploded view isometric drawings shall be used whenever necessary to show the proportionate size of machinery parts, proper relation to other parts, and assembly or disassembly sequence. It is preferable that all parts be exploded in isometric projection of their line of assembly axis. Exploded views (see figure 41) of the equipment shall be used in parts breakdowns and for reference in disassembly and assembly instructions. Index numbers shall be used to identify parts. If the equipment is of such a nature that it cannot be adequately illustrated by a single exploded view, it shall be exploded by subassemblies as separate views. In such cases, an exploded view showing the complete equipment exploded into its major subassemblies shall be shown first. Parts that attach and connect the major assemblies together shall be shown on the exploded view illustration. These views and those in parts breakdowns shall be the same, with the sequence of index numbers in the order of disassembly. Parts in an exploded view shall be shown in proportional size. The spacing of parts shall achieve maximum clarity and effective use of space. The relationship of parts shall be shown by the use of assembly lines where the main line of exploded parts has been broken into two or more groups for convenience of layout. Leader lines and index numbers shall be used to assist in locating parts. Parts for which disassembly is not required, such as wafers, switches, and so forth, need not be exploded.

## MIL-DTL-24784C(NAVY)

3.7.8.2.24.2 Sectional views and location drawings. Sectional views may be illustrated for units with few components as long as clarity is not sacrificed (see figure 42). Sectional views or item location drawings shall be used to indicate where critical measurements shall be taken or when the information presented is easier to understand when depicted as a cross-sectional view. As a rule, sectional drawings are not needed when isometric drawings are available.

3.7.8.2.24.3 Printed-circuit board. Printed-circuit boards shall be illustrated foil side up. When printed wirings appear on both sides of the board, both sides shall be illustrated. All parts mounted on the board shall be outlined in black solid (front) or dashed line (rear) (even though mounted on the reverse side of the board) and their connections to the printed wiring clearly illustrated. If insufficient room exists, separate illustrations, top and bottom views, shall be provided. Each part shall be labeled with the applicable reference designation. To facilitate parts location, a locating grid and corresponding guide chart shall be provided when more than 30 items are mounted on a board. See figure 43.

3.7.8.2.25 Line graphs. Line graphs shall conform to the following:

- a. The number of ideas conveyed per graph shall be minimized. Line graphs shall have a maximum of four lines (that is, lines that show the relationship of variables). Such lines shall be coded for easy identification.
- b. If there is a natural orientation for the axes (for example, altitude on vertical axis), the axes shall be so oriented.
- c. Grid lines shall support the intended use (that is, more grid lines shall be provided where accurate interpretation is required). Grid lines shall be no less than 0.1 inch apart when reduced to final size and shall be lighter than the graph line.
- d. Graph scales shall be linear unless nonlinear are required for proper comprehension and use. They shall include the zero value of the variables. One line break may be used per scale in order to include the zero value if this saves space without jeopardizing clarity.
- e. For complex graphs, instructions shall be provided for use and interpretation.

3.7.8.3 General graphic requirements. The following paragraphs provide general requirements applicable to all graphic types.

- a. Illustration use. Liberal use of illustrations is encouraged to ensure clarity of descriptive text and procedural steps. Exploded views shall be used to the greatest extent possible. Redundant drawings shall not be included. When only a part of an existing drawing is required, only that section of the drawing shall be provided.
- b. Multiple use of illustrations. Whenever possible, one illustration shall be used in support of two or more requirements. For example, illustrations prepared to support the parts list data shall be used to support the maintenance procedures. However, additional illustrations may be developed to support the maintenance procedures if the parts list illustration does not adequately provide the guidance to perform the maintenance procedures.
- e. Illustration consistency. A standard referencing system for associated text, signal flow, and equipment nomenclature shall be used between illustrations and text. Standard graphic symbols shall be used when possible. If special graphic symbols are required, they shall be made visually distinctive from other graphic symbols used and included in a special symbols chart. Official nomenclature shall be used for hardware, controls, indicators, switches, etc. Consistent, standard nomenclature shall be used for functions, signals, etc.
- d. Illustration placement. Refer to Appendices A and B for specific requirements.
- e. Illustration titles. Illustrations shall be assigned figure titles. The title shall follow two spaces after the figure number. The title shall be centered below the applicable illustration (except for foldout figures) (see 6.4.8). The first letter of the first word and of each principal word shall be capitalized. Figure titles shall begin with an identifying name when applicable. For example:

“Figure 3-1. Guidance System Gyroscope Assembly.”

## MIL-DTL-24784C(NAVY)

The title shall be short and describe the contents or purpose of the illustration. Illustrations applicable to one Service, in a manual that will be used by more than one Service, shall be identified. For example:

“Figure 2-3 (Navy Only). Fuel Indicator.”

- f. Material or parts list. When applicable, a material or parts list shall be included on the illustration. Only those parts referenced in the supporting text shall be identified on the illustration. All parts shall be listed on the illustration when specifying disassembly in accordance with disassembly sequence numbers.
- g. Acceptability of drawings and illustrations. Engineering drawings and illustrations that are not prepared primarily for TM illustration purposes are acceptable if the copy print is legible, reproducible, and readable when reduced to manual size. All irrelevant material shall be removed.
- h. Signal flow. Signal flow, especially for electrical and electronic equipment, critically affects the understandability of diagrams. To assist the TM user in following the diagram, where possible, major signal or pressure flow shall be from left to right, and feedback or return flow shall be from right to left.
- i. Drawing reduction. Drawings that are to scale but not dimensioned shall be reduced for inclusion in the manual. A line approximately three to six inches long, indicating the actual scale of the subject drawing, shall be added to the drawing before reduction. The scale shall then be reduced in the same proportion as the drawing.
- j. Drawing identification. Drawings reproduced or modified from an existing approved blueprint or drawing shall contain information identifying the drawing.

#### 3.7.8.4 Illustration details.

3.7.8.4.1 Lettering and line spacing. Lettering and line spacing shall be accomplished in the following manner:

- a. All lettering on the diagrams shall be uppercase sans-serif 8-point minimum.
- b. Lowercase lettering shall not be used for general lettering on a diagram. Lowercase letters may be used when:
  - (1) Lower case lettering appears on the physical part (such as connector pins).
  - (2) Symbols requiring lowercase letters are used on drawings.
  - (3) Signal names contain lowercase letters such as an abbreviation like “Db”.
- c. The distance between two lines must at least be equal to the sum of the thickness of these lines

3.7.8.4.2 Border rules. Border rules shall not be used for single illustrations, but shall be used to separate multi-section illustrations on the same graphic.

3.7.8.4.3 Use of human figures. Where it is necessary to illustrate an operation, procedure, or installation, illustrations may include a human figure or parts of the body. Jewelry shall not appear in any illustration. The human figure shall not be permitted to obscure details of the equipment necessary for a complete understanding of its operation. The human figure shall be clothed as designated by the Government. A cross section of races and sexes shall be used.

3.7.8.4.4 Credit lines. The artist’s name shall not appear on any artwork; neither shall a manufacturer’s name, symbol, or trademark appear on artwork for the purpose of identifying the illustration. A contractor’s identification number may be used. When used, such numbers shall be in approximately 4- to 6-point type and placed in the lower right-hand corner of the illustration sufficiently removed to avoid being confused as part of the illustration or margin data.

3.7.8.4.5 Callouts. Index numbers, reference designations, nomenclature, leader lines, legends, and so forth, shall be used, when necessary, to identify significant features. Leader lines and arrows may be used, in combination with the callouts, to enhance the illustration. Type size shall be no smaller than 8-point and no larger than 10-point. Lettering shall be in upper case. Nomenclatures shall appear on illustrations only if it can be done without crowding or reducing type size so as to make reading difficult. Callouts shall be placed in the background areas of illustrations when practical. Care shall be taken not to introduce clutter and distractions.

## MIL-DTL-24784C(NAVY)

3.7.8.4.5.1 Index numbers. Index numbers for each separate figure shall start with Arabic numeral 1 and continue consecutively. All multi-sheet illustrations shall be considered one figure. Sequence on exploded views used to show assembly or disassembly shall be in disassembly order. Otherwise, sequence shall be from top to bottom or clockwise, when possible. All functional items shown on exploded views shall be identified except for exploded views used for disassembly or assembly. When an illustration is changed, index numbers added between existing numbers may be the same as the preceding index number with added alpha characters (e.g., 22A, 22B). This system may also be used in basic manuals when errors are discovered so late in preparation that renumbering of all following index numbers would delay submittal.

3.7.8.4.5.2 Nomenclature. Nomenclature of more than one line shall have the left margin justified. All lines of copy shall parallel the horizontal edges of the figure, whenever possible. When applicable, a cross reference shall list the official nomenclature and its corresponding acronym or general usage nomenclature.

3.7.8.4.5.3 Leader lines and arrowheads. Leader lines and arrowheads may end close to the callout and object, or may touch the objects to which they apply. Lines shall be uniform, short and straight as possible; however, dogleg shaped lines are permitted. Lines and arrowheads shall not cross or come in contact with other callout lines or arrowheads nor shall they obscure essential details. A line shall be highlighted or changed from black to white to make the line easier to follow. Arrowheads may be added for clarity. Arrowheads shall be uniform in shape and size.

3.7.8.4.6 Legends. Only that information which is necessary to clearly identify the items shall be included in a legend.

3.7.8.4.7 Reference designations. Where applicable, reference designations shall be included. Reference designations marked on equipment take precedence.

3.7.8.4.8 Zoning on diagrams. Diagrams containing the symbols for more than 100 parts shall be zoned. Diagrams shall be divided into equally spaced horizontal zones (ordinates) designated A, B, and so forth, from bottom to top along the outside left and right borders. Diagrams shall be divided into equally spaced vertical zones (abscissa) designated 1, 2, 3, and so forth, from right to left along the outside top and bottom borders. The zone size shall be as needed to clearly locate referenced points.

3.7.8.4.9 Notes for diagrams. Notes on diagrams shall be confined to clear spaces of the image area. Notes for foldout diagrams, with the exception of installation control drawings, shall be placed on the apron. Notes shall be identified with the legends GENERAL NOTES and SPECIFIC NOTES, as applicable. General notes shall precede specific notes and shall be identified by capital letters (A, B, and so forth). Specific notes shall be identified by Arabic numerals (1, 2, and so forth).

3.7.8.4.9.1 General notes. General notes shall apply to the entire diagram and shall appear only on the first sheet of multi-sheet diagrams. No reference shall be made to general notes from the diagram or from specific notes. Examples of general notes are: the general instructions for positioning switches and a list of the test equipment needed to take measurements.

3.7.8.4.9.2 Specific notes. Specific notes shall apply only to a specific item on the diagram. Specific notes shall be repeated on each sheet of a multiple sheet diagram to which they apply and it shall not be required to refer to a specific note on another sheet of a diagram.

3.7.8.4.10 Multi-sheet illustrations. Illustrations having multiple sheets shall be assigned sheet numbers starting with the number one (1). The first sheet of a multi-sheet illustration shall include the total number of sheets following the figure title [for example: Figure 1. Power Distribution (Sheet 1 of 4)]. The remaining sheets shall be numbered in consecutive order such as "(sheet 2), (sheet 3)" and so forth.

3.7.8.4.11 Multi-section illustrations. Each section of a multi-section illustration shall be identified by a capital letter. Sections may or may not be captioned, but if one section is captioned, all shall be captioned. Each caption, with the identifying letter as its first character, shall be centered with respect to the section to which it applies. Where captions are not used, the identifying letters shall be centered. Identifying letters and captions shall be larger and bolder than any other lettering on the illustration. Sections shall be separated by lines. Separation by shading shall not be used. See figure 44.

## MIL-DTL-24784C(NAVY)

3.7.8.4.12 Cartoons. Generally, the use of animated drawings and other visual techniques are permitted. Animated drawings shall not include copyrighted cartoon characters (see Appendix B). Such presentations must serve a functional purpose.

3.7.8.4.13 Color in illustrations. The use of color illustrations is discouraged. When color is authorized, it shall be in accordance with A.2.9.2.2 and A.4.9.1.2. When color is not authorized, shadings, cross-hatchings, and patterned lines may be used instead of color.

3.7.8.4.14 Photographs and line drawings. Line drawings may be used in lieu of photographs. The use of a photograph instead of a line drawing shall be determined by the practical considerations of the purpose and suitability of the illustration in the publication. Existing illustrations and engineering drawings shall be used where they meet the requirements of this document. In the early development of equipment, a line drawing may be prepared from the source data if the equipment is not available for photographing.

3.7.8.4.14.1 Photographic details. When specified for use, photographs shall be detailed and sharp, free of heavy shadows, distorted objects, cluttered foregrounds or backgrounds, and give good contrast from white, middle tones, and black.

3.7.8.4.14.1.1 Retouching. Photographic retouching shall be held to a minimum. Retouching shall be used only to emphasize detail, exclude unwanted detail, correct slight photographic defects and eliminate undesirable shadows for those portions of the photograph related to the text only. Quality of retouched photographs shall be such that tonal values are held when reproduced.

3.7.8.4.14.1.2 Prescreened photographs. When approved by the Government, prescreened photographs are acceptable as reproducible copy provided they will not be re-screened and are of proper quality, size, and mounted on the reproducible copy of the text page or margin data. When prescreened photographs are used, artwork will be clearly marked to indicate prescreening. Unscreened continuous tone photographs and original artwork shall be supplied, with reproducible copy, as specified by the contract.

3.7.8.4.14.2 Line drawing details. The darkness and sharpness of lines shall be sufficient to reproduce clearly without additional treatment. Parallel lines on wiring and schematic diagrams shall in no case, be less than  $\frac{1}{16}$ -inch apart when reduced to final size. Secondary lines, such as those used to indicate extensions or measurement, shall be lighter but strong enough to reproduce clearly. Shading may be used to give substance and form to the item depicted, to sharpen the contrast between the subject and its background or to increase effectiveness. Shadows shall be used only when necessary to provide a clear understanding of form, shape, or depth. Shading effects shall not be used for decorative purposes. Accented lines may be used to emphasize detail. Lines, cross-hatching, or mechanical patterns used for coding shall remain clearly defined when reduced to final size.

3.7.8.4.15 Designations, diagrams, and symbols. Designations, diagrams, graphic symbols and letter symbols shall be consistent and the source or reference for these items shall be identified.

3.7.8.4.16 Continuous tone artwork. When specified for use, such artwork, whether photograph or drawing, shall be clear in detail, sharp in contrast of tones and with light and shadow in proper relation to a consistent light source. The background shall be an intense white. It shall extend the full width and depth of the artwork.

3.7.8.4.17 Combination artwork. Presentation of a subject by combining photographs or continuous tone artwork with line drawings shall be limited to where this presents the subject more accurately or more clearly.

3.7.8.5 Changes to illustrations. When changes are made to illustrations, the original artwork shall be used unless the development of new artwork is less expensive.

3.7.8.6 Review of illustrations. Illustrations shall not be furnished separately for review. If a publication is reviewed, illustrations forming a part of the publication shall be included in the review.

3.7.8.7 Graphic format. Vector formats are preferred for all new 2-D drawings, schematics, and illustrations and should be either Computer Graphic Metafile (CGM), delivered in accordance with ISO/IEC 8632 and the implementation profile specified by WebCGM 1.0 Second Release W3C Recommendation or Scalable Vector Graphics (SVG) delivered in accordance with Scalable Vector Graphics (SVG) 1.1 Specification W3C Recommendation. SVG is preferred for vector graphics requiring animation or gradients.

## MIL-DTL-24784C(NAVY)

3.7.8.7.1 Graphic format (raster). While generally discouraged for new acquisition, legacy 2-D drawings, schematics, and illustrations may use raster images (e.g., TIFF, BMP, GIF, JPEG) for the simple capture of existing drawings not already in an acceptable vector format. Raster graphics should not be used:

- a. Where there is a requirement for navigation (hot-spotting, hyper-linking) within the image.
- b. Where there is a requirement to attach metadata or added information to text or graphic elements within the image.

Legacy applications may continue to use MIL-PRF-28002, Types 1, 3, and 4. Type 2, the ODA/ODIF format (CAL S Type 2) included within MIL-PRF-28002, should not be used. For more information refer to the Guidance on Acquisition and Conversion of Product/Technical Data to Digital Form in the DON Policy on Digital Product/Technical Data. The C4 format (CAL S Type 4) is the preferred legacy format for raster engineering drawings within JEDMICS (Joint Engineering Data Management Information Control System) and ATIS (Advanced Technical Information Support). The Navy Image File Format (NIFF) is also acceptable for drawings and schematics.

3.7.9 Style and format for revisions. The following are general requirements applicable to all TM types. Refer to Appendices A and B for unique requirements.

3.7.9.1 Renumbering and removal. All pages, paragraphs, illustrations, and tables shall be renumbered, as necessary, to eliminate all number suffixes and to establish correct sequence except when use of the manual will not be substantially improved by renumbering. All previous revision numbers and revision dates and revision change symbols from previous issues of the manual shall be eliminated.

3.7.9.2 Revision designator. For superseding revisions, the latest revision number as assigned by the Government, shall be placed on the cover/title page as follows: "Revision No. 1" or "Revision 1." The non-superseding revision shall be classified as "original", and shall have a unique TM identification number, as assigned by the Government.

3.7.9.3 Revision change markings. When specified by the acquiring activity (see 6.2), after all previous change markings have been eliminated, new change markings shall be inserted to identify technical changes in text, illustrations, and tables.

- a. Change markings from a previous revision shall be deleted when information is subsequently updated. Markings shall show current updates only.
- b. Change markings are not required for correction of minor inaccuracies, such as spelling, punctuation, relocation of material, renumbering, unless such correction changes the meaning of the information.
- c. Updates to the text and tables shall be indicated by a vertical line (change bar) opposite the updated, deleted, or added text.
- d. As specified by the acquiring activity (see 6.2), screens (shading), screened (shaded) boxes, or miniature pointing hands shall be used to highlight updated areas of graphics.

#### 4. VERIFICATION

4.1 TMQA program and responsibilities. The preparing activity shall establish a TMQA program to ensure the development of technically accurate and complete TMs. The preparing activity shall be responsible for the implementation of the TMQA program and for product quality. The TMQA program shall be in accordance with the ASQC Q9003 or other documented quality assurance procedures as approved by the Government. Review requirements will be specified by the acquisition documents. The preparing activity's TMQA program shall encompass the accountability for and development of quality control functions required for the management of the following TM program elements:

- a. Source data collection.
- b. Intermediate product.
- c. Participation in quality reviews and IPRs.
- d. Graphics and illustrations.

## MIL-DTL-24784C(NAVY)

- e. System software documentation and control (**IETMs only**).
- f. System capability.
- g. Validation.
- h. Internal coordination (documentation of preparing activity operating procedures).
- i. Record keeping.
- j. Verification support
- k. Final product.

4.1.1 Written operating procedures. Preparing activity personnel, subcontractors, and vendors involved in TM generation shall operate in accordance with written operating procedures. Portions of these procedures that relate directly to product quality shall be cited in the TMQA program plan, identified by name, number, and date. Such procedures shall be originated, revised, and controlled within the framework of the overall TMQA program, and shall periodically be reviewed, evaluated, and updated as required (see 4.2.1.1.6). Current operating procedures shall be made available for Government inspection (see 4.1.3.2). A plan for controlling and updating such procedures shall be presented in the TMQA program plan.

4.1.2 TMQA program organization. The preparing activity's TMQA program organization shall have well defined responsibility, authority, and the organizational freedom to identify and evaluate quality assurance problems and to recommend and initiate solutions.

4.1.3 TMQA program functions. All TM program elements and processes shall be evaluated by preparing activity and Government quality assurance personnel at various stages of development, using any or all of the following quality assurance program functions:

- a. Guidance and quality planning conferences.
- b. Quality program reviews.
- c. Quality reviews.
- d. IPRs.
- e. Validation.
- f. Verification.

4.1.3.1 Guidance and quality planning conference. The guidance and quality planning conference (also referred to as the TMQA guidance conference or start of work meeting) is conducted soon after contract award to ensure the preparing activity's understanding of applicable specifications, contract requirements, instructions, established policies, and program requirements. Such conferences may be requested by either the preparing activity or Government. Anticipated quality assurance problems will be identified and resolved at this conference. The preparing activity shall explain the proposed TMQA program, showing how the program meets all of the requirements of this specification and how the program will function to assure a quality product. The preparing activity shall also explain the classification of defects (CD) table during this conference. Attendance shall include all key Government and preparing activity personnel who will be involved in the TMQA program.

4.1.3.2 Quality program reviews. The preparing activity shall support quality program reviews as requested by the Government and provide access to QA records as specified in the TMQA program. During the quality program review, the preparing activity shall demonstrate to the Government the operation of the TMQA program, and establish that product quality reviews are being correctly implemented, defects are being identified, and appropriate corrective actions are being taken. This shall include review of data generated during preparing activity quality reviews and quality related reports and records. TMQA program reviews chaired by a Government representative shall be conducted at the preparing activity's facility. All quality review results will be documented by the Government. Quality program reviews should not be confused with technical reviews of TMs.

4.1.3.3 Quality reviews. The preparing activity's QA organization shall conduct quality reviews to ascertain compliance with the TMQA program and provide for corrective action. Quality reviews shall be conducted to evaluate the availability and adequacy of materials, processes, procedures, and intermediate products that constitute TM development.

## MIL-DTL-24784C(NAVY)

4.1.3.3.1 Corrective action. The preparing activity shall initiate a process of corrective action for all recorded and detected deficiencies. The preparing activity shall implement preventive action programs to counter any apparent deficiency trends. The detection of deficiencies that are recognized and are not cited in the classification of defects (CD) table shall be added. Objective evidence of the effectiveness of the corrective action program for each deficiency shall be maintained.

4.1.3.3.2 Source data control. The preparing activity shall ensure source data is controlled through a systematic management and recording process to ensure the presence, accuracy, currency, and completeness of the source data utilized for TM development.

4.1.3.3.3 Task identification matrix or equivalent. The preparing activity shall ensure the TM content and organization is consistent with a task identification matrix or equivalent. The task identification matrix or its equivalent shall be used to ensure that all required levels of maintenance are sufficiently detailed and complete. The task identification matrix or equivalent shall be in agreement with the LMI task analysis data, approved maintenance concept (see 6.4.12) or plan, and approved source, maintenance, and recoverability (SM&R) codes (see 4.2.1.1.8.1).

4.1.3.3.4 Control of subcontractors and vendors. The preparing activity shall ensure the quality of TMs developed by subcontractors and suppliers. The preparing activity's quality program shall not be deemed acceptable to the Government unless that preparing activity requires from the subcontractor a quality control program satisfying the requirements of this specification, or equivalent control over the subcontractor.

4.1.3.3.5 Sampling. All TM products, regardless of percentage of completion, shall be sampled and evaluated as a method of determining the acceptability of product in development.

4.1.3.3.6 Classification of defects (CD). The CD table associated with the preparing activity's sampling procedures shall be made available during the guidance and quality planning conference and other quality reviews and IPRs. The CD table shall be used for product evaluation to identify TM defects. The CD table shall be patterned after the items listed below. The preparing activity and the acquiring activity may jointly classify additional defects applicable to the specific products being acquired.

- a. Major defects (incorrect, incomplete, missing):
  - (1) Maintenance procedures.
  - (2) Hotspots and links (**iPDFs and IETMs only**).
  - (3) Values and tolerances.
  - (4) Illustrations, schematics, wiring diagrams.
  - (5) Part numbers.
  - (6) References and indices.
  - (7) Safety - notes, cautions, warnings, dangers.
  - (8) Alert acknowledgement (**IETMs only**).
  - (9) Technical content (source data and hardware comparison).
  - (10) Classified matter (incorrect identification and handling).
  - (11) Charts and tables.
- b. Minor defects:
  - (1) Typographical errors.
  - (2) Pages not collated correctly.
  - (3) Incorrect, incomplete, or missing SM&R codes.
  - (4) Use of unfamiliar words.
  - (5) Style and format inconsistencies.
  - (6) Inconsistent vocabulary.
  - (7) Long sentences.

## MIL-DTL-24784C(NAVY)

- (8) Long paragraphs.
- (9) Non-informative headings.
- (10) Organization not based on immediate needs of the user.
- (11) Complex or unclear illustrations.

4.1.3.4 In-process reviews (IPRs). IPRs will be authorized and convened by the Government to ensure that TMs are adequate, accurate, meet user requirements, and are in compliance with the contract and cited specifications. The preparing activity shall support IPRs and provide access to TM source materials, intermediate, and final products. IPRs shall include evaluation of source data, TM preparation methods, readability, a review of the book plan/content plan, intermediate, and final TM deliverables (including completed text, artwork, and technical content). As applicable, IPRs are convened to monitor the preparation of IPBs to ensure coverage is in accordance with the approved SM&R codes. IPRs will also be conducted during the preliminary development stages of the IETM to ensure adequacy and accuracy of IETM functionality, usability, and presentation (see 4.1.3.4.3 through 4.1.3.4.7). Safety and nuclear weapon procedures identified by the Government shall require a 100 percent IPR. The Government and the preparing activity will jointly establish the frequency and timing of IPRs, and the Government shall have final approval authority for the schedule. Additional IPRs may be required based on the preparing activity's or Government's evaluation of the TM development process or criticality/complexity of the material covered. The IPR schedule will be agreed upon at the guidance and quality planning conference, and the Government approved IPR schedule shall be contained in the guidance and quality planning conference minutes.

4.1.3.4.1 IPR review location. IPRs intended for locations other than the preparing activity's facility will be approved by the Government.

4.1.3.4.2 Evaluation of the authoring system. An IPR will be authorized to monitor the use of the authoring system to be employed in generating the TM, including a demonstration that the authoring system functions outlined in the TMQA program plan are in working order and are being used in the TM generation process. Relationship of the TM authoring process to acquisition and use of relevant source data (particularly LSA/LSAR and drawings) shall be specifically addressed.

4.1.3.4.3 Evaluation of the IETM and the display device. An IPR will be authorized to monitor the compatibility of the IETM with the operating and presentation software of the display device before any actual use, testing, or evaluation of operational suitability can take place (for example, using the Government specified or preparing activity recommended end-user IETM display device). In this sense, the IETM cannot be approved without demonstrating its operability with the required display device.

4.1.3.4.4 Evaluation of IETM navigation functions. An IPR will be authorized to determine if a comprehensive set of commands to navigate and sequence through the technical information has been provided and that these navigation functions are user-friendly and are explained adequately within the IETM.

4.1.3.4.5 Evaluation of the IETM functionality. An IPR will be authorized to evaluate the IETM functionality as specified by the acquiring activity.

4.1.3.4.6 Evaluation of IETM presentation techniques. An IPR will be authorized to monitor the placement of the IETM technical information within the inner shell of the display device to be used. A demonstration shall be provided showing the following:

- a. Location and use of standard navigation buttons.
- b. Placement and use of the table of contents.
- c. Placement of the technical content such as narrative text, procedural data, and parts information.
- d. Display and placement of graphics and tables.
- e. Hotspot and linking capability.

4.1.3.4.7 Evaluation of world wide web applicability. When specified by the acquiring activity, the preparing activity shall demonstrate that the IETM can be accessed and displayed over the World Wide Web.

## MIL-DTL-24784C(NAVY)

4.1.3.4.8 Evaluation of source files. When specified by the acquiring activity that the TM source files be delivered to the Government, the preparing activity shall validate that the source files have been tagged to the level and depth required by the applicable DTD and the content requirements contained in this specification.

4.1.3.4.9 IPR records. The Government will act as recorder and record decisions, results, and findings during the IPR. The Government will provide a copy of all recorded IPRs to the preparing activity.

4.1.3.4.9.1 Disposition of IPR findings. The Government and the preparing activity shall resolve IPR findings that involve problem areas or findings that require further evaluation before final disposition. Any discrepancy or deficiency found as the result of the IPR shall be corrected prior to certification and acceptance of the TM.

4.1.3.5 Validation. Validation is a preparing activity quality assurance responsibility that shall be accomplished for all TMs, changes, and revisions thereto. Validation shall provide a measure of the overall quality of the manual. The validation shall be performed by individuals who are of approximately the same education, experience, and skill level as the actual target audience for the TM. Where it is not possible to obtain such personnel for validation, validation personnel shall at least exclude those who cannot be expected to provide a realistic test of the validity of the TM (e.g., graduate engineers or those involved in authoring the TM). The Government reserves the right to witness validation. The preparing activity shall notify the Government of the validation schedule prior to commencement. A TM shall not be considered validated until the following conditions have been fulfilled:

- a. Preparing activity's engineering technical review has been completed (see 4.1.3.5.1).
- b. Information reflects configuration of the systems and equipment.
- c. Procedural instructions are readily understandable by the intended user and adequate to perform all intended functions.
- d. Adequacy of data is checked to ensure that it supports the approved maintenance and support plan.
- e. Hardware of the proper configuration is available for the validation effort. An operational environment shall be used, if possible, or simulated, if practicable.
- f. **(IETMs only)** Functionality is in accordance with the specified requirements.
- g. **(IETMs only)** All descriptive, operation, maintenance, troubleshooting, and parts information can be easily accessed from the Table of Contents and that the navigation and logical sequencing through the information is manageable and user friendly.
- h. **(IETMs only)** All technical information, including text, tables, and graphics appear in the appropriate data panes in accordance with Appendix B.
- i. Source files are tagged to the level and depth required by the applicable DTD and the technical content requirements contained in this specification.

4.1.3.5.1 Engineering reviews. The preparing activity shall conduct appropriate engineering reviews of the technical information to ensure that it is safe, complete, logical, technically accurate, and comprehensible. Based on this review, the preparing activity shall certify prior to validation that the technical information permits efficient performance of the intended equipment-support functions and that the technical information is ready for validation. All errors noted during this engineering review shall be corrected prior to validation. The preparing activity shall maintain engineering review records.

4.1.3.5.2 Validation performance. Theory and principles of operation, system and component description, SM&R codes (when applicable), schematic, and wiring data shall be validated against engineering source data in accordance with the validation plan. Operating and maintenance procedures including checkout, alignment, removal and replacement instructions, and associated checklists shall be validated against the system and equipment by actual demonstration. Malfunctions shall not be introduced into the system or equipment for the purpose of validation unless specifically required for certification of procedural tasks or system tests. Destructive malfunctions shall not be introduced into the system or equipment for any purpose.

4.1.3.5.3 Support equipment. Government-approved support equipment shall be utilized in the performance of validation. Simulation or substitution of support equipment shall be approved by the Government. It is the responsibility of the preparing activity to request Government furnished equipment in order to support the validation effort. The preparing activity shall provide all consumable and expendable items required to support validation.

## MIL-DTL-24784C(NAVY)

4.1.3.5.4 Validation of readability. Narrative text shall be validated for conformance to readability standards specified in 3.7.2.1. If the overall grade level (OGL) (including tolerance) is exceeded, the manual shall be rewritten as required to meet the specified reading grade level (RGL). If a sample grade level (GL) is exceeded, the entire text surrounding each sample shall be rewritten as required.

4.1.3.5.5 IETM system validation. An IETM system consists of the EDS hardware, the IETM, and the EDS presentation software interoperability. Validation of the IETM system shall be performed by demonstration. The extent of the demonstration shall be in accordance with the preparing activity's validation plan. The field version of the IETM system hardware and software shall be demonstrated to the extent required to establish its accuracy, capabilities, and compatibility with Government systems and contractual requirements. The IETM system validation shall:

- a. Demonstrate the general visibility and readability of the IETM as displayed on the EDS.
- b. Check that all data access links and branches are valid and operable.
- c. As applicable, ensure that there are no "open loops" in the fault isolation tasks (i.e., that each task ends in a single resolution, and each retrieval string ends in successful isolation and repair of a discrete fault).
- d. Ensure that there are no un-referenced or inaccessible data in the system.
- e. Demonstrate all required functionalities are fully operable.

4.1.3.5.6 Disposition of validated data. Corrections and significant comments resulting from validation shall be incorporated prior to issue of the validation certification.

4.1.3.5.7 Validation records. Records of all validations performed shall be maintained. These records shall indicate the affected manuals, system/equipment, component part number, or serial number. The records shall be maintained by the preparing activity and be available for Government review. Records shall be maintained of the inspections, and shall include the signatures of the inspectors, identification of the deliverables inspected, any discrepancies found and corrections made resulting from validation.

4.1.3.5.8 Validation certification. The preparing activity shall prepare a validation certification attesting to the TM adequacy and accuracy by actual performance or simulation. The preparing activity shall certify that the TM delivered to the Government for verification has been validated, that all corrections have been made, and that all contract requirements have been met. The certification shall list any exceptions, the document(s) authorizing the exception, and as applicable, the signature of all Government witnesses present at the validation. Individual validation certification reports shall be prepared for each TM validated by the preparing activity, using NAVSEA Form 4160/3 from S0005-AA-PRO-010 as the certification document.

4.1.3.6 Verification. Verification shall be accomplished under the jurisdiction of the Government and, when specified (see 6.2) shall include preparing activity support. Verification is a responsibility of the approval authority or authorized representative. The purpose of verification shall be to ensure that the preparing activity's products and services are in conformity with the requirements of this specification.

4.1.3.6.1 Verification support requirements. Preparing activity support of verification shall consist of the following:

- a. Serve as verification recorder, if required. Record and maintain records of changes associated with performance of verification.
- b. Provide assistance in performing verification tasks, if required.
- c. Certification that all discrepancies and defects noted during verification have been corrected or resolved.

4.1.3.6.2 Verification disposition records. The preparing activity shall maintain records (that document the preparing activity's analyses of verification comments) and correct TM discrepancies recorded during verification. The Government will review and indicate acceptance of verification dispositions.

4.1.3.6.3 Verification incorporation certification. Upon completion of all verification actions, the preparing activity shall certify that all discrepancies and deficiencies recorded during verification have been corrected or resolved. The certification shall reflect the requirements of this specification. Final acceptance of the TM shall be in accordance with terms of this specification.

## MIL-DTL-24784C(NAVY)

4.1.3.7 Combined validation and verification. When authorized by the Government, verification shall be performed concurrently with validation. Final acceptance of the TM will be made upon receipt of the validation and verification incorporation certifications.

4.2 TM quality assurance product development. The following are general requirements applicable to all TM types.

4.2.1 TMQA program plan. When directed by the acquiring activity, the preparing activity shall document its TMQA program in a plan that shall describe the scope and approach of the TMQA program. The plan shall detail the organization, planning, and data control to be performed on each TM. The plan shall also provide evidence of the preparing activity's intent and methods for complying with the quality facets of this specification. The plan shall require Government review for acceptability.

4.2.1.1 Components of the TMQA program plan. The TMQA program plan shall reflect all requirements of this specification and in addition, shall contain the following:

- a. Scope and applicability of the TMQA program plan, including a list of all contractually deliverable TM items to which the plan applies.
- b. A description of the function and structure of the preparing activity's QA organization.
- c. As applicable, a description of the TM authoring system and intent to use a Government Electronic Display System (EDS).
- d. A description of the preparing activity's plan to use Government approved word lists.
- e. A listing of the preparing activity's written operating procedures involved in TM generation (see 4.1.1).
- f. A listing of preparing activity's procedures for quality reviews, including the accomplishment of required changes and the correction of identified errors.
- g. A source data management plan.
- h. A subcontractor and vendor control plan.
- i. Sampling procedures and criteria.
- j. A CD table.
- k. A validation approach summary.
- l. As applicable, a verification support approach summary.

4.2.1.1.1 Scope and applicability of the TMQA program plan. The plan shall identify the scope and applicability of the QA effort. The plan shall identify all contractually deliverable TM items, the contract specifications with which they must comply, and the schedule (to the extent it can be estimated at the time the plan is submitted) for their inspection and delivery. The plan shall list:

- a. All deliverables in accordance with the contract.
- b. Specifications that each contractually deliverable TM item must meet in order to comply with the contract.
- c. A preliminary (proposed) schedule for each deliverable item; a brief discussion shall be presented, describing any factors anticipated by the preparing activity that might result in schedule changes (early or late accomplishment). The schedule for each TM deliverable item shall include the following:
  - (1) Conduct of Government quality reviews (including guidance and planning conferences, in-process reviews, and review of interim deliverables).
  - (2) Preparing activity quality reviews.
  - (3) Validation.
  - (4) TM readiness for verification (proposed start of verification).
  - (5) Estimated date of delivery.
  - (6) Any other contractually required milestone.

## MIL-DTL-24784C(NAVY)

4.2.1.1.2 Function and structure of the QA organization. The preparing activity's QA organization shall have the responsibility for implementation, administration, and conduct of the QA program, and shall function as the point of contact between the preparing activity and the Government in all matters related to QA. The TMQA program plan shall describe the preparing activity's QA organization (e.g., structure and approximate size during the proposed course of QA effort). This description shall indicate how the preparing activity's QA personnel are organized to retain their independence from personnel responsible for TM generation, to be able to carry out their QA responsibilities in an objective manner.

4.2.1.1.3 Description of the authoring system. The authoring system must possess certain minimum capabilities in order to effectively produce a TM. Where the preparing activity proposes use of an authoring system, which does not provide the following capabilities, the TMQA program plan shall describe how the capabilities in question will be provided.

- a. Support TM planning and control.
- b. Capture data from a wide variety of databases/sources, including text, graphics, and tables.
- c. Create and change technical information, including text, graphics (both vector and bit-map), and tabular data, and the ability to merge these information elements into a single composite element.
- d. Provide prompts to the author to propose proper sequences of writing, to identify omissions in pre-established plans, and to identify faulty authoring logic.
- e. Provide the author with a view of the finished product in a form identical to that in which it will be viewed by the end user (as established by comparison with the display on a Government furnished EDS of the type employed by the end user).

4.2.1.1.4 Electronic display system. The TMQA program plan shall affirm the preparing activity's intention to use a Government furnished EDS (incorporating the operating system and associated software provided) for quality reviews and validation.

4.2.1.1.5 Word list. The TMQA program plan shall describe the approach to, and identify software for, comparison of authored text with a Government approved word list. The preparing activity shall describe the plan for identifying and obtaining Government approval for use of words considered necessary that are not on the Government approved word list (see SL160-AA-LST-010/TM-WORDS). The plan shall also include the preparing activity's recommendations for system-specific or specialized word lists, which will supplement the common and technological area word lists, identified in the plan.

4.2.1.1.6 Changes to QA procedures. Any changes to QA procedures identified in the TMQA program plan, which result from changes in TM delivery schedules or revisions to QA methodology, or any other changes considered desirable for assuring a more effective product, shall be put into effect by the preparing activity after incorporation into the plan, and after the plan change has been approved by the Government. Updating written operating procedures, where procedural changes are not made (see 4.1.1), does not constitute a change as described in this paragraph.

4.2.1.1.7 Preparing activity quality reviews. The TMQA program plan shall describe the proposed quality review procedures for each individual type of TM deliverable to ensure compliance with its contractual specifications. Where a given process (e.g., validation of procedural information) applies to several deliverables, the procedure need be presented only once, but may be referred to as often as necessary. The plan shall also explain procedures for maintaining records of defects found and corrective actions taken.

4.2.1.1.8 Source data management plan. The TMQA program plan shall describe plans to assure that the most current source data are made available, controlled, and utilized for TM generation.

## MIL-DTL-24784C(NAVY)

4.2.1.1.8.1 Logistics management information (LMI). The TMQA program plan shall include a statement that the QA effort will assure direct communication between information developed by the LMI system maintenance plan, appropriate supportability analyses, and other LMI generated logistics documents (including supply support to include provisioning, support and test equipment, manpower and training, etc.) (see MIL-PRF-49506), and the TM authoring system. The appropriate logistics data sources as specified by the program acquisition process are carefully followed to construct the TM (i.e., that the TM is consistent with the LMI source data elements). For older programs that utilized MIL-STD-1388 (cancelled; replaced by MIL-HDBK-502), Logistics Support Analysis/Logistics Support Analysis Record (LSA/LSAR), the TMQA program plan shall state the continued use of LSA/LSAR source data or as directed by the appropriate Program Manager for update of program logistics information.

4.2.1.1.8.2 Drawings. The TMQA program plan shall include measures proposed by the preparing activity to assure the effective use of design and manufacturing drawings for the TM generation without the necessity to completely redo the drawings.

4.2.1.1.9 Control of subcontractors and vendors. The TMQA program plan shall describe the approach by which the preparing activity shall ensure that TM products prepared by subcontractors and vendors satisfy all contractual requirements.

4.2.1.1.10 Sampling procedures and criteria. The TMQA program plan shall describe the sampling procedures and criteria to be used by the preparing activity in evaluating the TM products.

4.2.1.1.11 Classification of defects table. The TMQA program plan shall contain a classification of defects (CD) table (see 4.1.3.3.6) in which the complete listing of the possible types of defects discovered in the TM will be classified into major or minor categories, depending upon their probable impact. The preparing activity and Government may jointly classify additional defects as needed.

4.2.1.1.12 Validation approach summary. The TMQA program plan shall contain a validation approach summary covering the approach the preparing activity intends to use for validation. This summary shall outline the intended methodology upon which the preparing activity intends to base the validation plan (see 4.2.3). As applicable, the summary shall indicate the planned use of a Government furnished EDS to conduct validation (as well as for other quality review functions).

4.2.1.1.13 Verification support approach summary. When verification support is contractually required (see 4.1.3.4.6), the TMQA program plan shall summarize the preparing activity's proposed approach to support the Government's verification effort for each applicable TM deliverable.

4.2.2 Quality review records. The preparing activity shall maintain objective records of all quality reviews. Objective evidence of the preparing activity's compliance shall be demonstrated by the ease of retrieval of specific information from records and their accuracy, currency, and completeness at the time of the Government representative's request. The records shall document quality problems and disposition recommendations. The records shall adequately identify the items in the manual(s) to which the comments and recommendations apply.

4.2.3 Validation plan. A validation plan shall be developed and shall reflect compatibility with the overall maintenance and support plan, outline the preparing activity's recommended validation procedure, and indicate the scope of the validation effort. The plan shall reflect the requirements of this specification. The plan may include recommendations for combined validation and verification as appropriate. The validation plan shall ensure there is a system for inspection, validation, and correction of the manual. The plan shall require Government review for acceptability.

- a. The validation plan shall address:
  - (1) The validation methods by which the TM is tested for technical adequacy, accuracy, and compliance with the provisions of the specifications and contractual requirements.
  - (2) A detailed review of the final deliverable TM to ensure it reflects the authorized, validated, verified, and corrected TM material and, as applicable, complies with the functionality and display requirements.
- b. The validation plan shall contain, as a minimum, the following:

## MIL-DTL-24784C(NAVY)

- (1) The titles and identification numbers (when available) of all deliverables to be validated.
- (2) Schedules for validation.
- (3) The preparing activity's organization and personnel responsible for accomplishing the validation effort.
- (4) Site locations, support equipment, facilities, test equipment, materials, contractual end items, and tools required during validation.
- (5) General characteristics relating to skill level of target audience type personnel to be used in validation of procedural technical information.
- (6) Identification of next higher assembly(ies)/system(s) required to support the effort (e.g., if a procedure entails installing a black box on the system, the system or a mock-up of one is the next higher assembly).
- (7) Associated technical information recommended for concurrent or consecutive validation.
- (8) Special safety precautions.
- (9) Any special environmental requirements.
- (10) Record keeping system to be used in validation.
- (11) Description of how validation of procedures is to be accomplished.
- (12) A proposed fault simulation list (see 4.2.3.1) for use in validation of troubleshooting procedures.
- (13) **(For IETMs)** Approach to evaluation of usability of the IETM as generated by the preparing activity. Specifically, establishment of the adequacy and accuracy of information access procedures and identification of any potential man-machine interface problems involving effective use of the IETM on the Government specified EDS.

4.2.3.1 Troubleshooting procedures list. The preparing activity shall prepare a list of troubleshooting branches for every fault identified during system/equipment supportability analyses development that includes Failure Mode and Effects Analysis (FMEA), Failure Mode, Effects and Criticality Analysis (FMECA), or other failure analysis process. These shall constitute a complete list of fault simulations for use during validation of troubleshooting procedures. Upon approval by the Government, the troubleshooting procedures list shall be appended to the validation plan. The procedures list and fault simulations list will be used by the Government to validate the troubleshooting technical information. As a minimum, the fault simulation list shall contain:

- a. Fault symptoms.
- b. Fault simulated and results of the simulation.
- c. The condition that was (or will be) inserted into the equipment to simulate the fault.

## 5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

## 6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. Technical manuals developed in accordance with this specification are intended for use in the installation, operation, maintenance, repair, personnel training and logistics support of weapon systems and equipment or for accomplishment of assigned missions and to set a style and format standard for related manuals for which no other standards exist.

## MIL-DTL-24784C(NAVY)

- 6.2 Acquisition requirements. Acquisition documents should specify the following:
- a. Title, number, and date of the specification (or any TMCR referencing this specification).
  - b. Issues of documents to be cited in the solicitation (see 2.2.1, 2.2.2, 2.3, B.2.1.1).
  - c. When a new TM is required to support a ship, system or equipment, the manual type must be specified (see 3.1.1).
  - d. For ship and major system acquisitions, that a TMOP is required (see 3.3.1).
  - e. If a book plan/IETM content plan should be developed (see 3.3.2, 3.3.3, A.2.2.1, A.3.2.1, and A.4.2.1).
  - f. The TM quality assurance products required to be developed and delivered (see 3.3.4).
  - g. If schedules and status reports are required (see 3.3.5).
  - h. If cost reports are required (see 3.3.6).
  - i. If a supplement is required (see 3.4.1.2).
  - j. If long-line diagrams (oversized schematics, timing circuit diagrams, test setup diagrams, wiring diagrams, etc.) require re-authoring to be easily viewed on screen and printed or, are to be delivered as a separately packaged hardcopy supplement (see 3.4.1.2 and B.4.3.4.2).
  - k. If a change package is required (see 3.4.1.3).
  - l. If a revision should be developed (see 3.4.1.4).
  - m. Types of manual issues required for delivery (RDC, PTM, FTM) (see 3.4.2).
  - n. If XML or SGML is required for chapter-format TMs (see 3.4.3.1.1, 3.4.3.1.2).
  - o. The specific DTD (including the version) to be used to develop the TM (see 3.4.4c, and 3.4.3.2).
  - p. The entity files, tagging guidelines document, and style sheets to be used (see 3.4.4.4, 3.4.4.5, 3.4.4.5.2, and 3.4.4.6).
  - q. When Portable Document Format (PDF) is required for delivery, and specify if additional document functionality is required for the FTM (see 3.4.5).
  - r. The level(s) of maintenance coverage required (see 3.5.2).
  - s. Applicable security classification (see 3.5.5). For classified equipment and manuals, attach a DD Form 254 specify the following:
    - (1) Specify appropriate Distribution Statement (if other than Distribution Statement C).
    - (2) Identify whether an Export Control Notice is required.
    - (3) Security classification.
    - (4) Downgrading and declassification notification.
    - (5) Areas requiring security protection.
  - t. If other than Distribution Statement C should be placed on the cover/title page (see 3.6.13).
  - u. If new revision change symbols should be provided in the revision (see 3.7.9.3 and 3.7.9.3.d).
  - v. If preparing activity support is required for verification (see 4.1.3.6).
  - w. Packaging requirements (see 5.1).
  - x. If an alphabetical index is required (see A.2.3.2.5 and A.4.3.2.4).
  - y. If double column is required (see A.2.4.2).
  - z. If color is to be used in illustrations (see A.2.9.2.1 and A.4.9.1.2).
  - aa. If foldout pages are allowed in the manual (see A.2.9.2.6 and A.4.9.1.8).
  - bb. If individual parts on a supporting maintenance graphic should be linked to IPB information (see A.3.4.6).
  - cc. If hot spots are required to link all abbreviations, acronyms, and uncommon terms to the complete explanations and listings (see A.3.5.1).

## MIL-DTL-24784C(NAVY)

- dd. Identify the optional and optional-recommended features from the Functionality Matrix that are to be included (see B.3.1).
- ee. Identify optional guide post functions required (see B.4.1.2.2.1).
- ff. Identify search functions to be provided in the IETM (see B.4.1.2.5.2.4).
- gg. If the minimum reference viewing distance is other than specified (see B.4.3.2.1).
- hh. If custom developed fonts are required (see B.4.3.2.2).
- ii. If alerts require manual acknowledgement (see B.4.3.2.5.9.2).
- jj. If changed/revised data shall be marked on screen/in printed copy (see B.4.3.2.5.12.1).
- kk. Identify the session control functionalities required (see B.4.4.1).
- ll. Identify bookmark and annotation functionalities required (see B.4.4.2).
- mm. Identify the browsing functions to be provided (see B.4.4.4).
- nn. If context filtering or other filtering is to be provided (see B.4.4.6).
- oo. If the function to search keywords and full text strings including alphanumeric and hyphenated words is required (see B.4.4.9).
- pp. If multimedia presentation is required (see B.4.4.12).

6.3 TM acquisition. This specification, or a TMCR based on this specification, must be cited in the contract and (if applicable) listed on the Contract Data Requirements List (DD Form 1423) in order to acquire the TMs described by this specification. An alternate acquisition strategy should be devised by contracting officers for those solicitations or contracts, which are exempted from using the Uniform Contract Line Item Numbering System (UCLINS).

#### 6.4 Definitions.

6.4.1 Accuracy. The precision and technical correctness of the contents of a manual. Accuracy includes the requirements that the TM reflect the “as built” or “as is” configuration of the associated hardware.

6.4.2 Adequacy. A depth of scope of coverage sufficient to support all tasks and functions at the prescribed level of the user, consistent with the equipment to be used and the mission environment in which the manual is to be utilized.

6.4.3 Assembly. A number of parts or subassemblies or any combination thereof joined together, to perform a specific function and capable of being disassembled.

6.4.4 Component. A composite fabricated unit (generally complete within itself) that is designed to perform a stated service when installed in its proper position.

6.4.5 Comprehensibility. The completeness with which a user in the target audience understands the text or text-graphics combination.

6.4.6 DTD. Rules determined by an application that apply SGML or XML to the markup of documents of a particular type.

6.4.7 Entity file. A file separate from the DTD file that contains the replacement text of an external entity declared and referenced in the DTD.

6.4.8 Foldout. A foldout has the same height as, but is wider than, a standard 11-inch page. Foldout pages are folded either 2 or 4 times (depending on width) to assume the dimensions of a standard page.

6.4.9 Functional division. A function or a portion of a function that performs a particular task in relationship to the entire system/equipment.

6.4.10 IETM. The Interactive Electronic Technical Manual (IETM) also referred to interchangeably as an “ETM” or “iETM” is technical information prepared and delivered digitally to an end user possessing characteristics based on the functionality matrix contained in Appendix B.

## MIL-DTL-24784C(NAVY)

- a. Linear IETM. The sequence of the data presentation is largely predefined by the data author. It is an organization of technical data that replicates the order of information found in a page-based document. There is generally one primary "path" through the technical data.
- b. Non-linear IETM. There are high levels of interactivity between the data and the user. The sequence of presentation is dictated by inputs by the user, external sources or events (as in diagnostics). An organization of content that does not follow a document or page based paradigm. There are multiple paths through the data. Individual paths through the data are generally determined based on user or other input via dialog boxes.

6.4.11 Leading. The vertical spacing between lines of type measured from baseline to baseline (bottom of line to bottom of next line below). Leading is measured in points.

6.4.12 Maintenance concept. The planned concept by which the equipment, assemblies, units, components, modules, or piece parts are to be repaired or replaced by designated maintenance level activities (organizational, intermediate or depot).

6.4.13 Major function. An essential functional operation which is fundamental to operation (as opposed to a circuit) of the equipment (for example, transmit, receive, display, hoist, and so forth).

6.4.14 Overhaul. The process of reconditioning a system or equipment to conform to the stated performance and technical specifications of the system or equipment with a life expectancy equivalent to similarly configured new systems or equipment. Overhaul is also performed to repair or replace parts and components that have failed or are of marginal quality because of wear, deterioration, or damage so as to preclude premature failure. Installation of authorized approved engineering or field changes may be included as part of the overhaul.

6.4.15 PIN. An alphanumeric designator which identifies parts, items, or bulk materials, that are covered by a specification or standard. The number derived from a military specification such as type RWR74549R9FM; or military standard such as MS 18272.

6.4.16 Set. A set is a number of individual manuals or volumes which comprises a complete package of operational and maintenance information for an item.

6.4.17 SGML. An abstract syntax used to define document markup languages using the constructs defined in the ISO-8879 international standard.

6.4.18 Subassembly. A portion of an assembly or unit, which is replaceable as a whole, but also has a part or parts which are individually replaceable. (The distinction between an assembly and a subassembly is determined by the individual application. An assembly in one instance may be a subassembly in another, where it forms a portion of an assembly.)

6.4.19 Supplement. A supplement is a subsidiary document which complements information in a related manual.

6.4.20 System. Two or more equipments (sets) or components, each having its own identity and nomenclature, arranged and interconnected to perform a specific operation or function.

6.4.21 TM. TMs are publications that are used to install, operate, maintain, test, repair, overhaul, or provide logistic support for ships, systems, or equipment. TM information may be presented in various forms or possess various characteristics including, but not limited to, hardcopy, audio and visual displays, discs, and other electronic devices. Publications falling under this definition are installation, operation, and maintenance manuals for all levels of support; system and subsystem manuals, technical repair standards; check off cards and sheets; troubleshooting procedures and aids; lubrication charts and procedures, equipment training manuals and aids; parts lists, field changes; and alteration procedures.

6.4.22 TMCR. Provides the required content, format, and style requirements for the preparation and delivery of one or more TMs and/or TM management data items in a definitive contractual document. The TMCR consolidates the requirements from various government specifications and standards and tailors those requirements to produce a TM that satisfies specified user needs.

## MIL-DTL-24784C(NAVY)

6.4.23 Unit. A major building block for a set or system, consisting of a collection of basic parts, subassemblies, and assemblies packaged together as a physically independent entity. Refer to IEEE 200 for a detailed description.

6.4.24 XML. A unique markup language defined in a W3C specification that is a fully conforming subset of SGML and intended chiefly for the electronic exchange of data.

6.5 Acronyms and abbreviations used in this specification. The acronyms used in this specification are defined as follows:

3-M - Maintenance Material Management  
AAW - Anti-Air Warfare  
AC - Alternating Current  
ACN - Advance Change Notice  
ADP - Automated Data Processing  
AIL - Automated Interface Listing  
AMP - Ampere  
AMSDL - Acquisition Management Systems and Data Requirements Control List  
ANSI - American National Standards Institute  
AP - Attaching Parts  
APL - Allowance Parts List  
ASCII - American Standard Code for Information Interchange  
ASME - American Society of Mechanical Engineers  
ASSY - Assembly  
ASTM - American Society of Testing and Materials  
ASW - Antisubmarine Warfare  
ATE - Automatic Test Equipment  
ATIS - Advanced Technical Information Support  
BIT - Built-in Test  
BITE - Built-in Test Equipment  
BMP - Bitmap  
BOI - Basis of Issue  
CAGE - Commercial and Government Entity  
CBT - Computer Based Training  
CD - Classification of Defects / Compact Disk  
CD-ROM - Compact Disk-Read Only Memory  
CGM - Computer Graphics Metafile  
CID - Component Identification  
CIWS - Close-in Weapon System  
CNET - Chief of Naval Education and Training  
CO - Company/Carbon Monoxide  
CO<sub>2</sub> - Carbon Dioxide  
CODEC - Compressing and Decompressing  
CO-H<sub>2</sub> - Carbon Monoxide - Hydrogen  
COML - Commercial

MIL-DTL-24784C(NAVY)

COTS - Commercial Off-the-Shelf  
CPS - Collective Protective System  
CSFID - Combat System Functional Interface Diagram  
CSI - Critical Safety Item  
CSOSS - Combat System Operational Sequencing System  
CSP - Critical Safety Process  
CSTOM - Combat System Technical Operations Manual  
DB - Decibel  
DC - Direct Current  
DCN - Design Change Notice  
DFAR - Defense Federal Acquisition Regulation  
DID - Data Item Description  
DLL - Dynamically Linked Library  
DOA - Designated Overhaul Activity  
DTD - Document Type Definition  
DVD - Digital Video Disk  
EDS - Electronic Display System  
EHF - Extremely High Frequency  
EJR - Engineering Judgment Records  
ELF - Extremely Low Frequency  
EMC - Electromagnetic Compatibility  
EMI - Electromagnetic Interference  
EMP - Electromagnetic Pulses  
EOSS - Engineering Operational Sequencing System  
ESD - Electrostatic Discharge  
ESDS - Electrostatic Discharge Sensitive  
ESWBS - Expanded Ship Work Breakdown Structure  
ETM - Electronic Technical Manual  
ETRAR - Examination, Test, Repair, Action Report  
FAR - Federal Acquisition Regulations  
FAT - Final Acceptance Test  
FBD - Functional Block Diagram  
FCD - Functional Circuit Diagram  
FFD - Functional Flow Diagrams  
FMA - Field Maintenance Agent  
FMEA - Failure Mode, Effects, and Criticality Analysis  
FTM - Final Technical Manual  
GAPL - Group Assembly Parts List  
GFI - Government Furnished Information  
GIF - Graphic Interchange Format  
GL - Grade Level

MIL-DTL-24784C(NAVY)

GPETE - General Purpose Electronic Test Equipment  
GPO - Government Printing Office  
HAZCOM - Hazardous Communication  
HCI - Hardness Critical Item  
HCP - Hardness Critical Process  
HEX - Hexadecimal  
HM&E - Hull, Mechanical and Electrical  
HTML - Hypertext Markup Language  
HTTP - Hypertext Transfer Protocol  
HVAC - Heating, Ventilating and Air Conditioning  
HZ - Hertz  
I&V - Inspection and Verification  
IC - Interior Communication  
ID - Reference Identifier  
IEEE - Institute of Electrical and Electronics Engineers  
IETM - Interactive Electronic Technical Manual  
IM - Information Module  
INSTL - Install  
I/O - Input/Output  
IP - Information Package  
IPB - Illustrated Parts Breakdown  
iPDF - Indexed Portable Document Format  
IPR - In-Process Review  
ISO - International Organization for Standardization  
ITPS - Identifying Technical Publication Sheet  
IVCS - Interior Voice Communications Systems  
JCS - Joint Chiefs of Staff  
JEDMICS - Joint Engineering Data Management Information Control System  
JPEG - Joint Photographic Experts Group  
LAMPS - Light Airborne Multi-Purpose System  
LCM - Life Cycle Manager  
LMI - Logistics Management Information  
LOX - Liquid Oxygen  
LPD - Landing Platform Dock  
LSA - Logistic Support Analysis  
LSAR - Logistic Support Analysis Record  
LSD - Landing Ship Dock  
MAG - Magnetic Control Items  
MAM - Maintenance Assistance Module  
MC/OR - Material Condition/Overhaul Report  
MIP - Maintenance Index Page

MIL-DTL-24784C(NAVY)

MOG - Material Ordering Guide  
MOV - Movieclip  
MPEG - Motion Picture Experts Group  
MRC - Maintenance Requirements Cards  
MSDS – Material Safety Data Sheets  
MWO - Modification Work Order  
NAVSEA - Naval Sea Systems Command  
NHA - Next Higher Assemblies  
NIFF - Navy Image File Format  
NMCI - Navy Marine Corp Intranet  
NSDSA - Naval Systems Data Support Activity  
NSN - National Stock Number  
NSTM - Naval Ships Technical Manual  
NTDS - Naval Tactical Data Systems  
N/A - Not Applicable  
OCI - Operational Critical Item  
OCP - Operational Critical Process  
ODS - Ozone Depleting Substances  
OEM - Original Equipment Manufacturer  
OGL - Overall Grade Level  
OSB - Operations Station Book  
OSD - Operational Flow Diagrams  
OSH - Occupational Safety and Health  
OSHA - Occupational Safety and Health Agency  
OSI - Observable Critical Items  
PCB - Printed Circuit Board  
PDA - Personal Digital Assistant  
PDF - Portable Document Format  
PDL - Page Description Language  
PEETE - Portable Electronic and Electrical Test Equipment  
PERT - Program Review Evaluation Technique  
PHST - Packaging, Handling, Storage, and Transportation  
PIN - Part Identification Number  
PMS - Planned Maintenance System  
PPI - Plan Position Indication  
PTM - Preliminary Technical Manual  
QA - Quality Assurance  
QAP - Quality Assurance Program  
QATIP - Quality Assurance Test and Inspection Plans  
QT - Quick Time  
QTY – Quantity

MIL-DTL-24784C(NAVY)

RAC - Rapid Action Changes  
RAD - Readiness Assessment Diagram  
RDC - Review Draft Copy  
RDF - Radio Direction Finder  
RFI - Ready-For-Issue  
RGB - Red, Green, Blue  
RGL - Reading Grade Level  
RHI - Range Horizontal Indication  
RIC - Repairable Identification Code  
RMC - Regional Maintenance Center  
SCAT - Subcategory  
SERT - Ship Electronic Readiness Team  
SFD - System Functional Diagram  
SGML - Standard Generalized Markup Language  
SHIPALT - Ship Alterations  
SIB - Ship Information Book  
SICR - Supply Item Change Record  
SM&R - Source, Maintenance and Recoverability  
SOA - Specialized Overhaul Activity  
SPAWAR - Space and Naval Warfare Systems Command  
SSSM - Submarine Ship System Manual  
STERF - Ship Test Equipment Repair Facility  
STTE - Special Tools and Test Equipment  
SUW - Surface Warfare  
SVG - Scalable Vector Graphics  
SYSCOM - (US Navy) Systems Command  
TAB - Training Aid Booklet  
TACAN - Tactical Air Navigation  
TDMIS - Technical Data Management Information System  
TIDRR - Traveler and Inspection, Discrepancy and Repair Reports  
TIFF - Tiled Image File Format  
TM - Technical Manual  
TMCR - Technical Manual Contract Requirements  
TMDE - Test, Measurement and Diagnostic Equipment  
TMDER - Technical Manual Deficiency/Evaluation Report  
TMMA - Technical Manual Management Activity  
TMOP - Technical Manual Organization Plan  
TMQA - Technical Manual Quality Assurance  
TREE - Transient Radiation Effects on Electronics  
TRS - Technical Repair Standard  
UCLINS - Uniform Contract Line Item Numbering System

MIL-DTL-24784C(NAVY)

UHF - Ultra High Frequency

UOC - Used on Code

V - Volts

VDC - Volts Direct Current

VIN - Vehicle Identification Number

W3C - World Wide Web Consortium

WAV - Waveform

XHTML - Extensible Hypertext Markup Language

XML - Extensible Markup Language

6.6 Subject term (key word) listing.

Book plan

Change package

Content plan

Final Technical Manual

Preliminary Technical Manual

Quality assurance

Review draft copy

Revision

Supplement

Validation

Verification

6.7 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.



MIL-DTL-24784C(NAVY)



BIOLOGICAL - abstract symbol bug shows that a material may contain bacteria or viruses that present a danger to life or health.



CHEMICAL - drops of liquid on hand shows that the material will cause burns or irritation to human skin or tissue.



CRYOGENIC - hand in block of ice shows that the material is extremely cold and can injure human skin or tissue.



EXPLOSION - rapidly expanding symbol shows that the material may explode if subjected to high temperatures, sources of ignition or high pressure.



EYE PROTECTION - person with goggles shows that the material will injure the eyes.



FIRE - flame shows that a material may ignite and cause burns.



POISON - skull and crossbones shows that a material is poisonous or is a danger to life.



RADIATION - three circular wedges shows that the material emits radioactive energy and can injure human tissue.



VAPOR - human figure in a cloud shows that material vapors present a danger to life or health.

Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 2. Hazardous materials warnings symbols.

MIL-DTL-24784C(NAVY)



EAR PROTECTION - headphones over ears shows that noise level will harm ears.



ELECTRICAL - electrical wire to arm with electricity symbol running through human body shows that shock hazard is present.



ELECTRICAL - electrical wire to hand with electricity symbol running through hand shows that shock hazard is present.



FALLING PARTS - arrow bouncing off human shoulder and head shows that falling parts present a danger to life or limb.



FLYING PARTICLES - arrows bouncing off face shows that particles flying through the air will harm face.



FLYING PARTICLES - arrows bouncing off face with face shield shows that particles flying through the air will harm face.



HEAVY OBJECT - human figure stooping over heavy object shows physical injury potential from improper lifting technique.



HEAVY PARTS - hand with heavy object on top shows that heavy parts can crush and harm.

Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 3. Safety warnings symbols.

## MIL-DTL-24784C(NAVY)



HEAVY PARTS - foot with heavy object on top shows that heavy parts can crush and harm.



HEAVY PARTS - heavy object on human figure shows that heavy parts present a danger to life or limb.



HEAVY PARTS - heavy object pinning human figure against wall shows that heavy, moving parts present a danger to life or limb.



HELMET PROTECTION - arrow bouncing off head with helmet shows that falling parts present a danger.



HOT AREA - hand over object radiating heat shows that part is hot and can burn.



LASER LIGHT - laser light hazard symbol indicates extreme danger for eyes from laser beams and reflections.



MOVING PARTS - human figure with an arm caught between gears shows that the moving parts of the equipment present a danger to life or limb.



MOVING PARTS - hand with fingers caught between gears shows that the moving parts of the equipment present a danger to life or limb.

Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 3. Safety warnings symbols - Continued.

MIL-DTL-24784C(NAVY)



MOVING PARTS - hand with fingers caught between rollers shows that the moving parts of the equipment present a danger to life or limb.



SHARP OBJECT - pointed object in hand shows that a sharp object presents a danger to limb.



SHARP OBJECT - pointed object in hand shows that a sharp object presents a danger to limb.



SHARP OBJECT - pointed object in foot shows that a sharp object presents a danger to limb.



SLICK FLOOR - wavy line on floor with legs prone shows that slick floor presents a danger for falling.

Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 3. Safety warnings symbols - Continued.

MIL-DTL-24784C(NAVY)

## SAFETY SUMMARY

Dangers, warnings, cautions, and notes appear throughout this manual. It is important that the significance of each be thoroughly understood by personnel using this manual. Their definitions are as follows:



**DANGER** – used to highlight a statement or some other notification about an operating or maintenance procedure, practice, or condition, that if not strictly observed will result in death or serious injury, or threatens the primary mission of the ship.



**WARNING** – used to highlight a statement or some other notification about an operating or maintenance procedure, practice, or condition, that if not strictly observed could result in death, injury, or long-term health hazards.



**CAUTION** - used to highlight a statement or some other notification about an operating or maintenance procedure, practice, or condition, that if not strictly observed could result in damage to or destruction of equipment, or loss of mission effectiveness.



**NOTE** – used to highlight a statement of some other notification that adds, emphasizes, or clarifies essential information of special importance or interest.

### GENERAL SAFETY PRECAUTIONS

The following are general safety precautions that are not related to any specific procedures and therefore do not appear elsewhere in this manual. These are recommended precautions that personnel must understand and apply during all phases of operation. Should situations arise that are not covered in these safety precautions, the Commanding Officer or other authority will issue orders as necessary to cover the situation.

#### KEEP AWAY FROM LIVE CIRCUITS

Operational and maintenance personnel must observe all safety regulations. Do not replace components or make adjustments inside equipment with the power turned on. Under certain conditions, dangerous potentials may exist even after power is removed due to charges retained by internal capacitors. To avoid bodily injury, always remove power and discharge a circuit by grounding before touching it.

#### DO NOT SERVICE OR ADJUST ALONE

Under no circumstances should any person reach inside any cabinet for the purpose of servicing or adjusting the equipment except in the presence of someone who is capable of rendering first aid. Whenever the nature of the operation permits, keep one hand away from equipment to reduce the hazard of current flowing through the body.

Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 4. Safety summary.

## MIL-DTL-24784C(NAVY)

## RESUSCITATION

Personnel working with or near high voltages should be familiar with modern methods of resuscitation.

**WARNINGS APPLICABLE TO HAZARDOUS MATERIALS**

Warnings for hazardous materials listed in this manual are designed to warn personnel of hazards associated with such items when they come in contact with them by actual use. Additional information related to hazardous materials is provided in OPNAVINST 5100.23, Navy Occupational Safety and Health (NAVOSH) Program Manual, NAVSUPINST 5100.27, Navy Hazardous Material Control Program, and the DoD 6050.5, Hazardous Materials Information System (HMIS) series publications. For each hazardous material used within the Navy, a Material Safety Data Sheet (MSDS) must be provided and available for review by users. Consult your local safety and health staff concerning any questions regarding hazardous materials, MSDSs, personal protective equipment requirements, and appropriate handling and emergency procedures and disposal guidance.

Symbols are used to save space in the manual while still conveying a clear message of the hazard to the technician using the manual. Since the symbol presents a visual image of the hazard rather than a more abstract message, recognition should be much faster than with a worded warning. The following provides an explanation of the hazard symbols and gives the complete warnings for hazardous material used in this manual.

**EXPLANATION OF HAZARDOUS MATERIALS SYMBOLS**

**CHEMICAL** - drops of liquid on hand shows that the material will cause burns or irritation to human skin or tissue.



**FIRE** - flame shows that a material may ignite and cause burns.



**EYE PROTECTION** - person with goggles shows that the material will injure the eyes.



**VAPOR** - human figure in a cloud shows that material vapors present a danger to life or health.

**HAZARDOUS MATERIALS WARNINGS**

In the text of the manual, the caption **WARNING** is not used for hazardous material warnings; hazards are cited with appropriate icon(s), and the nomenclature of the hazardous material that relates to the complete warning identified below. Users of hazardous materials shall refer to these complete warnings.

**Acrylic Lacquer, MIL-L-81352**

Acrylic lacquer, MIL-L-81352, is toxic, flammable, and highly irritating to the eyes. Protection: chemical splash proof goggles, gloves, and good ventilation. Keep container closed; keep sparks, flames, and heat away. Keep lacquer off skin, eyes, and clothes. Do not breathe vapors.

**Drycleaning Solvent, P-D-680**

Drycleaning solvent, P-D-680, Type II, is toxic and combustible. Protection: chemical splash proof goggles, gloves, and forced ventilation (or respirator). Keep container closed; keep sparks, flames, and heat away. Keep solvent off skin, eyes, and clothes. Do not breathe vapors.

Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 4. Safety summary - Continued.

MIL-DTL-24784C(NAVY)

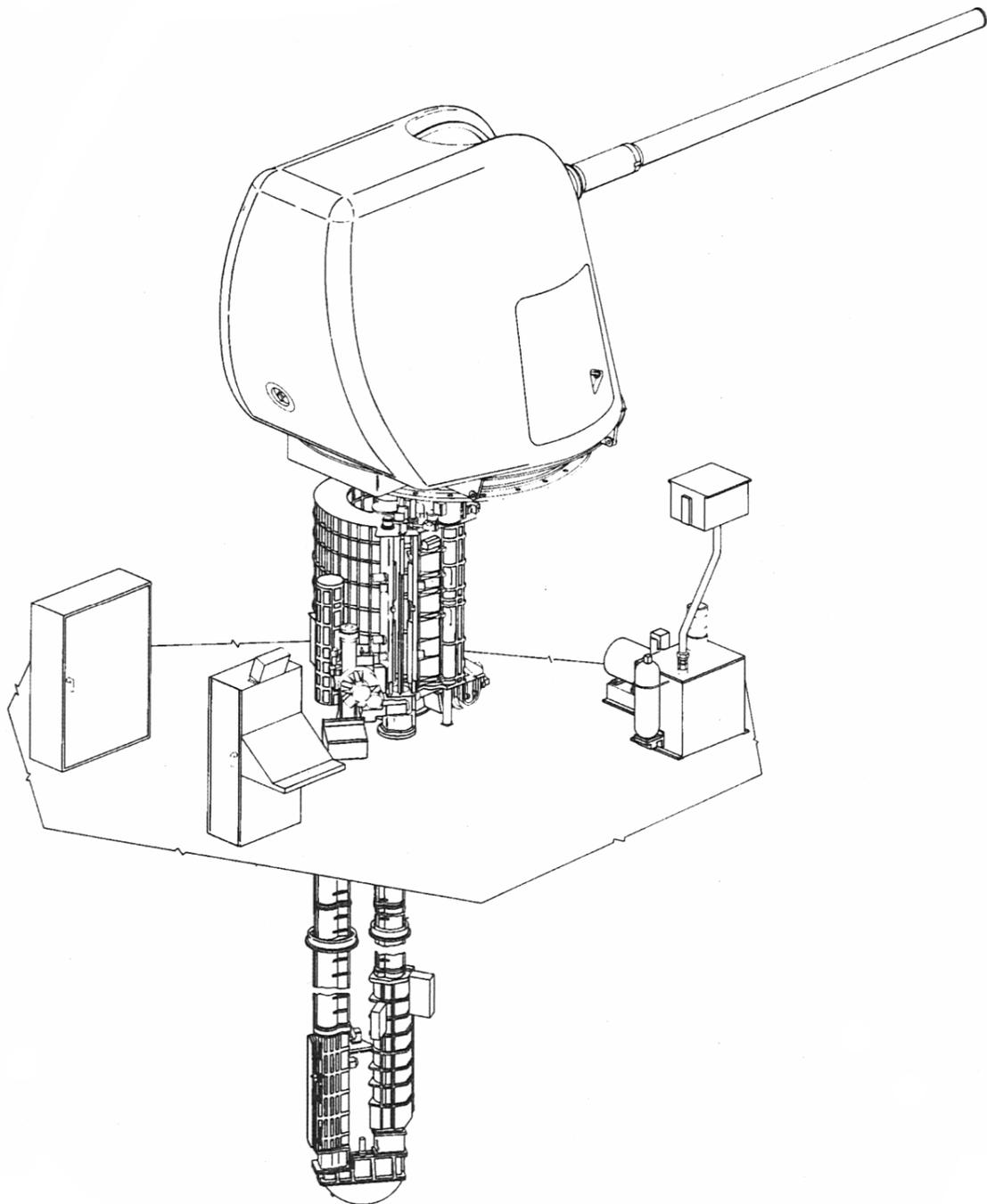
**Table 2-1. Hydraulic System Pertinent Data.**

Feature	Operating Parameter
Hydraulic Fluid	MIL-H-83282
Nominal Operating Pressure	3000 Pounds per Square Inch (psi)
Fluid Capacity	5.3 Gallons
Reservoir Usable Fluid Capacity	1.7 Gallons
Reservoir 1 Shutoff Level	0.865 Gallons
Reservoir 2 Shutoff Level	0.414 Gallons
Filtration	
Pressure	23 Micron Absolute
Return	21 Micron Absolute

Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 5. Typical table.

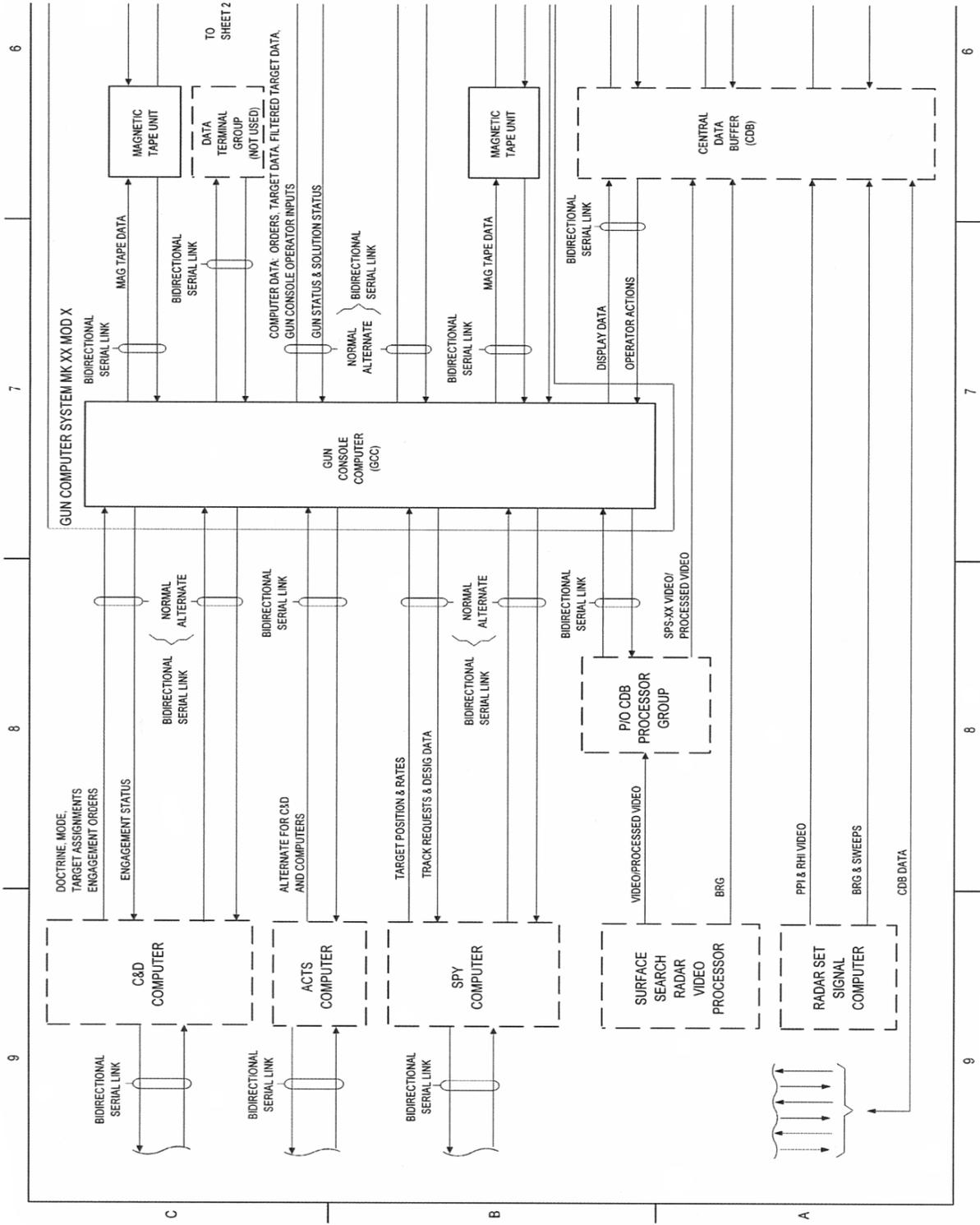
MIL-DTL-24784C(NAVY)



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 6. Frontspiece, typical equipment.

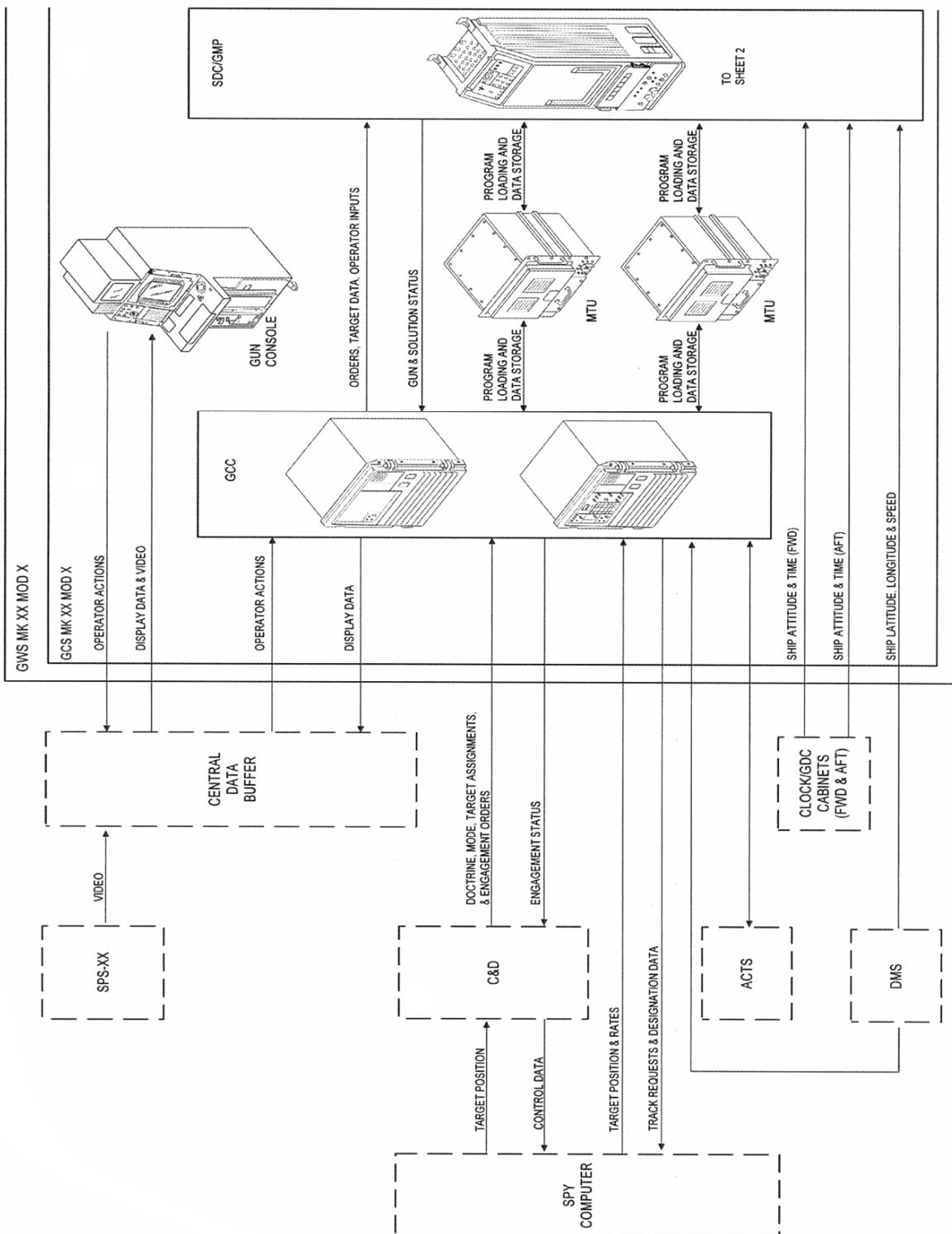
MIL-DTL-24784C(NAVY)



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 7. FBD, master.

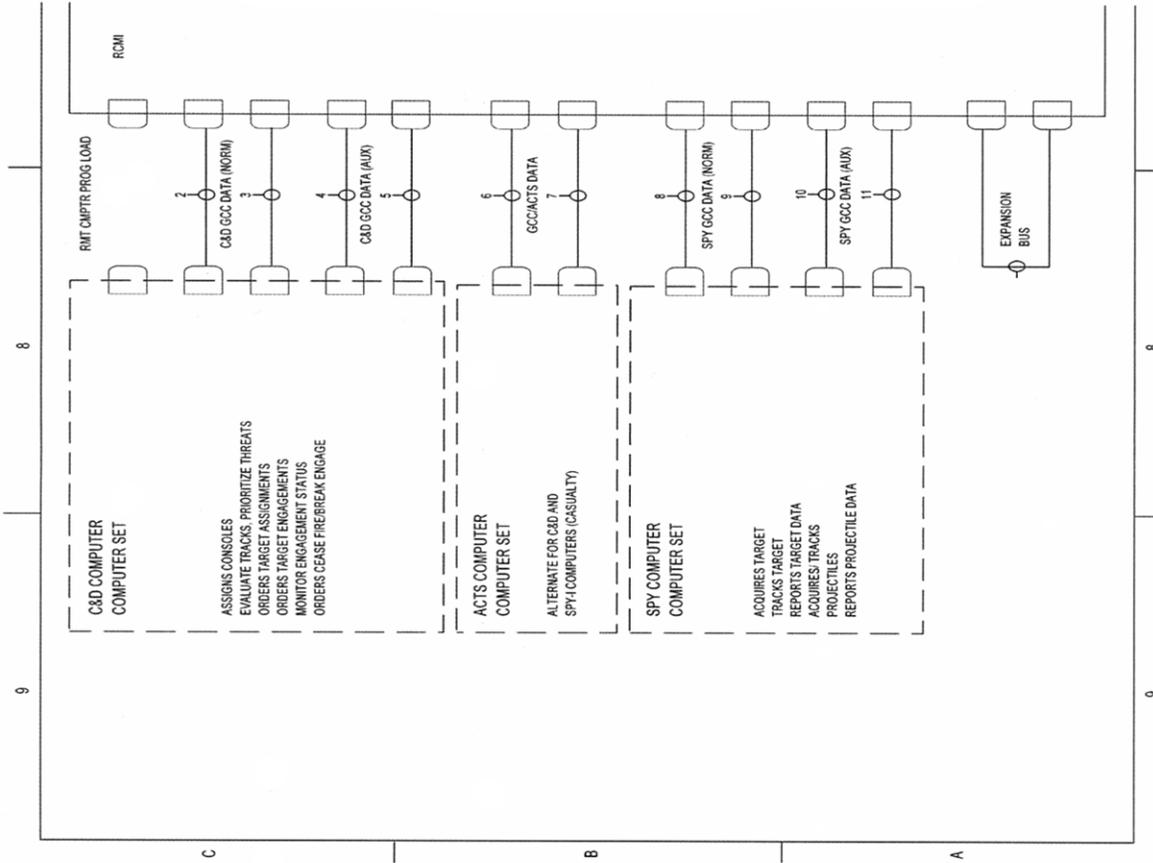
MIL-DTL-24784C(NAVY)



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 8. FBD, primary.

MIL-DTL-24784C(NAVY)

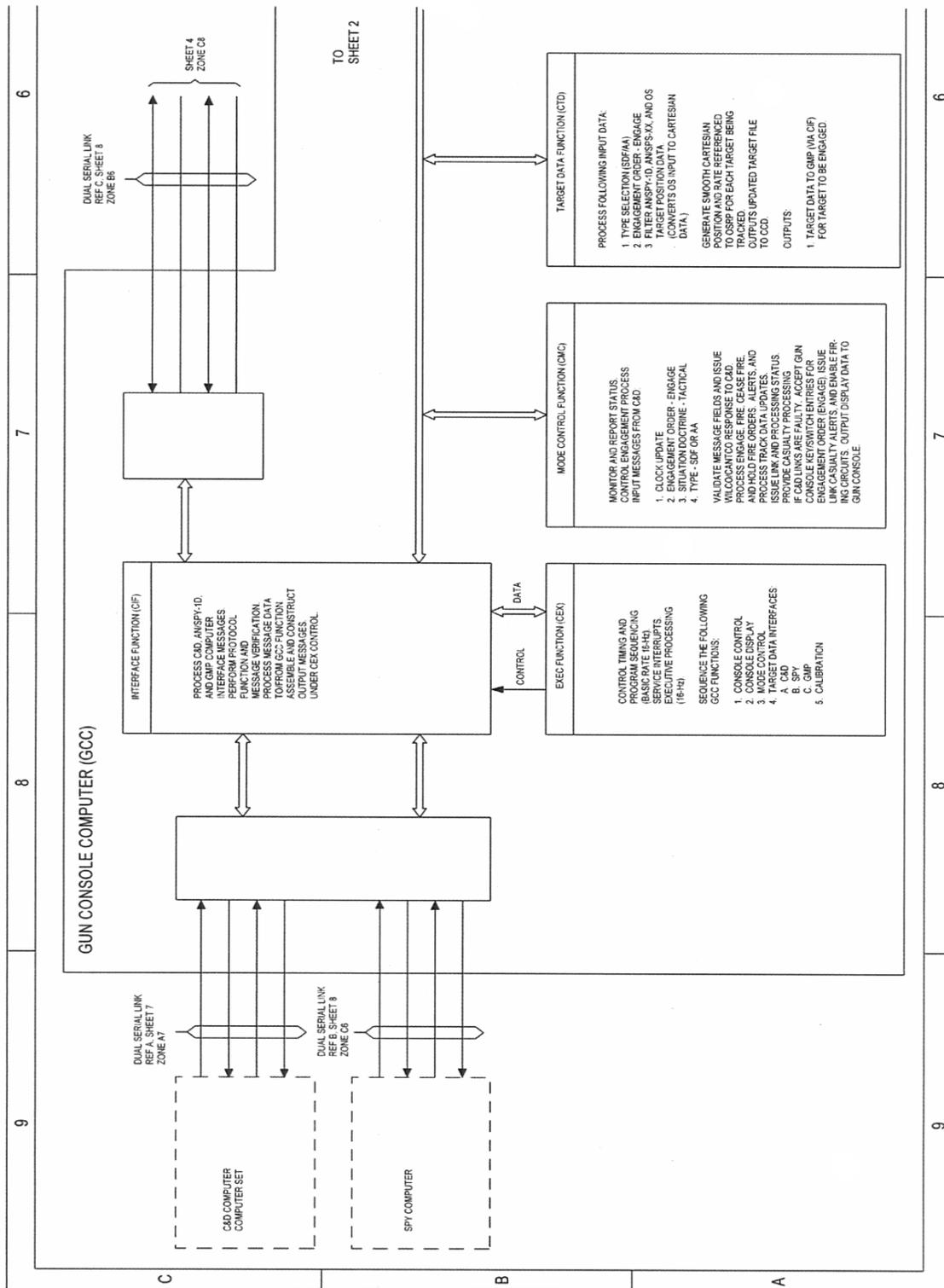


- GENERAL NOTES:  
 A. DASH LINES INDICATE EQUIPMENT NOT PART OF GCS.
- SPECIFIC NOTES:  
 1. THE GCC IS SHOWN AS A SINGLE UNIT FOR SIMPLICITY. HOWEVER THERE ARE TWO CABINETS: THE XXX CABINET AND THE EXPANSION CABINET. IOC 0 CHANNELS ARE PHYSICALLY LOCATED IN THE XXX CABINET AND IOC 1 CHANNELS ARE PHYSICALLY LOCATED IN THE EXPANSION CABINET.  
 2. CABLE AND CONNECTOR DESIGNATIONS ARE PROVIDED FOR REFERENCE ONLY. THOSE WHICH ARE NOT CONSISTANT BETWEEN HULLS ARE OMITTED FOR CLARITY.

Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 9. FBD, secondary.

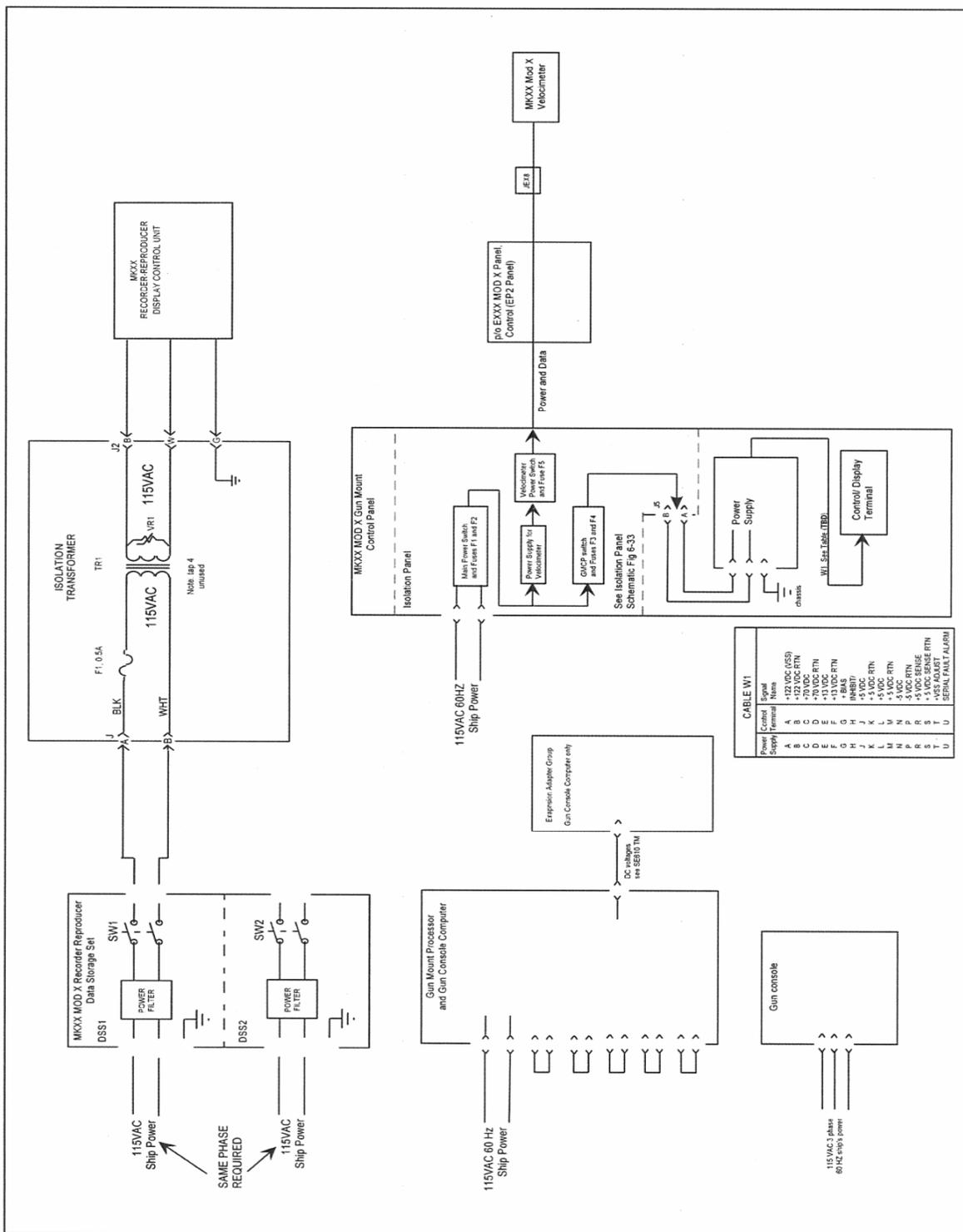
MIL-DTL-24784C(NAVY)



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 10. FBD, lowest level.

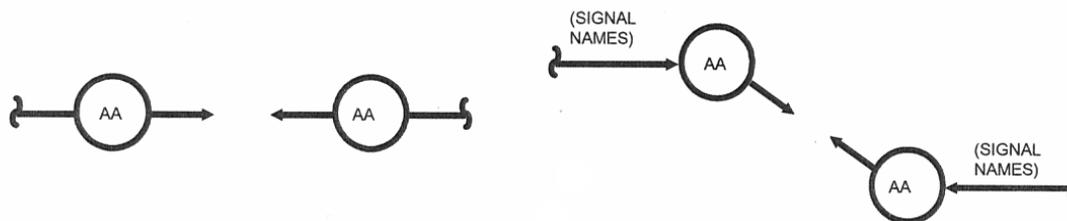
MIL-DTL-24784C(NAVY)



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

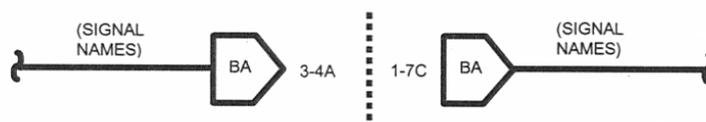
FIGURE 11. FBD, unit power.

MIL-DTL-24784C(NAVY)



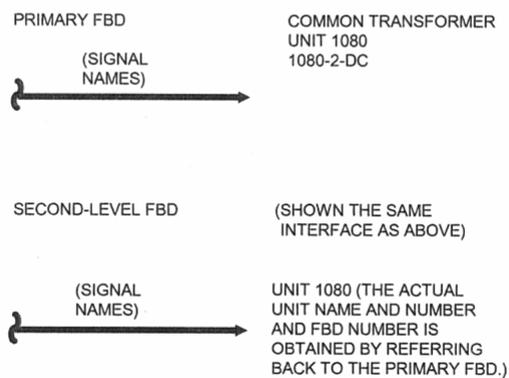
Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 12. Signal referencing on the same sheet.



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

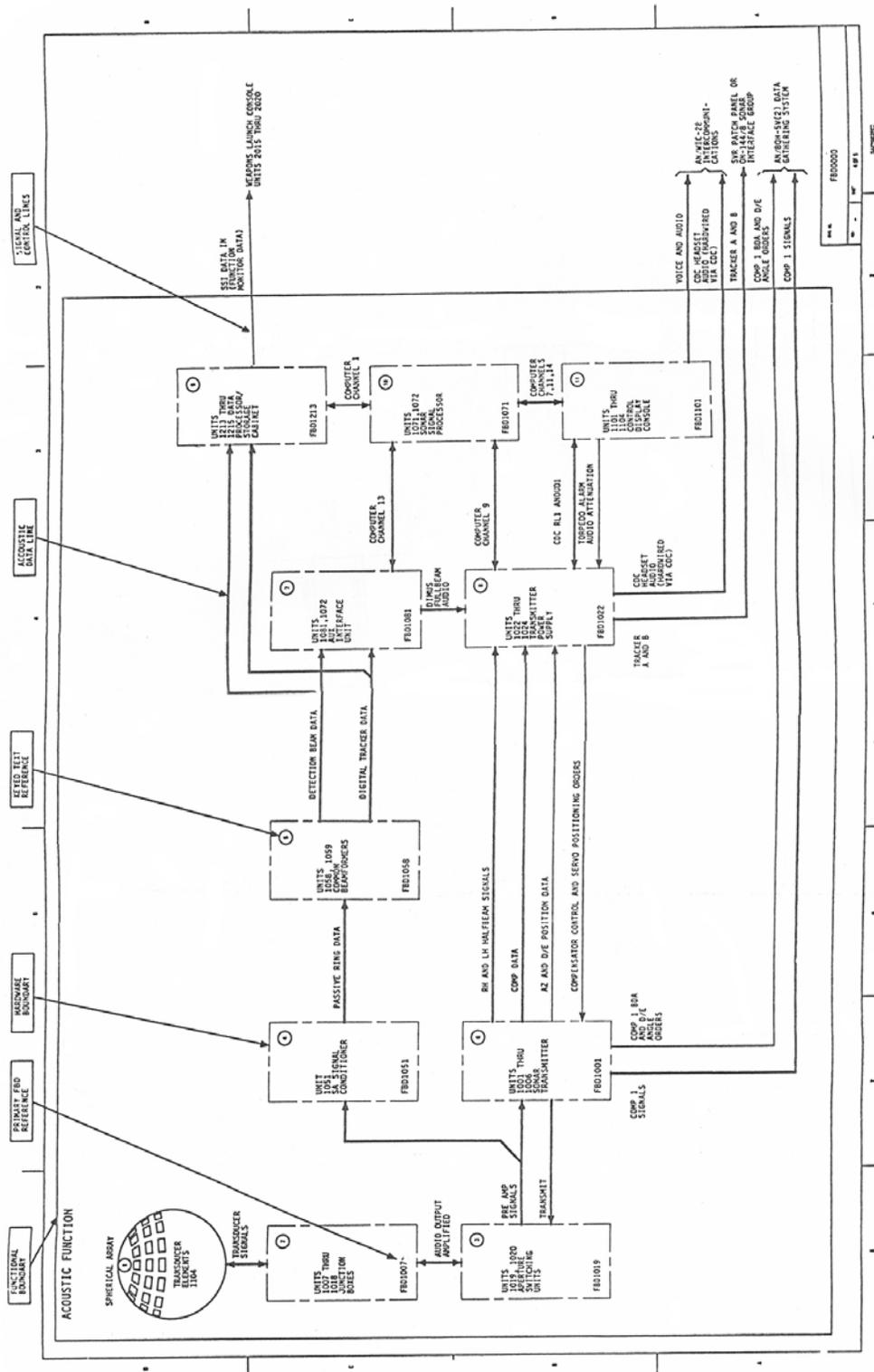
FIGURE 13. FBD signal referencing between two or more functional parts.



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 14. FBD reference between units.

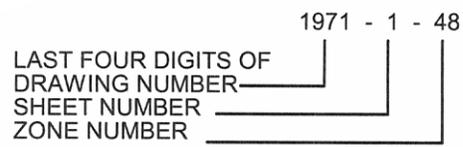
MIL-DTL-24784C(NAVY)



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 15. FBD, master with reference to keyed text.

MIL-DTL-24784C(NAVY)



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

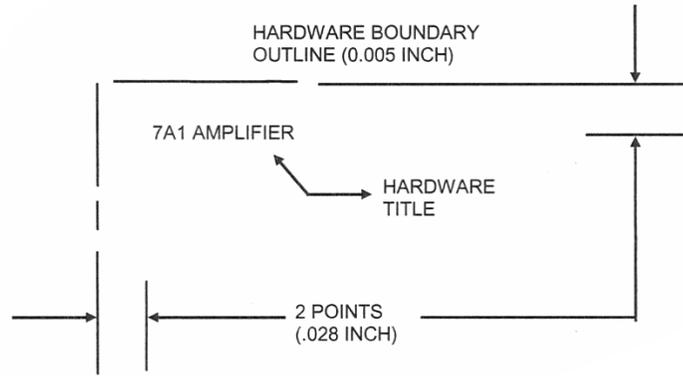
FIGURE 16. Zone numbers.





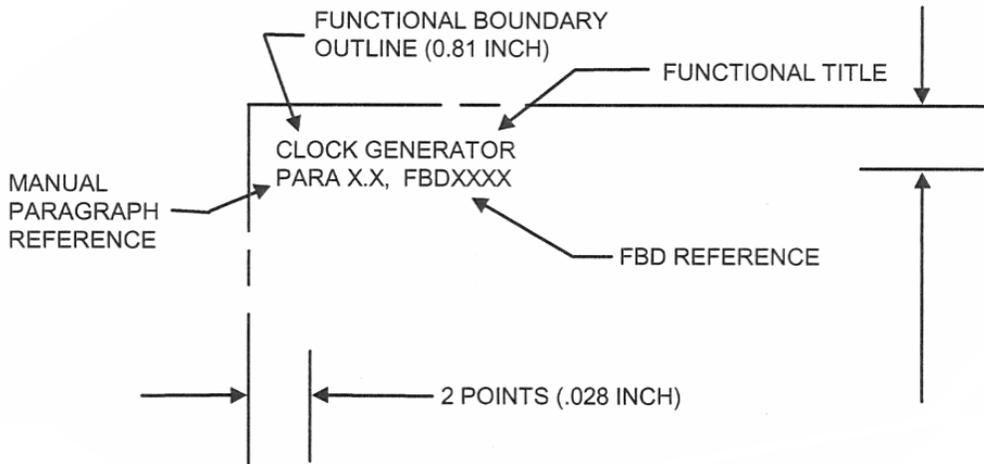


MIL-DTL-24784C(NAVY)



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

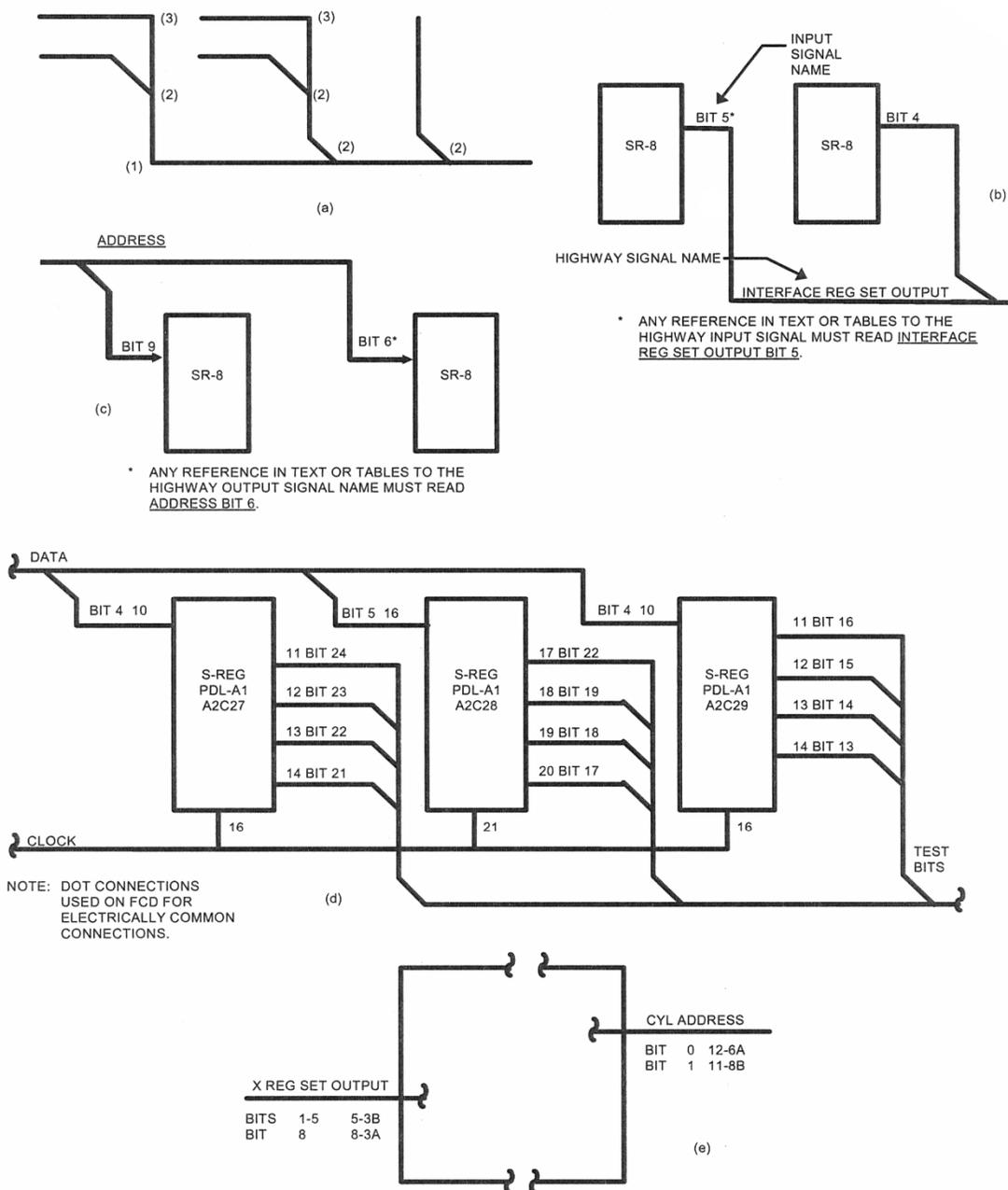
FIGURE 20. Hardware boundary.



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 21. Functional boundary.

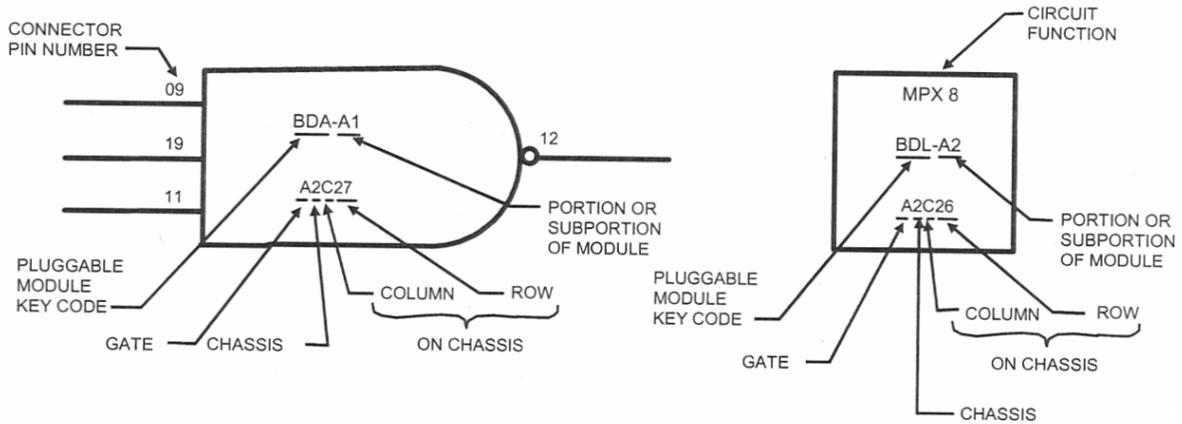
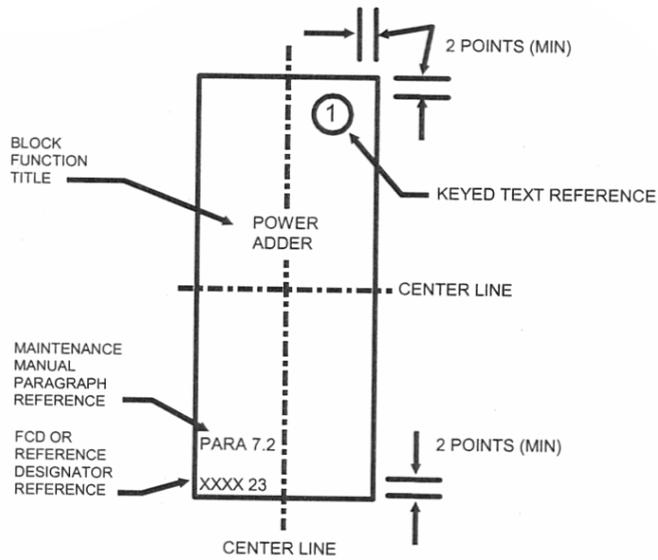
MIL-DTL-24784C(NAVY)



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 22. Interconnecting lines.

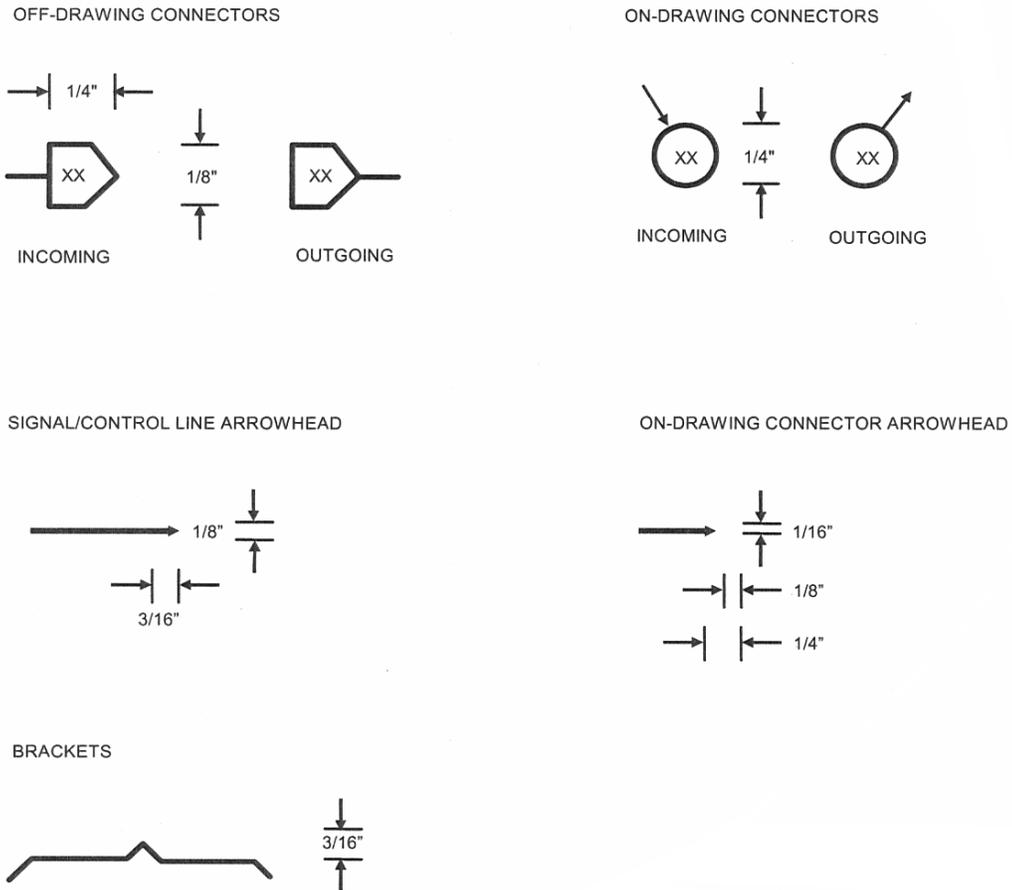
MIL-DTL-24784C(NAVY)



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 23. Symbols.

MIL-DTL-24784C(NAVY)

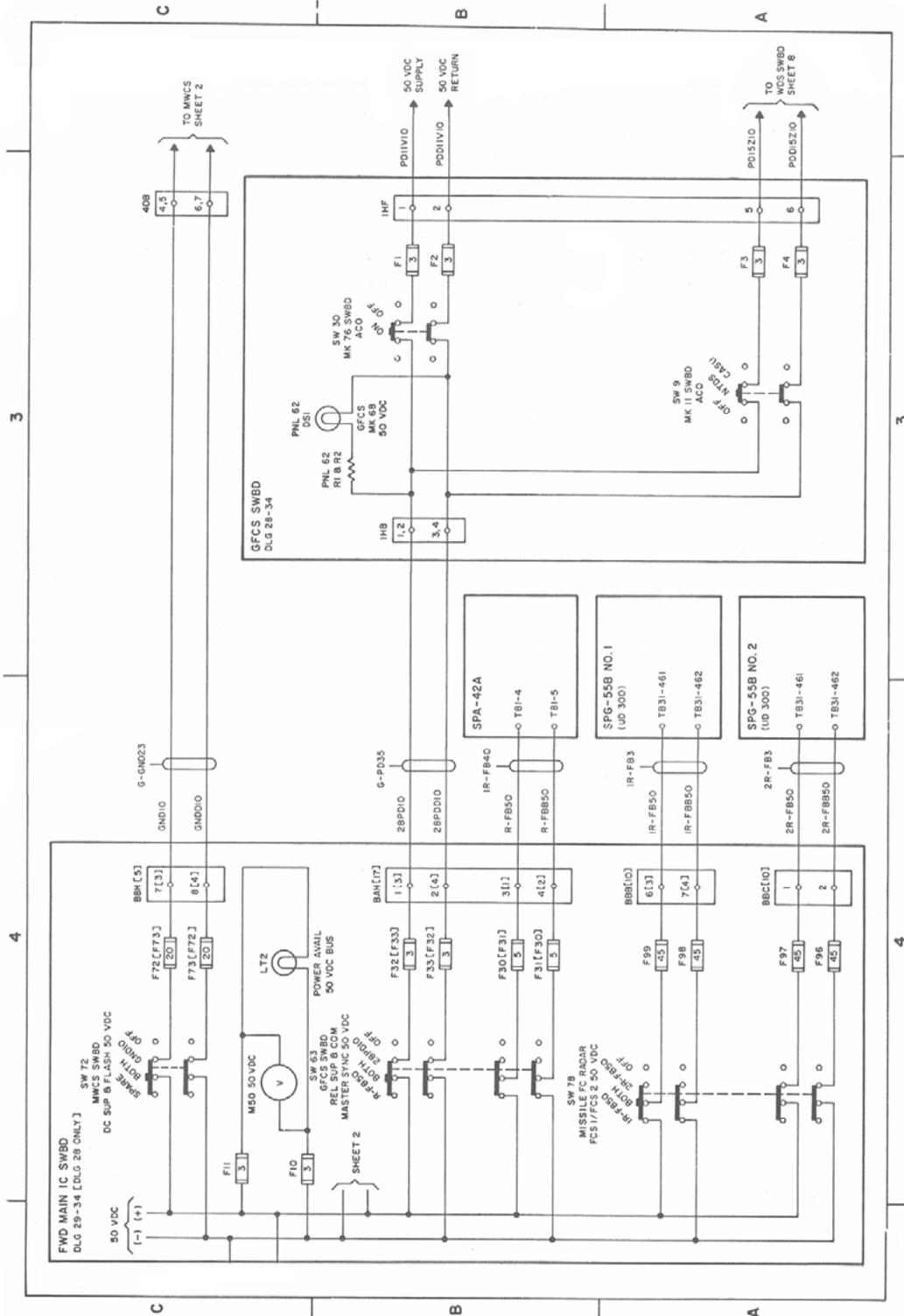


Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 24. On-drawing and off-drawing connectors and miscellaneous symbols.



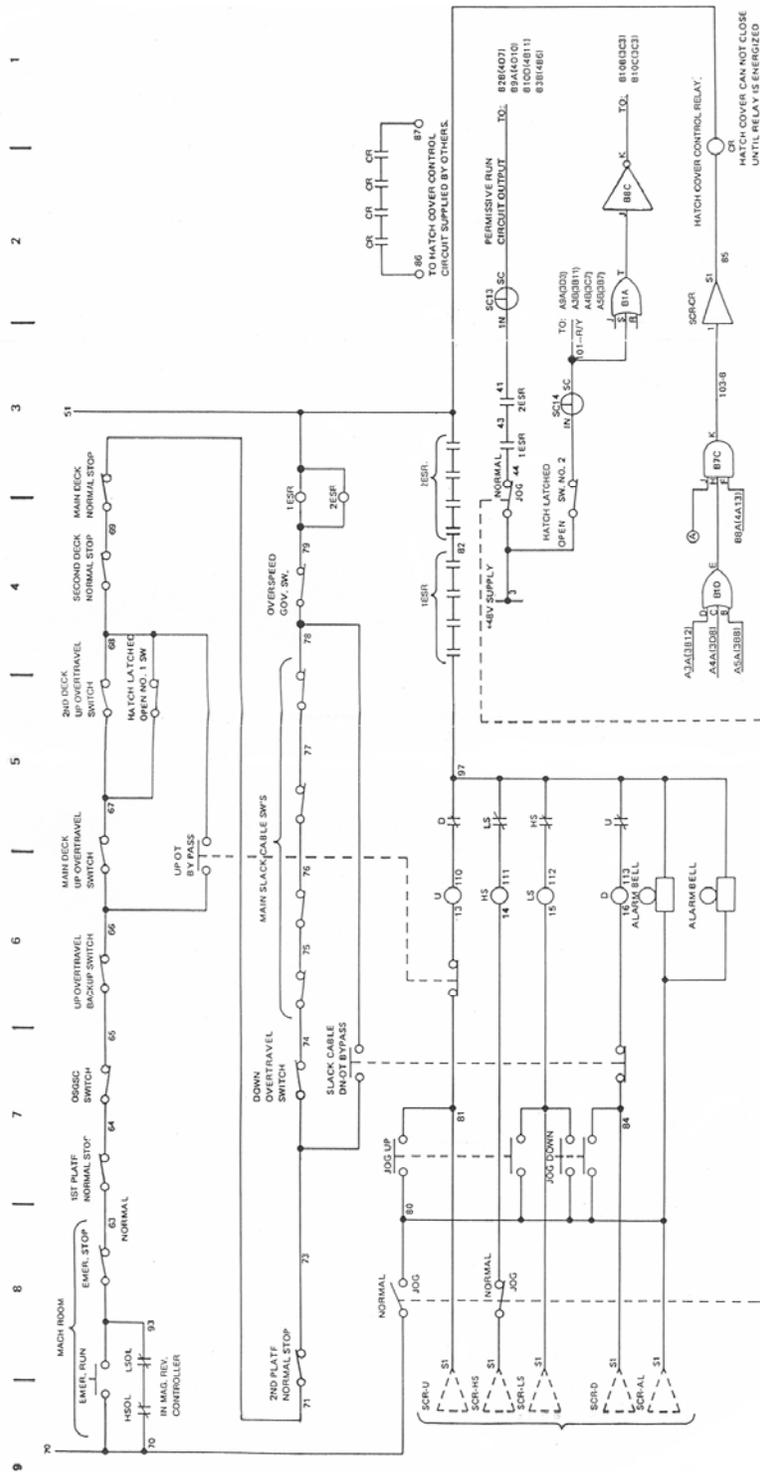
MIL-DTL-24784C(NAVY)



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 26. System functional diagram – power distribution.

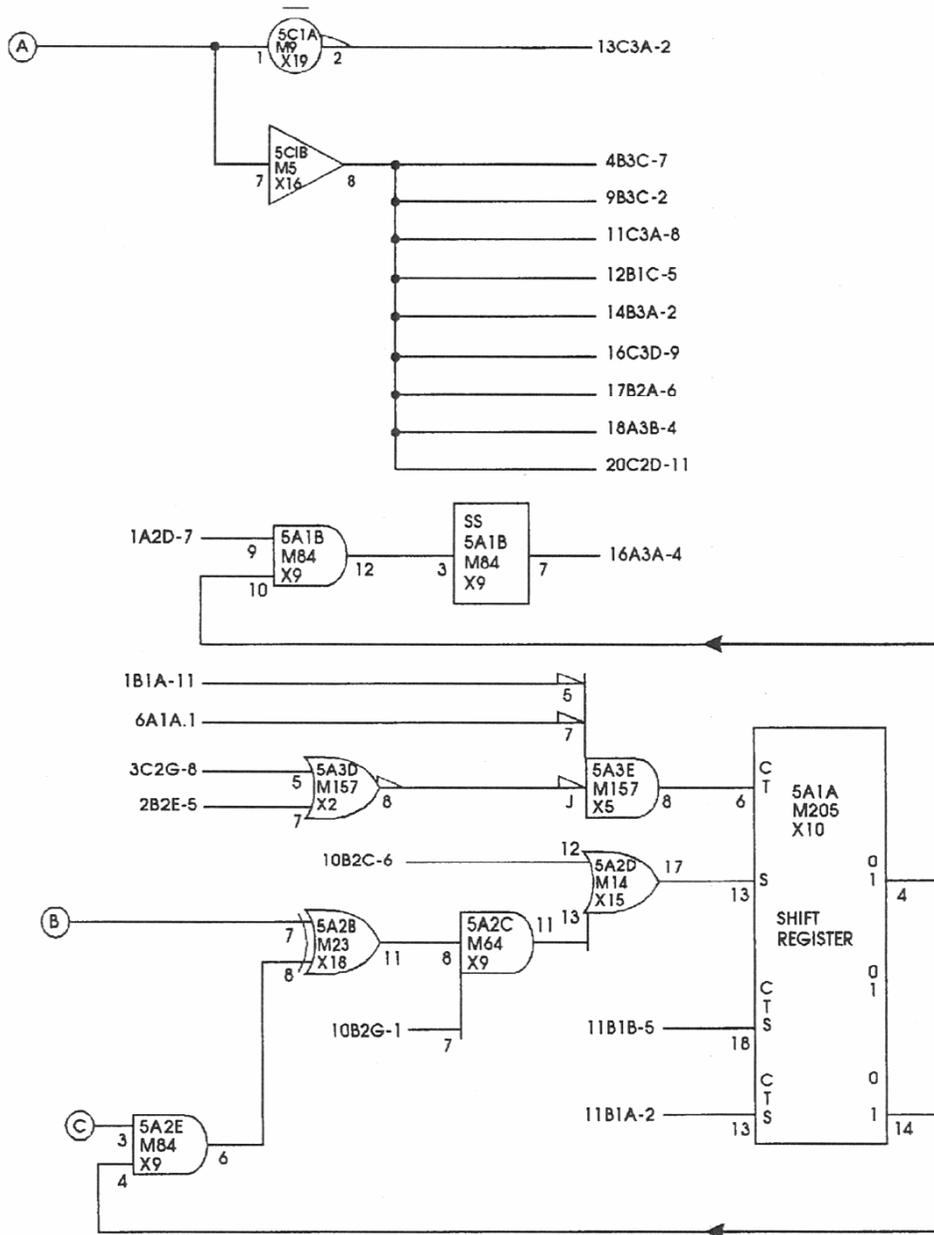
MIL-DTL-24784C(NAVY)



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 27. Control diagram.

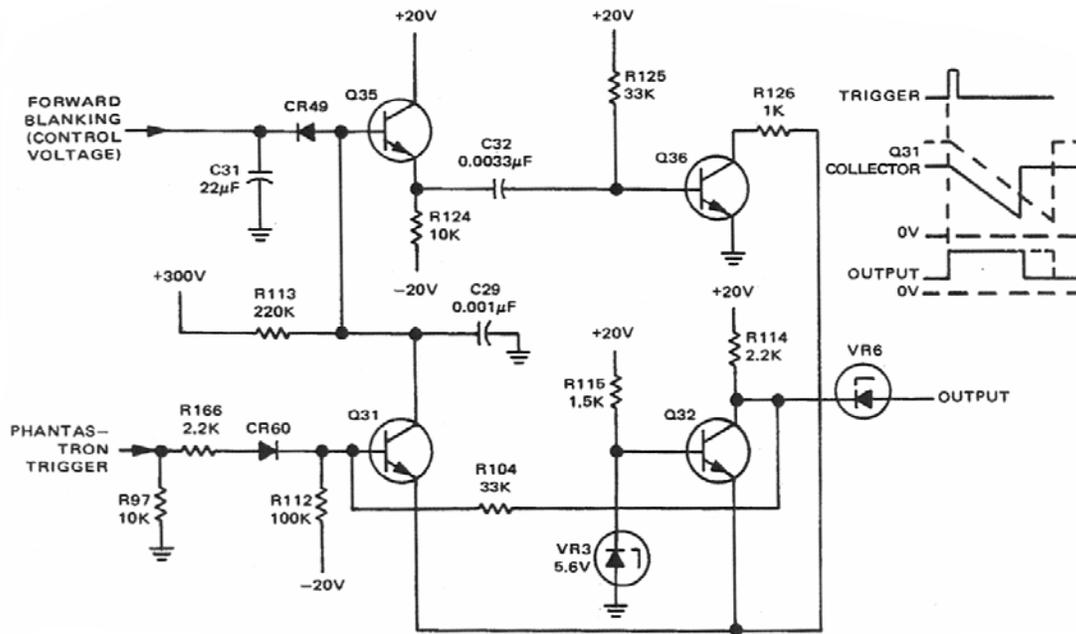
## MIL-DTL-24784C(NAVY)



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 28. Logic diagram.

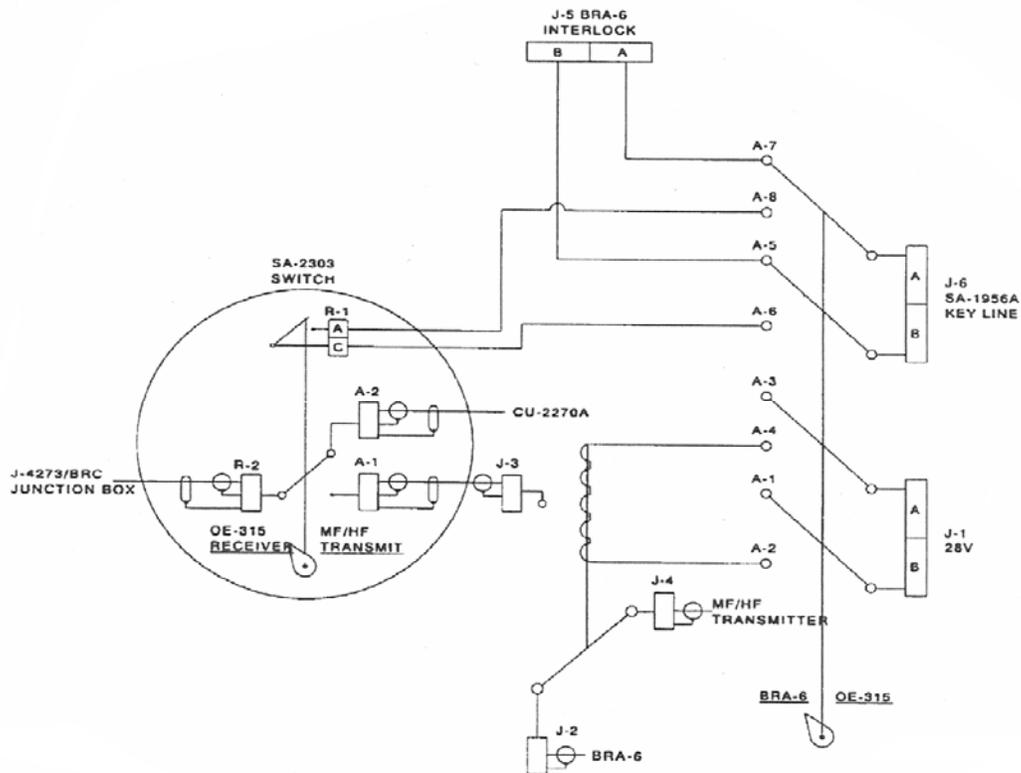
## MIL-DTL-24784C(NAVY)



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 29. Maintenance schematic diagram.

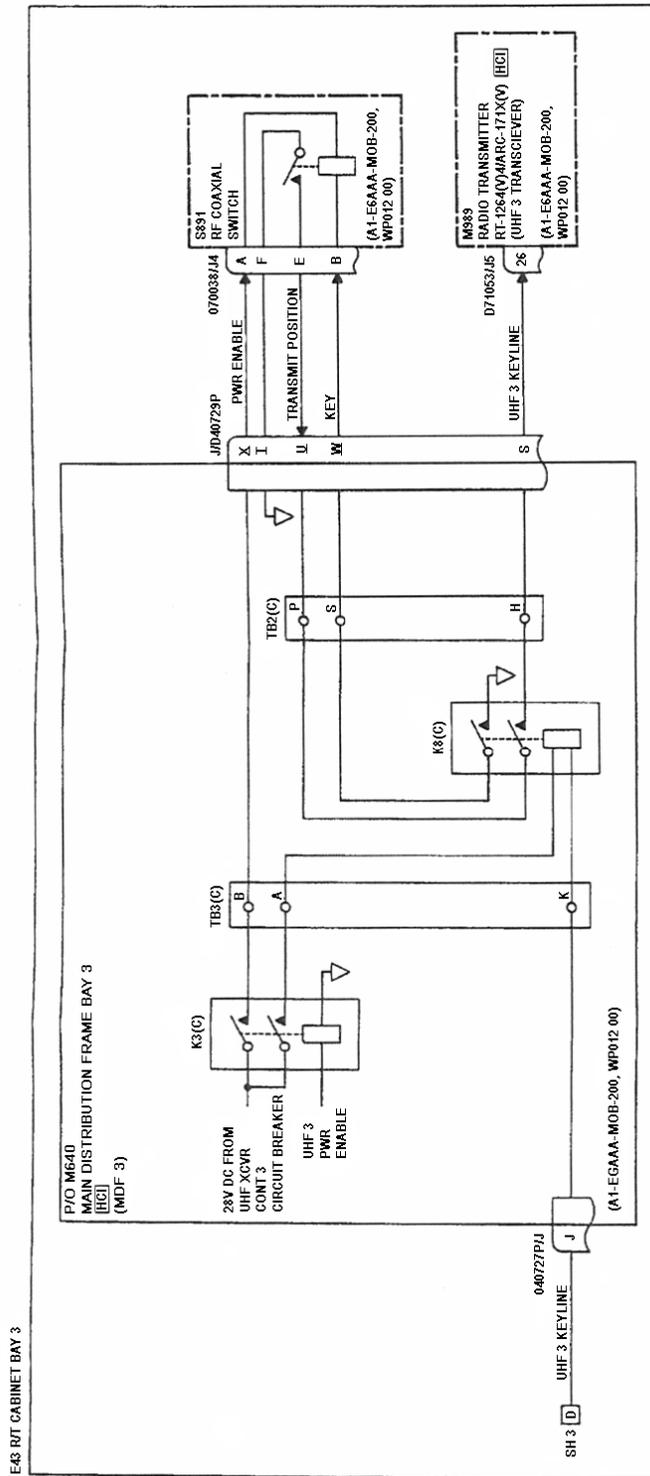
## MIL-DTL-24784C(NAVY)



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 30. Simplified schematic diagram.

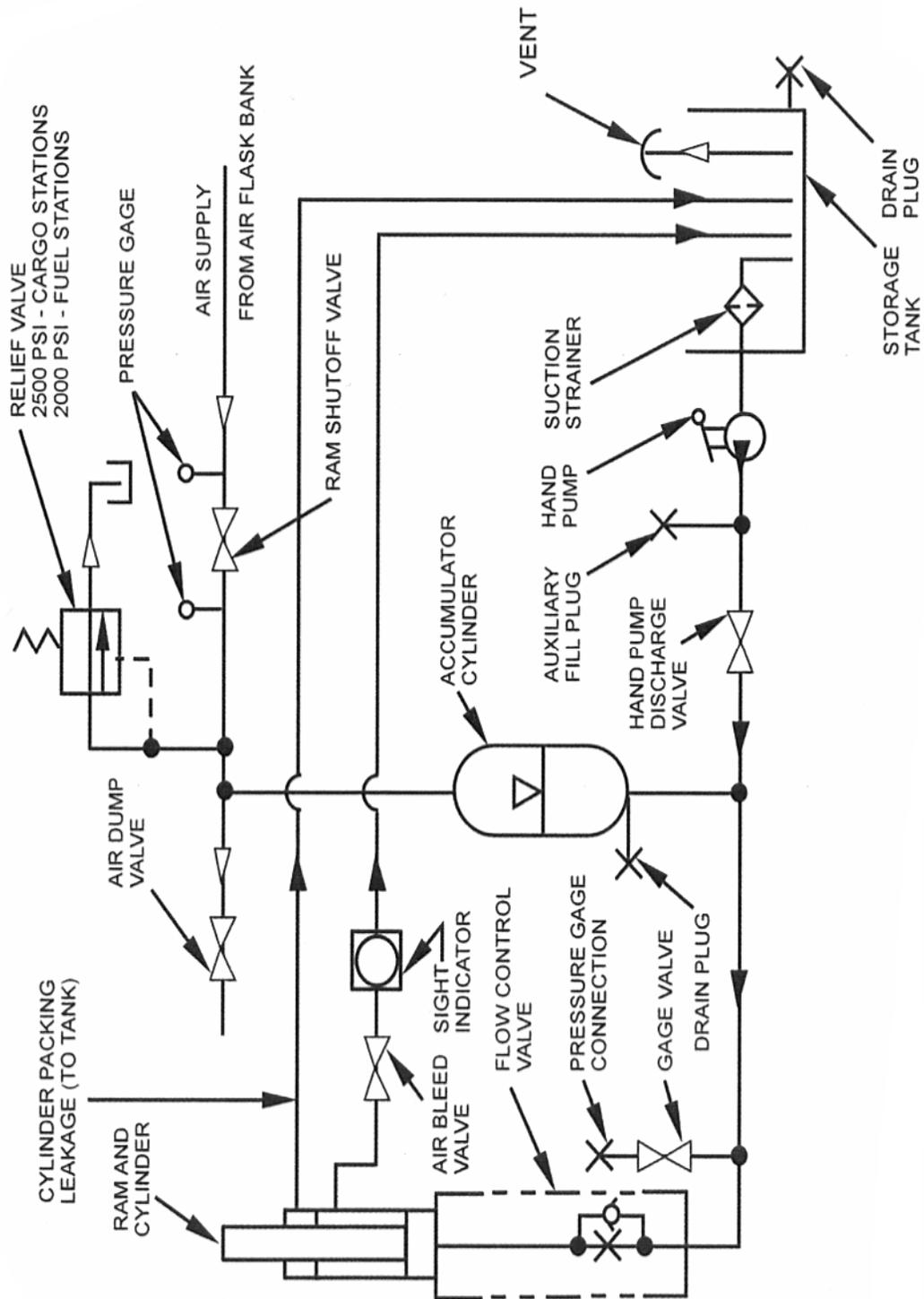
MIL-DTL-24784C(NAVY)



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 31. Functional schematic diagram.

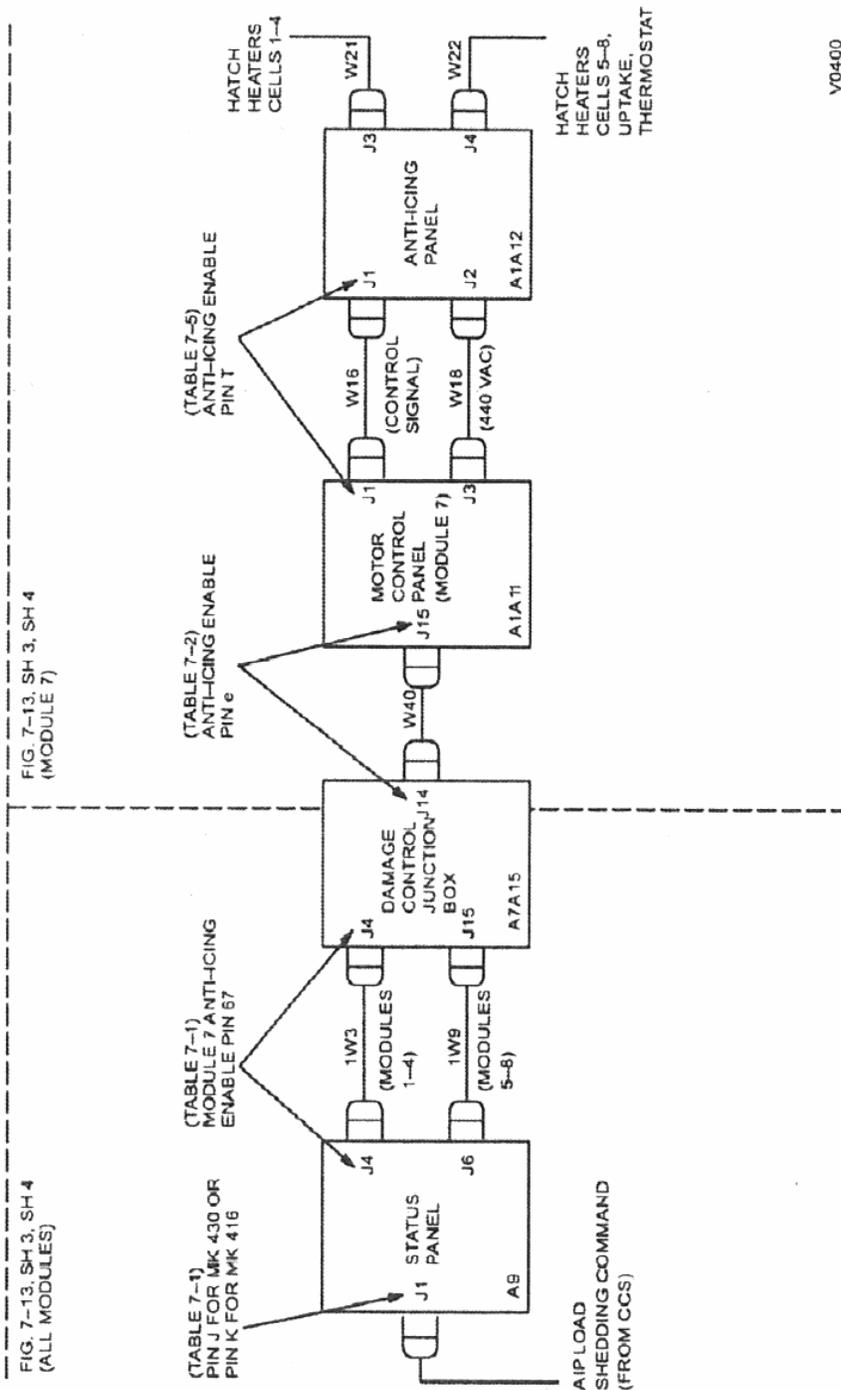
MIL-DTL-24784C(NAVY)



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 32. Pneumatic/hydraulic schematic.

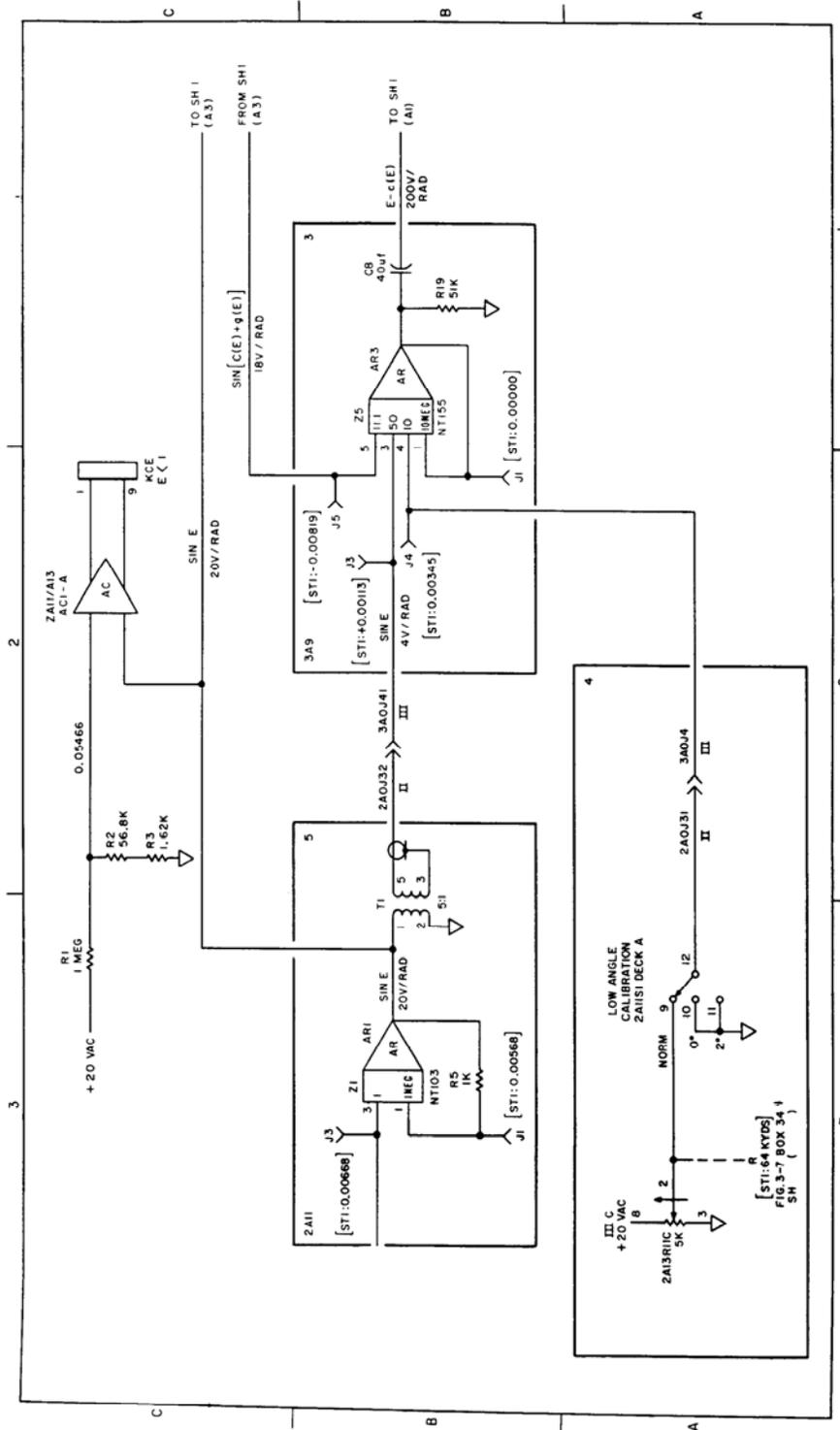
MIL-DTL-24784C(NAVY)



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 33. Single function diagram.

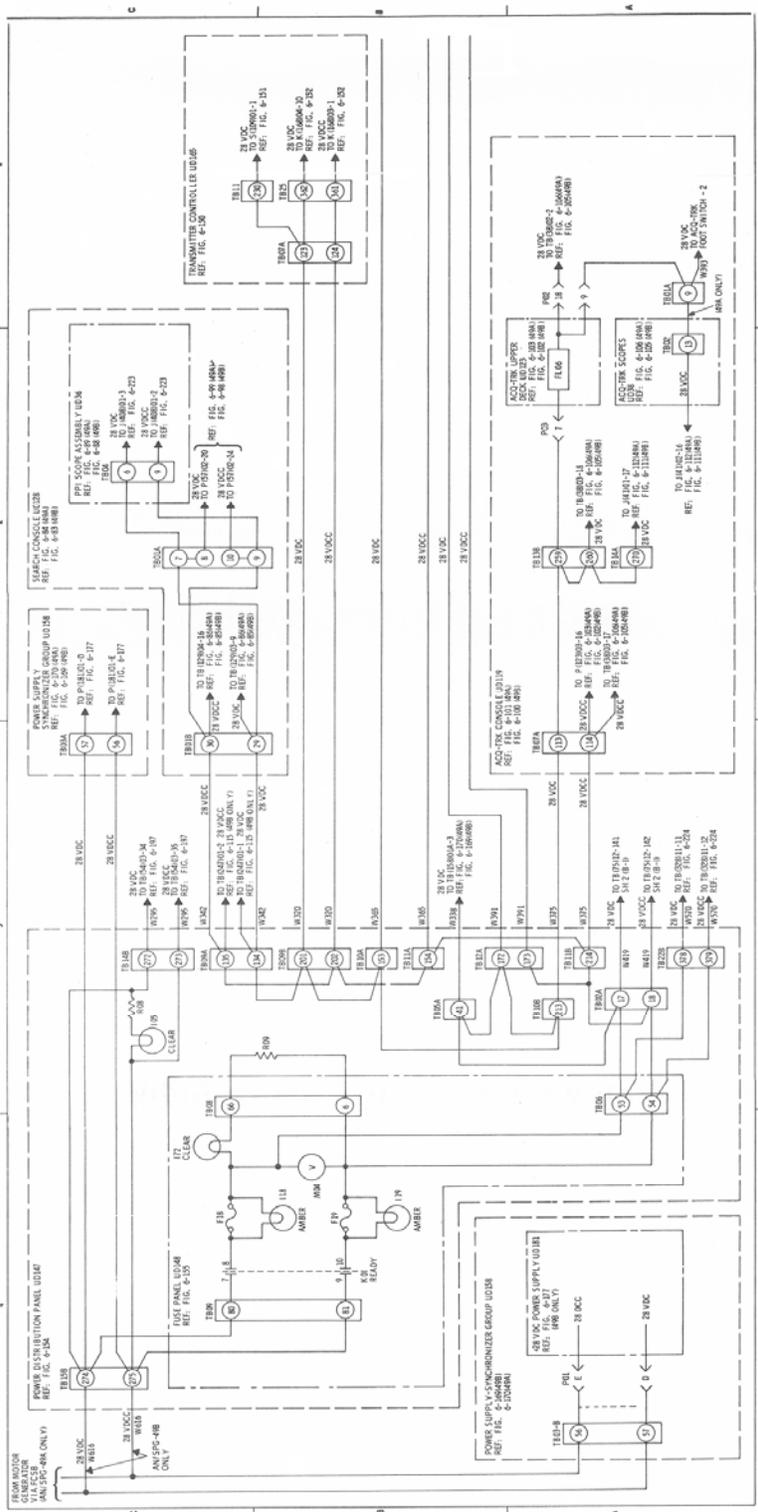
MIL-DTL-24784C(NAVY)



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 34. Signal flow diagram, functional dependency type.

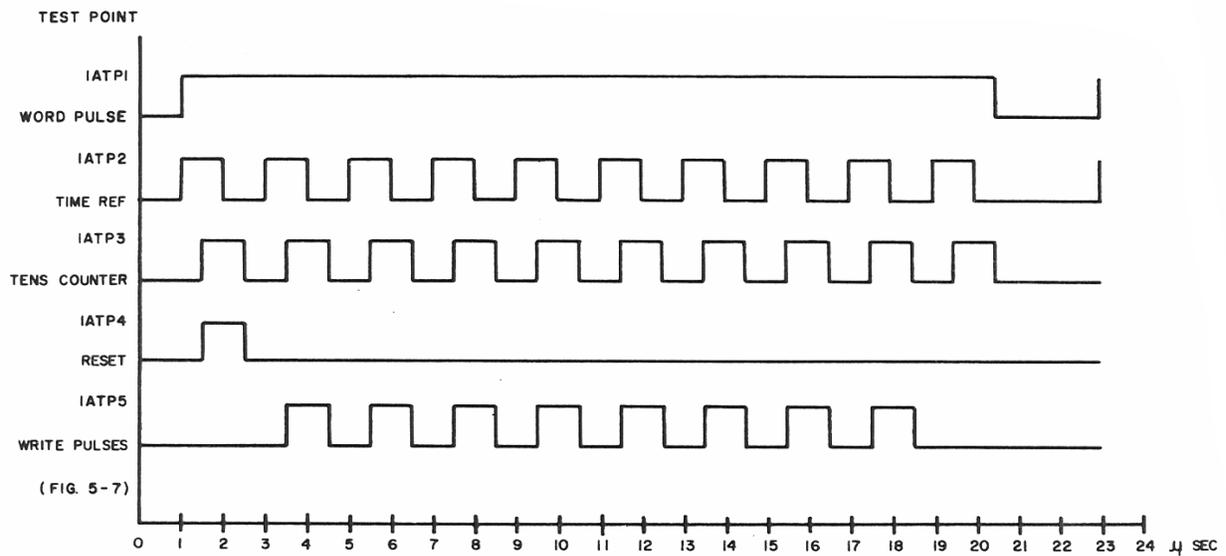
MIL-DTL-24784C(NAVY)



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 35. Power distribution diagram.

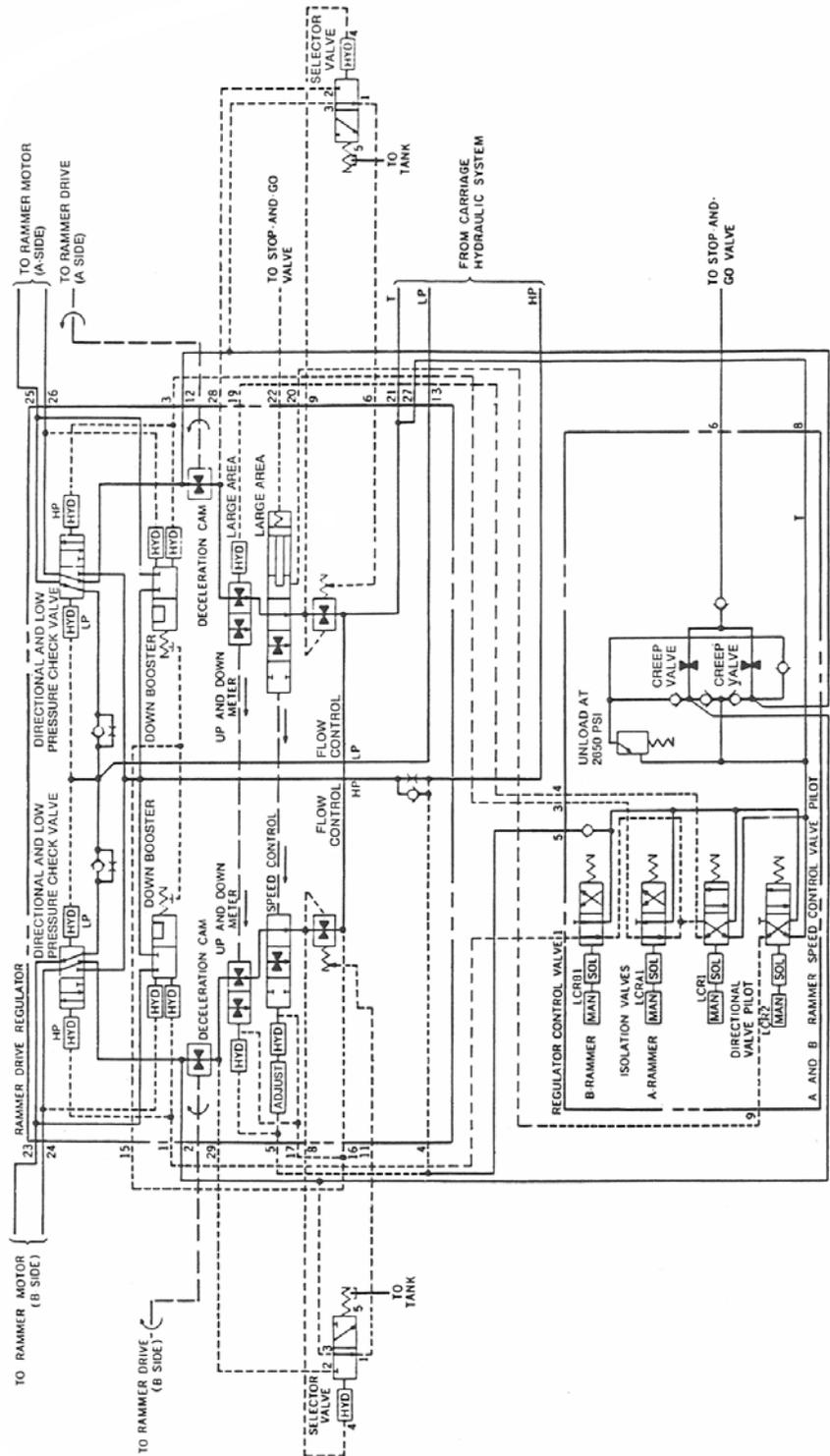
## MIL-DTL-24784C(NAVY)



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 36. Timing circuits diagram.

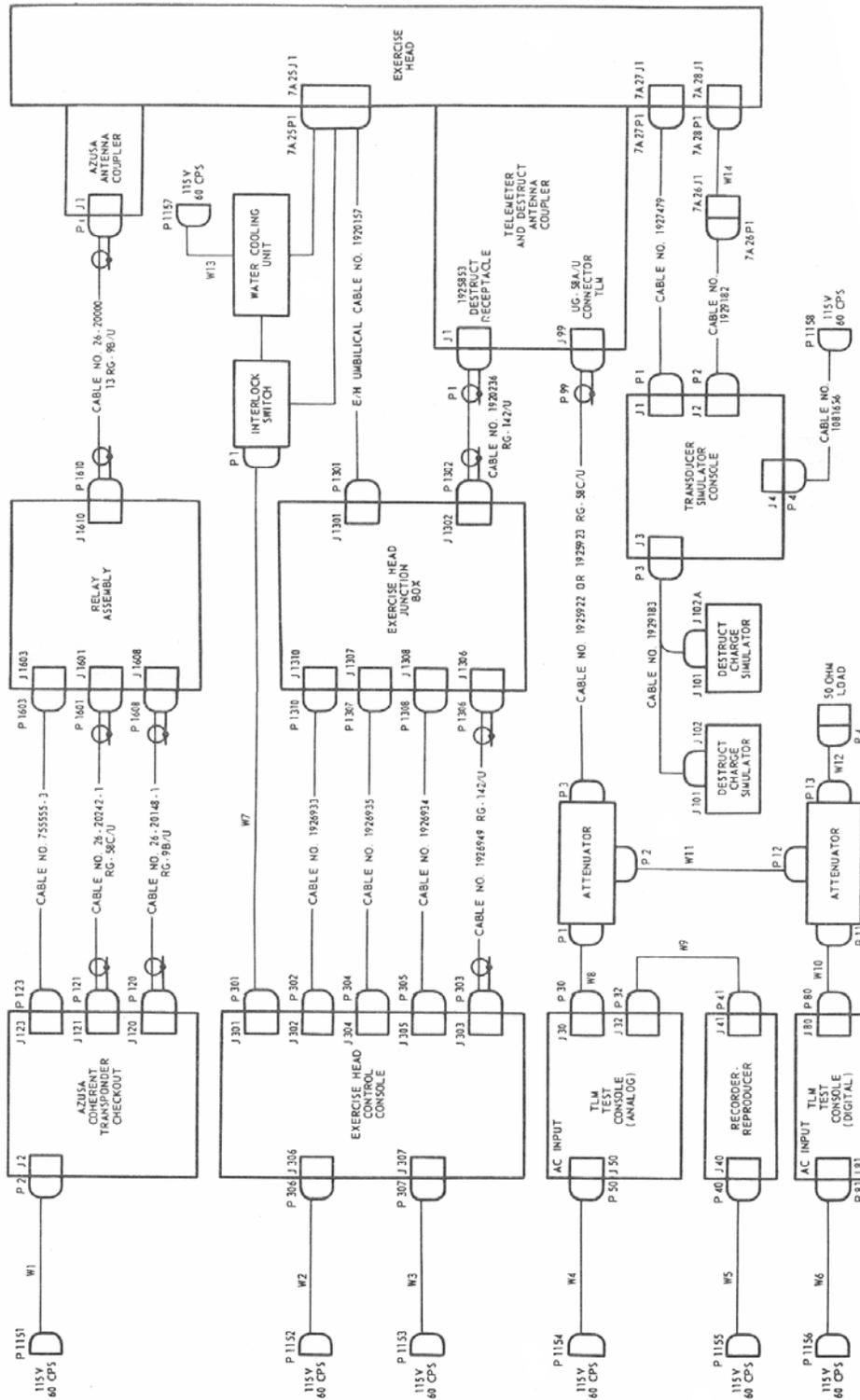
MIL-DTL-24784C(NAVY)



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 37. Piping diagram.

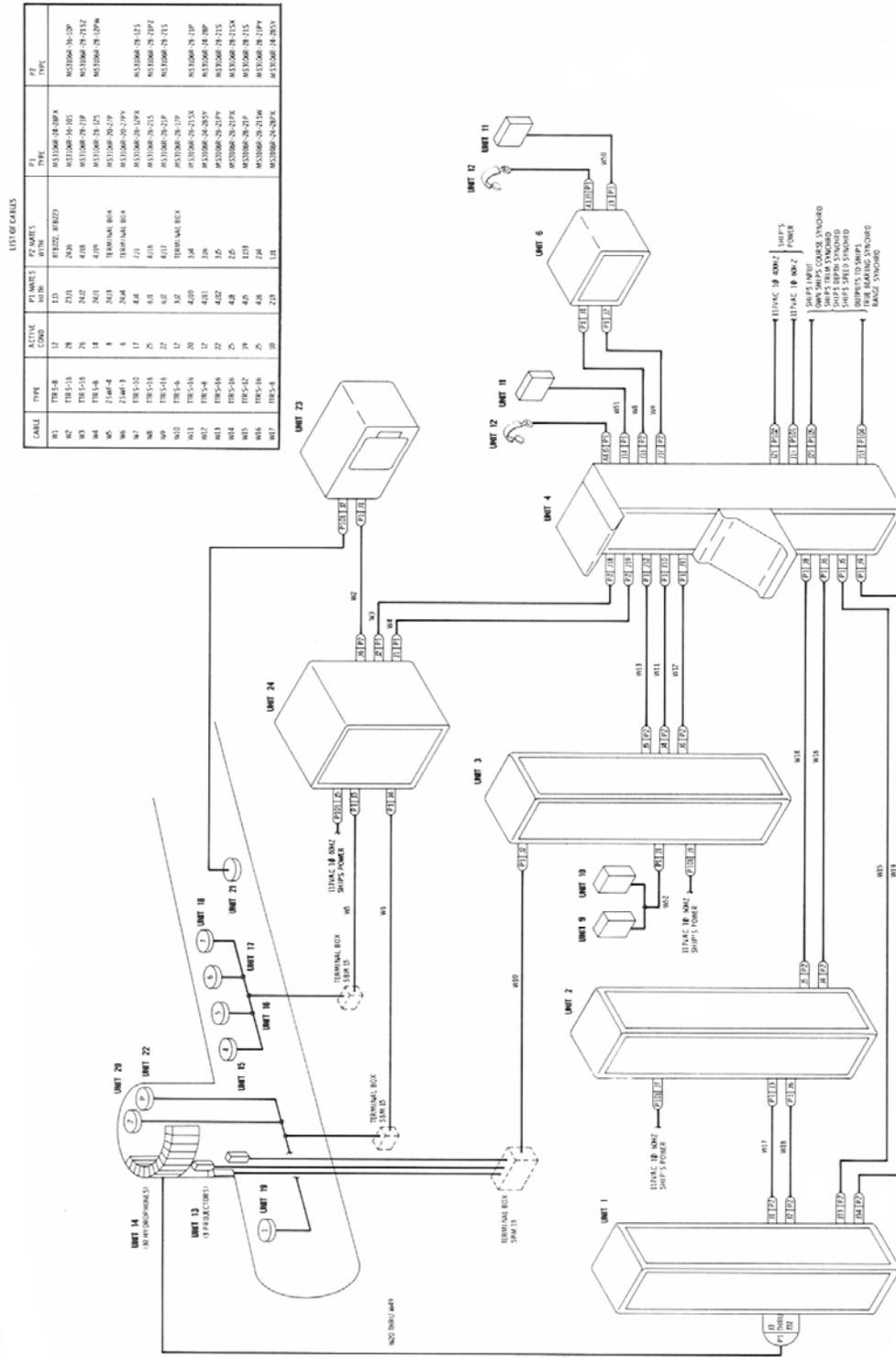
MIL-DTL-24784C(NAVY)



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 38. Interconnection diagram, typical.

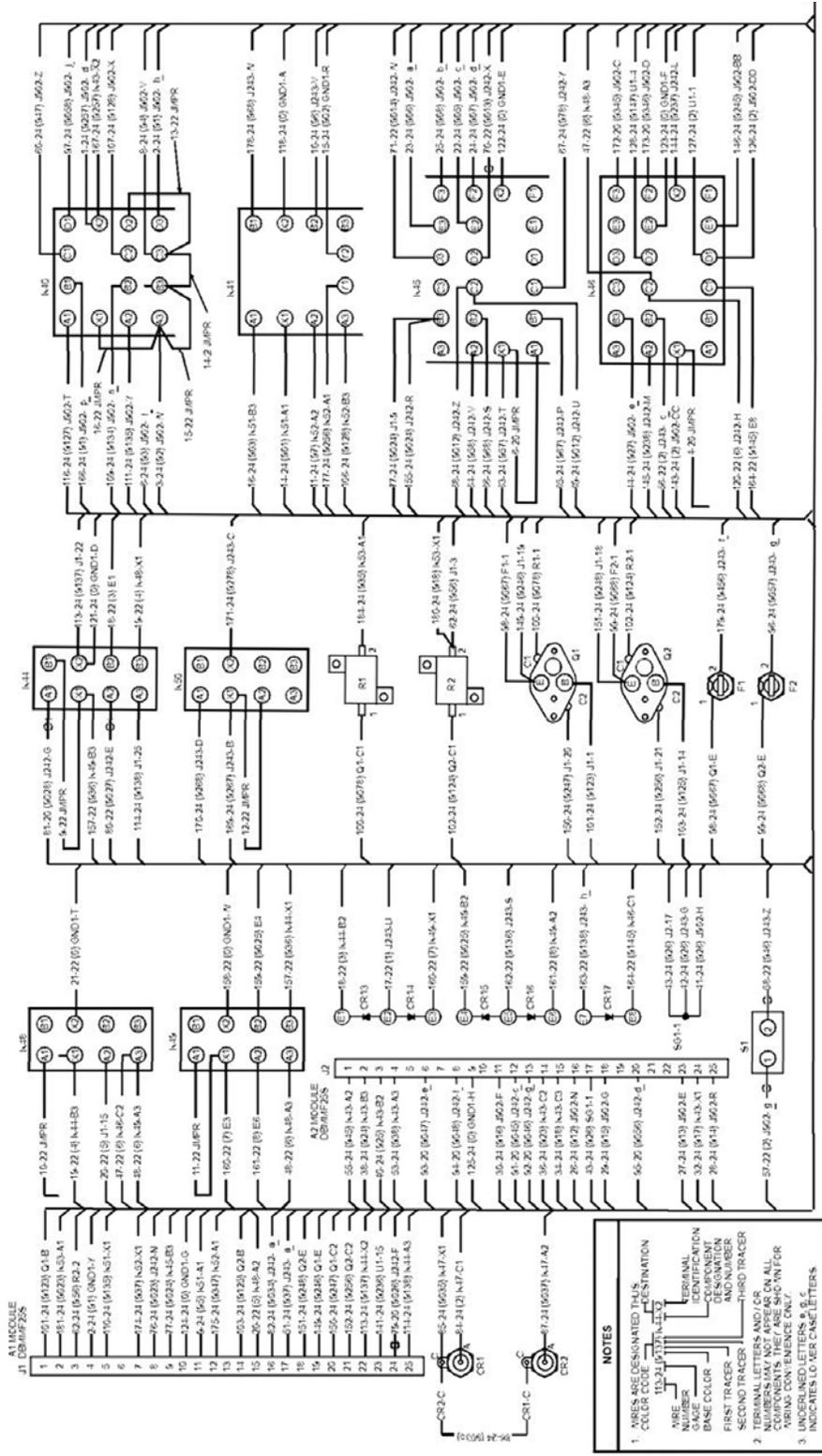
MIL-DTL-24784C(NAVY)



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 39. Interconnecting cable run/piping diagram.

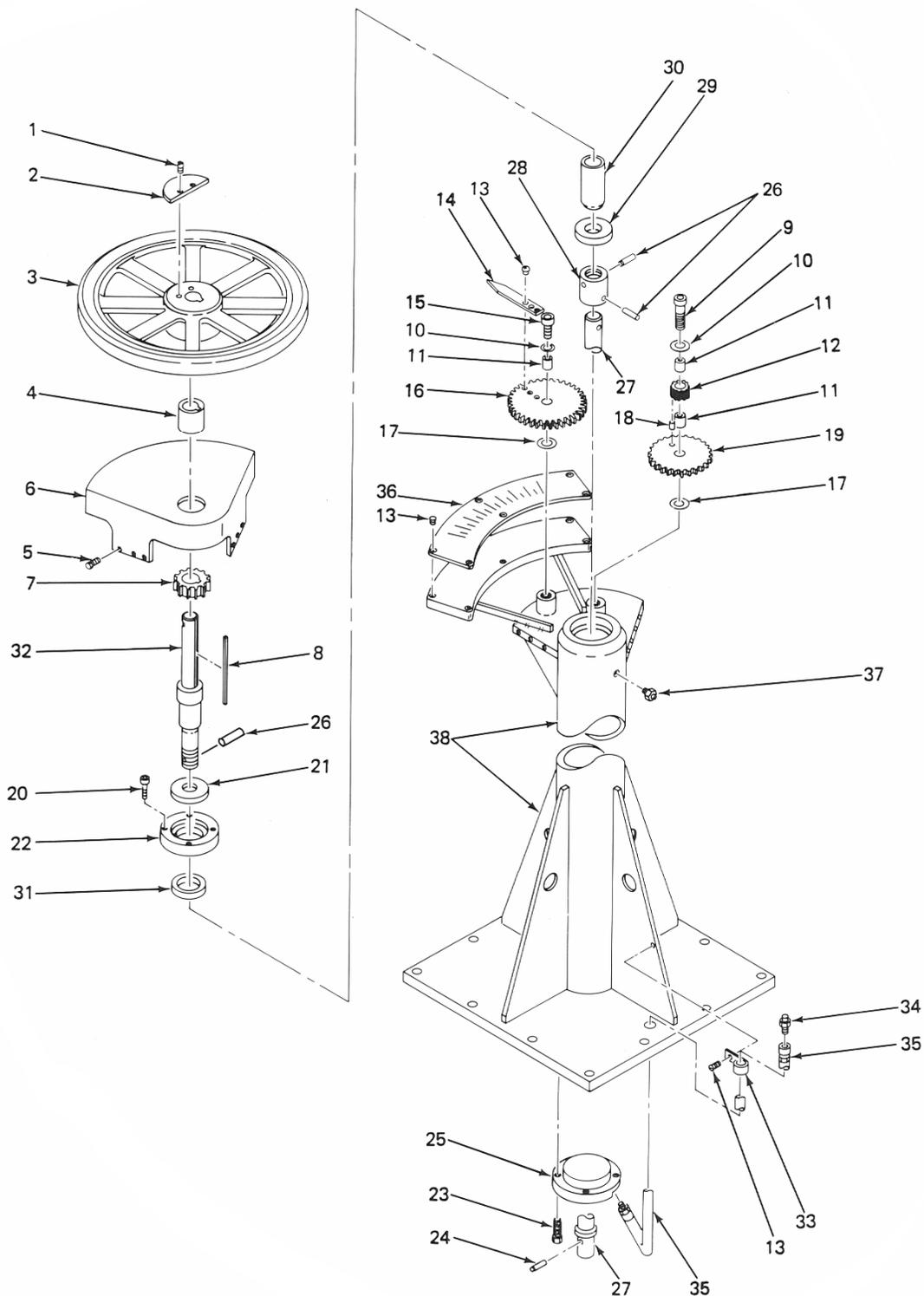
MIL-DTL-24784C(NAVY)



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 40. Wiring diagram.

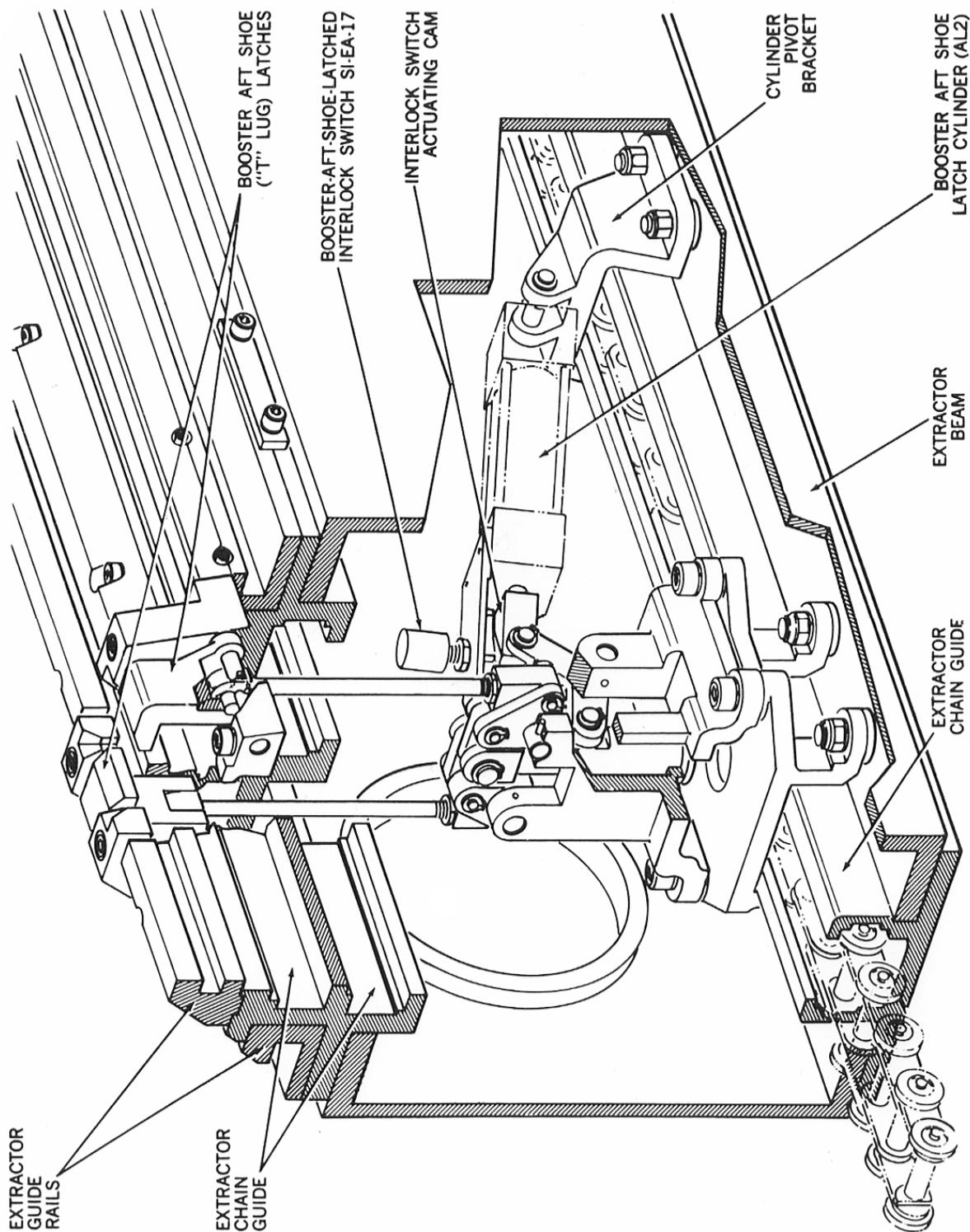
MIL-DTL-24784C(NAVY)



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 41. Exploded view.

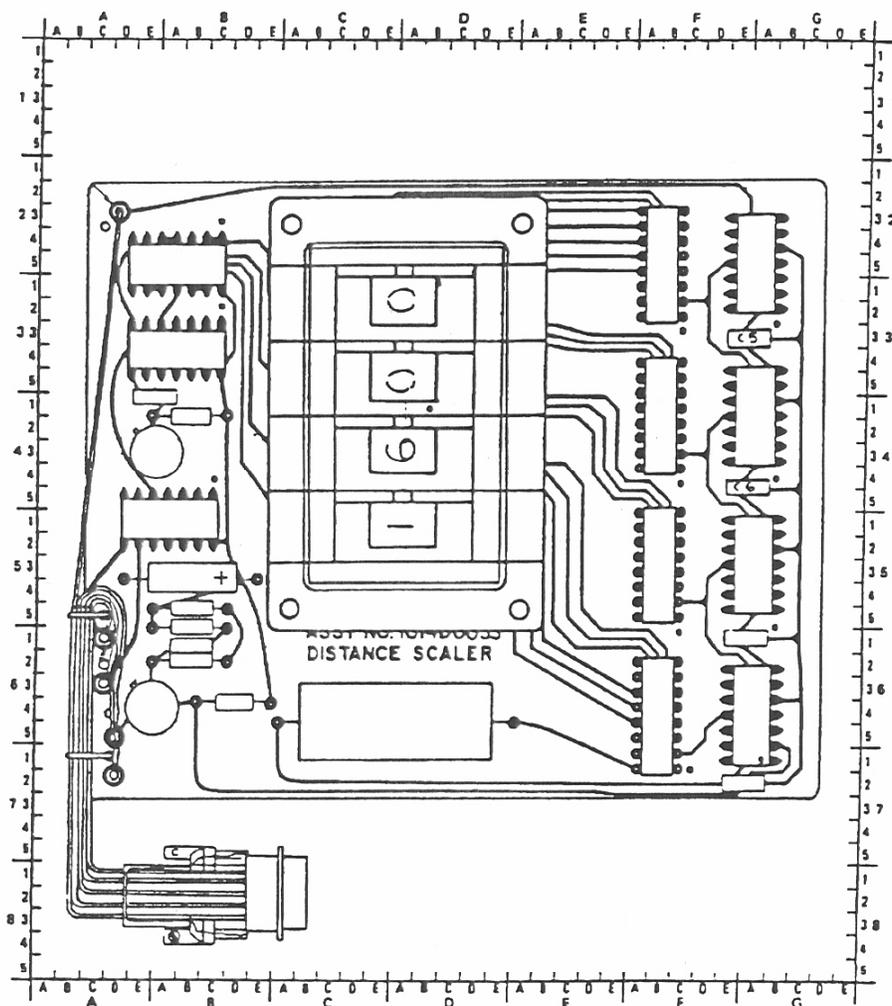
MIL-DTL-24784C(NAVY)



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 42. Sectional view.

MIL-DTL-24784C(NAVY)

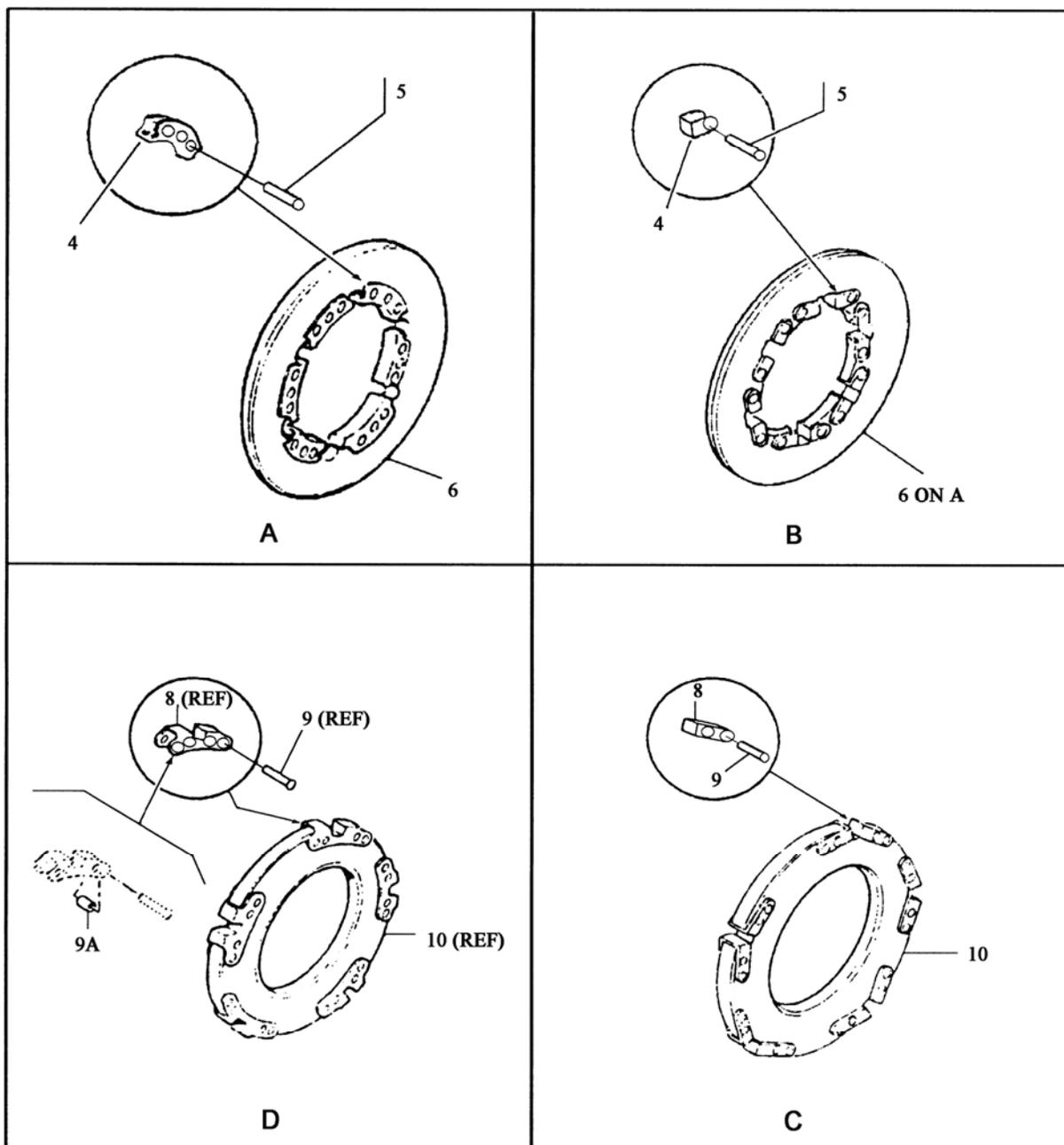


REF DESIG	LOCATING COORD	NAME AND DESCRIPTION
C1	B.B/5.2	CAPACITOR: 15 uf, 20%, 20V, MIL TYPE M39003/01-2050
C2	D.A/6.4	CAPACITOR: 0.1 uf, 10%, 50V, MIL TYPE CH09A1RA1D4K
C3	B.B/6.1	CAPACITOR: 0.01 uf, 20%, 200V, MIL TYPE CK06CW103M
C4	A.E/4.1	SAME AS C3
C5	F.E/3.3	SAME AS C3
C6	F.E/4.2	SAME AS C3
C7	F.E/6.1	SAME AS C3
C8	F.E/7.2	SAME AS C3
E1	A.C/2.3	TERMINAL: MIL TYPE 55155
E2	A.C/6.1	SAME AS E1
E3	A.C/6.3	SAME AS E1
E4	A.D/6.5	SAME AS E1
E5	A.D/7.2	SAME AS E1
P4	B.E/3.2	CONNECTOR: MIL TYPE M53106A14S-6P
Q1	A.E/5.4	TRANSISTOR: MIL TYPE JAN2N2222
Q2	A.E/4.3	SAME AS Q1

Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 43. Printed circuit board, typical.

MIL-DTL-24784C(NAVY)



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE 44. Multisection illustration.

MIL-DTL-24784C(NAVY)  
APPENDIX ASPECIFIC DEVELOPMENT REQUIREMENTS FOR  
PAGE-BASED CHAPTER-FORMAT TECHNICAL MANUALS,  
INFORMATION PACKAGE-FORMAT INTERACTIVE ELECTRONIC TECHNICAL MANUALS, AND  
PAGE-BASED INFORMATION PACKAGE-FORMAT TECHNICAL MANUALS

## A.1. SCOPE

A.1.1 Scope. This appendix establishes the style, format, front matter, other supporting requirements, and products (book plan, IETM content plan) for page-based technical manuals (TMs) and Interactive Electronic Technical Manuals (IETMs). This appendix is a mandatory part of this specification. The information contained herein is intended for compliance.

## A.2. DEVELOPMENT OF PAGE-BASED CHAPTER-FORMAT TECHNICAL MANUALS

A.2.1 General. The following are unique requirements applicable to chapter-format TMs developed in accordance with MIL-DTL-24784/5, /7, /10, and /11.

A.2.2 Development products.

A.2.2.1 Book plan. When specified by the acquiring activity (see 6.2), a book plan shall be developed for each TM.

A.2.2.1.1 Book plan coverage. A book plan shall be developed with the content and format requirements of the applicable specification sheet. The book plan shall portray the planned manual coverage by volume, division, and so forth. The book plan shall be based on the development of a table of contents for each planned volume (including separately bound parts of that volume) and shall include:

- a. A text guide shall list by volume, each part, chapter, section, and informative paragraph titles. A brief statement (outlining the content and intended coverage) shall follow each chapter, section, and paragraph title.
- b. A list of illustrations and a list of tables shall be keyed to the text plan. Each illustration and table listed shall be described. The illustration plan shall contain figure numbers, title, information content, and approximate size and nature for all illustrations (such as schematic, line drawing, and exploded view). A sample of each drawing type referenced in the illustration plan shall be included.
- c. An estimated page count for each chapter and a statement indicating the scope, depth, or coverage.
- d. Data for the front matter, including a brief description of the material to be presented in the foreword, shall be developed.
- e. Data required for the technical content portion of the manual shall outline the planned coverage by proposed volumes, divisions, and so forth, in accordance with the content and format requirements of the applicable specification sheet.
- f. A description of the approach to be used in presenting procedural information. If users of a procedure are expected to vary widely in experience and capability, the Government may direct that certain procedures be presented in a dual-level format (see 3.7.1.8.5).
- g. For **TRS manuals only**:
  - (1) The approach to be used in presenting the overhaul strategy shall be described. A repair process flow chart shall be used to present the overhaul strategy.
  - (2) The range and depth of coverage shall be based upon the maintenance concept or plan and the reliability centered maintenance program of the equipment and the complexity of the planned overhaul and shall include:
    - (a) The minimum procedures and testing requirements to ensure that the Class B overhaul can be performed in an efficient manner by a journeyman-level mechanic.
    - (b) The minimum mandatory replacement parts consistent with the required period between planned overhauls.

MIL-DTL-24784C(NAVY)  
APPENDIX A

- h. A synopsis of the validation approach to the manual content requirements shall be included based on a plan for use as supplied by the Government and the maintenance concept or maintenance plan for the equipment. The synopsis shall indicate coverage on a comprehensive and systematic basis of the most effective and efficient method of performing necessary maintenance. The synopsis shall be correlated to the maintenance concept or plan by direct referencing.
- i. The book plan shall fully enforce all content requirements.
- j. Problems regarding requirements, interpretation, and application shall be identified.
- k. Conflicts between guidance documents shall be highlighted.

A.2.2.1.2 Model manual. When specified by the acquiring activity or approved by the Government, an existing manual covering similar system/equipment may be used and marked up and submitted as a book plan. The text from the model manual may be used verbatim with changes to cover the equipment differences and to correct inconsistencies, unclear wording, or obvious editorial or typographical errors. For all new manuals, the format and style requirements in this specification shall apply. All inconsistencies, unclear wording, or errors noted in the model manual shall be identified to the Government. All deviations from the model manual shall be approved by the Government.

A.2.2.1.3 Milestone schedule. As an addendum to the book plan, a milestone schedule for development of the publication shall be furnished for the individual contract. Milestones to be identified shall include, but are not limited to, the following:

- a. Book plan submission.
- b. RDC drafting percent completion points.
- c. Schematic preparation.
- d. Illustrated Parts Breakdown (IPB).
- e. Editing.
- f. Composition.
- g. RDC submission.
- h. In-process review (IPR) schedule.
- i. Validation.
- j. PTM submission.
- k. Final submission and delivery.

A.2.2.1.4 Book plan updating. The book plan shall be kept up-to-date throughout the development of the TM RDC or PTM and until the RDC or PTM is accepted. Significant changes to the book plan based on IPRs, shall be submitted to the Government for acceptance. Improved data presentation shall be a prime justification in developing changes to the book plan. The need for a revised book plan shall be determined by the acquiring activity.

A.2.2.1.5 Book plan and model manual acceptance. The book plan or model manual shall be submitted to the Government for acceptance prior to development of the RDC or PTM. If rejected, the unacceptable portions shall be corrected and resubmitted. The accepted book plan or model manual shall become an addendum to the applicable specification sheet governing the development of the TM to the extent that it agrees with the requirements of the contract. The accepted document shall be available for review and comparison with the RDC or PTM at all scheduled IPRs. Acceptance of the book plan or model manual by the Government shall not waive any requirements within the scope of the contract.

### A.2.3 Divisions and arrangement.

A.2.3.1 TM divisions. TMs shall be divided into volumes, parts, chapters, sections, paragraphs, and procedures as appropriate. There shall be at least two of each subdivision used, except paragraphs. That is, where there is a Volume 1, Part 1, Chapter 1, or Section I, there shall be a Volume 2, Part 2, Chapter 2, or Section II. All volumes, parts, chapters, and sections shall be titled. Breakout shall be planned to subordinate that which should be subordinated.

MIL-DTL-24784C(NAVY)  
APPENDIX A

A.2.3.1.1 Volumes. Volumes shall be used when a publication exceeds 1500 printed pages (750 sheets) for 8½ by 11 inch manuals and when a publication exceeds 300 printed pages (150 sheets) for 11 by 17 inch manuals. Volumes shall be separated by complete chapters, where possible. When necessary, each volume of a manual may be formatted into two or more separate parts according to required subject matter. Each volume shall be identified by a unique TM identification number, title, and subtitles that describe the contents.

A.2.3.1.2 Parts. When a volume exceeds approximately three inches in thickness, it shall be divided by complete chapters (where possible) into separately bound parts. Each part shall be identified by both its volume number and part number and have a unique TM identification number assigned as provided by the Government.

A.2.3.1.3 Chapters. The manual shall be divided into chapters to provide a logical work sequence arrangement. Chapters shall start on a right-hand page.

A.2.3.1.4 Sections. When multiple coverage in chapters of manuals for compound items is approved by the Government, a chapter sectioning technique may be employed. In this instance, a section that reflects a separate breakout item or separate allowance parts list (APL) identified unit shall start on a new right-hand page.

A.2.3.2 TM arrangement. Each manual shall be arranged according to the following standardized format (as applicable):

- a. Front matter.
- b. Technical content.
- c. Appendices.
- d. Glossaries
- e. Alphabetical index.
- f. Technical Manual Deficiency/Evaluation Report (TMDER) form.

A.2.3.2.1 Front matter. Material preceding the first chapter shall consist of the following as applicable, in the order specified:

- a. Cover/title page.
- b. List of effective pages
- c. Table of contents
- d. List of illustrations.
- e. List of tables.
- f. Foreword.
- g. Safety summary.
- h. Frontispiece.

A.2.3.2.1.1 Cover/title page. The following are unique requirements for chapter-format TMs. See 3.6 for general requirements applicable to all TM types.

A.2.3.2.1.1.1 Backbone and back cover. When required by the acquiring activity, a backbone and/or back cover for the manual shall be prepared in accordance with figure A-1.

A.2.3.2.1.2 List of effective pages. A list of effective pages shall be included (see figures A-2 and A-3). The list of effective pages shall back up the title page and shall be numbered. When the last page is a right-hand page, it shall not be backed up and shall list the next succeeding page as blank, for example, "B/(C blank)". The list of effective pages shall be a complete list of all manual pages, including title page, the list of effective pages, table of contents pages, list of illustration pages, list of table pages, safety summary pages, blank pages, deleted pages, added pages and foldout pages. The list of effective pages shall include a statement of the total number of pages in the manual. The listing shall be held to a minimum by grouping numbers where applicable. The page numbers for a blank page and the printed side of the sheet shall be listed as separate numbers even though a double number will appear on the printed side of the sheet. When applicable, the list of effective pages shall be updated for each change or revision.

MIL-DTL-24784C(NAVY)  
APPENDIX A

A.2.3.2.1.2.1 List of effective pages for multi-volume manuals. A list of effective pages covering all volumes shall be included in Volume 1. In a multi-volume manual, each of the volumes, except Volume 1, shall include a list of effective pages for pages provided in that particular volume.

A.2.3.2.1.3 Table of contents. A table of contents listing front matter, parts, chapters, sections, and paragraphs in the same order and with the exact titles used in the text, with page number, shall be placed at the beginning of each publication (see figure A-4). In publications containing alphabetical indexes, only primary and first subordinate paragraphs shall be listed in the table of contents. There shall be no table of contents preceding individual parts, chapters, or sections. Each manual or volume in a set of manuals shall contain its own table of contents. Volume 1 or the first manual of the set shall contain a complete table of contents covering the entire set. Entries shall indicate the volume in which the referenced material appears. Layout shall be in accordance with figure A-4, except that a double column format shall be used when the manual is prepared in double column.

A.2.3.2.1.4 List of illustrations. Publications containing illustrations (including charts and graphs assigned figure numbers) shall have a list of illustrations showing the figure number, title, and page number of each figure. This list shall include foldout pages, schematics, and so forth. The security classification, if any, of illustration titles shall be indicated. Layout shall be in accordance with figure A-5 except that a double column format shall be used when the manual is prepared in double column. Each manual or volume in a set of manuals shall contain its own list of illustrations. In addition, Volume 1 or the first manual of the set shall contain a list of illustrations for all volumes or manuals in the set.

A.2.3.2.1.5 List of tables. Manuals containing tables (including charts assigned table numbers) shall have a list of tables showing the table number, title, and page number of each table. The security classification, if any, of table titles shall be indicated. Layout shall be in accordance with figure A-5 except that a double column format shall be used when the manual is prepared in double column. Each manual or volume in a set of manuals shall contain its own list of tables. In addition, Volume 1 or the first manual of the set shall contain a list of tables for all volumes or manuals in the set. When both are brief, the list of illustrations and list of tables may be included on the same page.

A.2.3.2.1.6 Foreword. A foreword containing the purpose and scope of the manual plus any other information required by the technical content specification sheet shall be provided (see figure A-6). The foreword shall identify and define abbreviations and nonstandard symbols, including any icons used in the manual if not explained elsewhere. When more than 20 abbreviations/symbols, etc. require definition, a glossary shall be used to identify and define the abbreviations/symbols used in the manual (see A.2.3.2.4). The first volume of a manual shall contain general information and reporting requirements regarding all volumes and specific information applicable to Volume 1, as required. The first volume of a manual shall provide current information on contacting Navy Distance Support (Anchor Desk) via the web (<http://www.anchordesk.navy.mil/>) and via the toll free number (1-877-4-1-TOUCH [86824]). The following statement shall also be included:

“Ships, training activities, supply points, depots, Naval Shipyards and Supervisors of Shipbuilding are requested to arrange for the maximum practical use and evaluation of NAVSEA technical manuals (TMs). All errors, omissions, discrepancies, and suggestions for improvement to NAVSEA TMs shall be submitted as a Technical Manual Deficiency/Evaluation Report (TMDER). All feedback comments shall be thoroughly investigated and originators will be advised of action resulting there from.

*(Use this statement for printed hard copy TMs)*

Three copies of the NAVSEA/SPAWAR Technical Manual Deficiency/Evaluation Report form, NAVSEA 4160/1 are included at the end of each separately bound hardcopy TM.

*(Use this statement for a TM on CD-ROM)*

The NAVSEA/SPAWAR Technical Manual Deficiency/Evaluation Report form, NAVSEA 4160/1 is included as the last page of the TM.

*(Include this statement for all TMs)*

Copies of form NAVSEA 4160/1 may also be downloaded from:

[https://nsdsa2.phdnswc.navy.mil/tmmp/forms/TMDER\\_BLANK\\_REV\\_7-2003.doc](https://nsdsa2.phdnswc.navy.mil/tmmp/forms/TMDER_BLANK_REV_7-2003.doc)

MIL-DTL-24784C(NAVY)  
APPENDIX A

The following methods are available for generation and submission of TMDERs:

- The most expedient and preferred method of TMDER generation and submission is via the Technical Data Management Information System (TDMIS) website at: <https://mercury.tdmis.navy.mil>. TDMIS accounts can be requested at <https://nsdsa2.phdnswc.navy.mil/>.
- Generate and submit TMDER via the Naval Systems Data Support Activity (NSDSA) website at: <https://nsdsa2.phdnswc.navy.mil/tmder/tmder-generate.asp?lvl=1>.
- When internet access is not available, submit TMDER via hardcopy to:

COMMANDER  
CODE 310 TMDERs  
NAVSURFWARCENDIV NSDSA  
4363 MISSILE WAY, BLDG 1388  
PORT HUENEME, CA 93043-4307

- TMDERs against classified TMs must be submitted using the hardcopy method cited above.
- Urgent priority TM deficiencies shall be reported by Naval message with transmission to Port Hueneme Division, Naval Surface Warfare Center (Code 310), Port Hueneme, CA. Local message handling procedures shall be used. The message shall identify each TM deficiency by TM identification number and title. This method shall be used in those instances where a TM deficiency constitutes an urgent problem, (i.e., involves a condition, which if not corrected, could result in injury to personnel, damage to the equipment or, jeopardy to the safety or success of the mission).

Complete instructions for TMDER generation and submission are detailed on the NSDSA website at: <https://nsdsa2.phdnswc.navy.mil/tmder/tmder.asp?lvl=1>.”

A.2.3.2.1.7 Safety summary. All TMs containing dangers, warnings, or cautions shall have a safety summary. General safety precautions and the complete warnings applicable to hazardous materials and related information shall be prepared as the safety summary in accordance with 3.7.5.10. The safety summary shall be located as the last page(s) of the front matter.

A.2.3.2.1.8 Frontispiece. A frontispiece shall illustrate the system, equipment or repairable item covered in the manual. It shall be placed preceding Chapter 1 (see 3.7.8.2.1).

A.2.3.2.2 Technical content. See MIL-DTL-24784/5, /7, /10, and /11 for technical content data requirements.

A.2.3.2.3 Appendices. Appendices shall be used to separate relatively bulky information from the body of the manual when such separation will increase the clarity of the overall manual. Each appendix shall contain a statement delineating its purpose and application. Appendices shall immediately follow the last chapter of the manual. Appendices shall begin on a right-hand page. Pages, paragraphs, illustrations, and tables for appendices shall be numbered. Each manual or volume in a set of manuals shall contain its own appendices. In addition, volume 1 or the first manual of the set shall contain a list of appendices for all volumes or manuals in the set.

A.2.3.2.4 Glossaries. Glossaries shall be used in TMs only when the terms (acronyms/abbreviations, symbols) are not adequately defined in the text, in the Navy, DOD or standard dictionary, or contained in the manuals foreword. If a glossary is required, it shall immediately precede the alphabetical index, if any. Each manual or volume in a set of manuals shall contain its own glossary. In addition, Volume 1 or the first manual of the set shall contain a glossary for all volumes or manuals in the set.

MIL-DTL-24784C(NAVY)  
APPENDIX A

A.2.3.2.5 Alphabetic index. Unless otherwise specified by the acquiring activity (see 6.2), an alphabetical index shall be developed when the number of titled paragraphs in a manual exceeds 100 (see figure A-7). When specified, an index shall be prepared regardless of the number of paragraphs. It shall list pertinent subjects under every topic for which users are likely to look. "See" and "see also" references may be included to guide the user to other pertinent entries. All applicable paragraph numbers for each item shall be indicated. The alphabetical index shall be so constructed as to enable the user to easily locate any part, information, or operation described in the text. Alphabetical indices shall begin on a right hand page. The alphabetical index shall be located at the end of the publication but, when applicable, shall be located before foldout page(s). Each manual or volume in a set of manuals shall contain its own index. In addition, Volume 1 or the first manual of the set shall contain an index for all volumes or manuals in the set.

A.2.3.2.6 TMDER. Three copies of the TMDER form NAVSEA 4160/1 shall be included at the back of each separately bound volume or part of a NAVSEA manual. The TMDER is a user activity TM comment sheet and shall be used to provide feedback on corrections and suggested improvements to the methods and procedures specified by a TM.

A.2.4 Style and format.

A.2.4.1 Page size, reproduction area, and margins. Unless otherwise specified in the specification sheet, manuals shall be prepared in 8½ by 11 inch size with a reproduction area of 7¼ by 10 inches. The binding edge margin shall not be less than 1 inch and the outside edge margin not less than ¼ inch.

A.2.4.2 Column format. Preferred text format for 8½ by 11-inch manuals is single column (7¼ inches wide), although double column can be used. Both single and double column formatted content can be included in a single TM if it would make the data more readable or comprehensible, however, both formats should not be used in the same chapter. If double column is used, each column shall be approximately 3½ inches wide with approximately a ¼-inch gutter between.

A.2.4.3 Text placement. Left justification shall be used for all lines of text displayed as sentences or paragraphs. Text shall not be wrapped around an illustration.

A.2.4.4 Type style, capitalization, and vertical spacing. Type style, size (font), and capitalization shall be as identified in figure A-8. Layout shall conserve space without lessening usability or clarity of material. Blank pages and spaces shall be avoided whenever possible. Leading (see 6.4.11) and vertical spacing as indicated by figure A-8 shall be used for best legibility and conservation of space. Text shall be single spaced (double spaced between procedural text). Double spacing of text within a paragraph, or similar wastefulness, is unacceptable. Layout practices shall not result in:

- a. The first line of a paragraph being at the bottom of a page or column.
- b. The last line of a paragraph being at the top of a new page.
- c. A sidehead falling on the last line of a page or column.
- d. Dangers, warnings, cautions, and notes being divided so that first lines or group of icons appear on one page and remaining lines or group of icons on another (first lines or group of icons) may appear in the left column with remaining lines in the right column on the same page).
- e. Dangers, warnings, cautions, and notes being separated from the paragraph that they apply to (dangers, warnings, cautions, and notes may appear in the left column with applicable paragraphs in the right column on the same page).
- f. Undesirable location of an illustration or table.

A.2.4.5 Margin data. Margin data (generally the running heads and feet) shall be placed outside that portion of the page used for either narrative text, full-page tabular data or full-page illustrations, but within the reproduction area dimensions of the page. When applicable, margin data also consists of the change number, security classification, page content and equipment identification, figure number, and figure title.

A.2.4.5.1 Running heads and feet. Complete running heads and feet shall be included on all pages except title pages or pages otherwise blank. Blank pages that back up classified pages shall be marked with the security classification of the backed up page.

MIL-DTL-24784C(NAVY)  
APPENDIX A

A.2.4.5.1.1 Running heads.

A.2.4.5.1.1.1 Security classification. The security classification, including unclassified pages, of classified manuals shall be marked at the top center of each page in bold face type in accordance with SECNAVINST 5510.36. For foldouts, the security classification shall be marked in bold face type, ¾ inch from the right-hand edge and repeated continuously to the left with four inches of space between each marking.

A.2.4.5.1.1.2 TM identification number. The TM identification number, as assigned for each volume and part, shall be in bold face type at the upper outer edge of each page and outer segment (page unit) of each foldout page. When all the information for a manual is placed horizontally on all pages and all pages are arranged head to foot, the TM identification number shall be placed in the upper right corner of all pages.

A.2.4.5.1.2 Running feet.

A.2.4.5.1.2.1 Page number. Page numbers shall be located at the lower outer edge ending at the outside margin and shall be in bold face type. Even numbers, including zero, shall be assigned to left-hand pages and odd numbers to right-hand pages. The page number for a foldout page shall be so placed (lower outer edge ending at the outside margin) that the number shall be visible when the printed page is folded.

A.2.4.5.1.2.2 Security classification. The security classification, including unclassified pages, of classified manuals shall be marked at the bottom center of each page in bold face type in accordance with SECNAVINST 5510.36. For foldouts, the security classification shall be marked in bold face type, ¾ inch from the right-hand edge and repeated continuously to the left with four inches of space between each marking.

A.2.4.5.1.2.3 Foldout figure number and title. The figure number and title for a foldout page shall be so placed (lower outer corner) that the number shall be visible when the printed page is folded.

A.2.4.6 Paragraph headings. Paragraph headings (titles) are identified as primary sideheads, first subordinate sideheads, second subordinate sideheads, and so forth. Each paragraph heading (sidehead) shall describe that paragraph's contents. There shall be two spaces between the paragraph number and the title. See figure A-9.

A.2.4.6.1 Primary paragraph sideheads. Primary paragraph sideheads shall begin at the left margin, two spaces below the preceding paragraph, appear in capital letters, be underscored, and end with a period. Primary paragraph sideheads stand alone (are not run in with text).

A.2.4.6.2 Subordinate paragraph sideheads. Subordinate paragraph sideheads shall begin at the left margin and begin two spaces below the preceding paragraph. The first letter of the first word and of each principal word shall be capitalized, and the title shall be underscored. The sidehead shall end with a period. The text shall begin on the same line as the title and paragraph number. Carry-over lines for all subordinate paragraphs shall return to the left margin.

A.2.5 References. References shall be kept to a minimum and shall be limited to Government approved documents such as military specifications and standards, TMs, drawings, engineering change data, and other approved material which will enhance the clarity and support the repair requirements and processes delineated in the manual. Referencing shall conform to the following:

- a. Where a small amount of information is needed (fewer than two pages), the applicable material shall be copied verbatim.
- b. Where a large amount of material is required (more than two pages), the applicable material shall be referenced fully, including the publication number and title. Reference to alternative repair procedures and drawings required to refurbish parts is acceptable if that refurbishment information is not routinely required.

A.2.5.1 Text references. The text shall reference to:

- a. Illustrations by the word "Figure", the figure number, including section letter and number when applicable, and the sheet number for multi-sheet illustrations, when applicable.

MIL-DTL-24784C(NAVY)  
APPENDIX A

- b. Illustrations by the word “Figure”, the figure number, followed by the index number. For example: “(Figure 2-6, Item 34).” However, when multiple references in a paragraph refer to the same figure, only the first reference need indicate the figure number. For example:

“2.7 NONREVERSIBLE VALVE.

2.7.1 Removal. Removal of the valve will allow access to the impeller.

- a. Remove safety wire from J1, J2, and J3 and remove connectors.
- b. Remove four nuts (Figure 2-2, Item 16), washers (17), and bolts (18) securing valve (1) to mount (20) and remove from mount.”

In such cases where a procedure involves two or more figures, the paragraph lead-in shall contain a statement similar to the following: “Item numbers below refer to Figure 2-2 unless otherwise indicated.” The remaining callouts shall cite the figure number followed by the index number, e.g., “(Figure 2-5, Item 3).” For example:

“2.7 NONREVERSIBLE VALVE.

2.7.1 Removal. Removal of the valve will allow access to the impeller. Item numbers below refer to Figure 2-2 unless otherwise indicated.

- a. Remove safety wire from J1, J2, and J3 and remove connectors.
- b. Remove four nuts (16), washers (17), and bolts (18) securing valve (1) to mount (20) and remove from mount.
- c. Remove safety wire from locking ring (Figure 2-5, Item 3).
- d. Unscrew locking ring from valve body (Figure 2-5, Item 5).
- e. Remove mount (3).”

- c. When reference is made to items in figures by reference designations, the numbers shall be indicated in the following manner: “The ON-OFF switch (S1, Figure 3-6) on the center console controls the TWT cooling”.
- d. Reference to zones by the zone number first then the zone letter to avoid possible confusion with references designations.
- e. Parts on diagrams by enough of their reference designation to identify the item. For example, Resistor A6R11.
- f. Tables by table number. For example, “Table 2-1”.
- g. Other supporting paragraphs by exact paragraph title (without the paragraph number) in capital letters, followed by the volume, part, chapter and section number in parentheses.
- h. Footnotes, when essential for reference, explanation, comments, and so forth. Footnotes shall be numbered. Identical footnotes shall not be repeated within the chapter. Footnotes in the text shall not be used for mandatory requirements. Footnotes to the text shall be placed at the bottom of the page with a one-inch horizontal rule placed flush left two spaces below the text and the footnote placed under the rule.

A.2.5.2 Post maintenance action referencing. When required, the last step of a procedure shall reference any post maintenance actions necessary to ensure the initial procedure has been successfully completed. The reference shall be to the procedure title

A.2.5.3 Enclosures. (**TRS manuals only**) Enclosures may be used to include closely related material that is not an inherent part of the manual. The enclosures, identified in full, shall be listed by numbers in the order they are mentioned in the text. Enclosures shall be inserted immediately after the last Appendix. The page designation shall be “Enclosure \_\_\_, page \_\_\_ of \_\_\_”.

MIL-DTL-24784C(NAVY)  
APPENDIX A

A.2.6 Use of terminology, nomenclature, numbers, and equations.

A.2.6.1 Abbreviations and acronyms. Use of abbreviations and acronyms shall be held to a minimum and each shall be spelled out the first time it appears in each chapter, section, or part where confusion may exist or usability shall be enhanced.

A.2.7 Tabular material.

A.2.7.1 Table titles. Tables shall be assigned table titles. The title shall follow two spaces after the table number and shall be centered above the table. The first letter of the first word and of each principal word shall be capitalized. Full-page tables, placed sideways on a page, shall be turned 90 degrees counterclockwise. The table number and title for a turned table shall also be turned 90 degrees counterclockwise to stay centered above the table. Table titles shall begin with an identifying name. For example:

“Table 3-1. Guidance System Test Points”

The title shall be short and describe the contents or purpose of the table. Tables applicable to one Service, in a manual that will be used by more than one Service, shall be identified. For example:

“Table 2-3 (Navy Only). Fuel Indicator Correction Factors”

A.2.7.2 Continued table material. When a table is continued on a following page, the number and title shall be repeated at the head of the columns on all following pages of the table, followed by a dash and the word “Continued.” Table head titles shall also be repeated. The above information shall not be repeated on a following page when the page is a foot page of a head to foot tabular arrangement. When a table entry is continued, the entry or its identifying number or letter from the first column shall be repeated in the first column followed by a dash and the abbreviation “Cont”.

A.2.7.3 Footnotes in tables. Footnotes shall be placed immediately below the table in which they are referenced. If a table is continued onto other pages, all footnotes shall be placed at the bottom of the page on which they are referenced or at the end of the table and the directory note “See footnotes at end of table” shall be placed at the bottom of pages containing footnote references. For footnotes coming before the end of the table, and for a directory note, a one-inch horizontal rule shall be placed flush left below the table and the footnote or directory note placed under the rule. Footnotes at the end of the table shall be started on the second line below the closing rule. All table notes and footnotes shall be indented five spaces from the left margin of the table and carry over lines shall return to the left margin of the table.

A.2.8 Numbering.

A.2.8.1 Cover and title pages. The cover and title page shall not be numbered.

A.2.8.2 Front matter. Lower case Roman numerals (in sequence i, ii, iii, and so forth) shall be used in numbering front matter pages following the list of effective pages and preceding Chapter 1.

A.2.8.2.1 List of effective pages. The list of effective pages shall be numbered using the letter “A” in the lower left-hand corner. When the list of effective pages otherwise begins as a right-hand page, the letter “A” shall be in the lower right-hand corner. When additional pages are required, they shall be identified as “B”, “C”, and so forth.

A.2.8.3 Volumes. When used, volumes shall be numbered consecutively in Arabic numerals. Two or more volumes shall be identified sequentially by volume numbers and subtitles indicative of volume content and have a unique TM identification number assigned as provided by the Government.

A.2.8.4 Parts. Each part shall be numbered consecutively in Arabic numerals. Each part shall be identified by both its volume and part number and have a unique TM identification number assigned as provided by the Government.

A.2.8.5 Chapters. Arabic numerals shall be used to number chapters consecutively throughout all volumes of the publication. Chapters shall begin on a right-hand page.

A.2.8.6 Sections. Roman numerals shall be used to number sections consecutively within each chapter

MIL-DTL-24784C(NAVY)  
APPENDIX A

A.2.8.7 Paragraphs. Paragraphs shall be numbered using the decimal numbering method (see figure A-9). Paragraphs shall be numbered consecutively within the chapter. All paragraph numbers shall be preceded by the chapter number and a period. For example, the first primary paragraph of Chapter 3 shall be 3.1, the second primary paragraph shall be 3.2, and so forth.

A.2.8.8 Procedural steps. Procedural steps, sub-steps, and checklist items shall be numbered as follows (see figure A-9):

- a. First level procedural steps shall be numbered consecutively with lower case letters, no title, and block indented under first word of the step.
- b. Second level procedural steps shall be numbered consecutively with Arabic numerals enclosed in parenthesis, no title, and block indented under first word of the step.
- c. Third level procedural steps shall be numbered consecutively with lower case letters enclosed in parenthesis, no title, and block indented under first word of the step.

A.2.8.9 Pages, tables, and illustrations. Pages, tables, and illustrations shall be numbered consecutively within each chapter. Manuals divided into chapters and in turn into sections, shall contain consecutively numbered pages, tables and illustrations for the entire chapter. Page, table, and illustration numbers shall consist of two part Arabic numerals separated by a hyphen. The first part shall be the chapter number with the second part being the order within the chapter. When specified by the acquiring activity, the volume number shall be included with the page number. For example:

<u>Number</u>	<u>Meaning</u>
2-17	Chapter 2, page 17
3-12-10	Volume 3, Chapter 12, page 10
Table 2-17. (Title)	Chapter 2, table 17
Figure 2-17. (Title)	Chapter 2, figure 17
Figure 2-17. (Title) (Sheet 1 of 3)	Chapter 2, figure 17 is a multi-sheet (3 total) illustration. Remaining sheets shall be numbered in consecutive order; (Sheet 2), (Sheet 3), and so forth.

Note that a manual may contain both a table and a figure, that is, 2-17. Only the first sheet of a multiple sheet illustration shall contain the total number of sheets; for example, Sheet 1 of 3. If a chapter is so short that the chapter can be completed on one page, permitting another chapter to start on the same page, both chapter numbers shall be indicated by the page number. For example: “3-1/4-1”.

A.2.8.10 Blank pages. A blank page shall be assigned a number but it shall appear on the preceding or following page. For example: if page 10 of Chapter 1 is blank, page 9 shall bear the number 1-9/(1-10 blank); if page 9 of Chapter 1 is blank, page 10 shall bear the number (1-9 blank)/1-10. When applicable, an added page, such as 1-10.1, shall show that 1-10.2 is blank.

A.2.8.11 Foldout figure numbers. Foldouts to be placed at the end of the manual shall be numbered “FO-1”, “FO-2”, and so forth, and shall be placed preceding the figure title under the illustration. The figure numbers for foldouts that fall at the end of a chapter or are interspersed with the text shall follow normal figure numbering sequencing. When a foldout consists of several sheets, the sheets shall be numbered in consecutive order following the figure title.

A.2.8.12 Foldout page numbers. The page numbers for foldout pages that fall at the end of the manual shall be FP-1/(FP-2 blank), FP-3/(FP-4 blank), and so forth. The page numbers for foldout pages that fall at the end of a chapter or are interspersed with the text shall follow normal page numbering sequence.

MIL-DTL-24784C(NAVY)  
APPENDIX A

A.2.8.13 Footnotes. Numbering of footnotes to tables shall be independent of that of footnotes to the text. Consecutive superior numbers beginning with “1” shall be used (in tables, superior lowercase letters, asterisks or other designation may be used where numbers could cause confusion). Footnote numbers and text shall be separated by two spaces. The numbering system shall be per chapter or table, as applicable. Footnotes to the text shall be placed at the bottom of the page on which they appear.

A.2.8.14 Glossary pages. The page numbers for an independent glossary shall be consecutively numbered in Arabic numerals with the word “Glossary” preceding the page number. For example: “Glossary 1”.

A.2.8.15 Index pages. When an index is used, page numbers shall be consecutively numbered in Arabic numerals with the word “Index” preceding the page number. For example: “Index 1”.

A.2.8.16 Appendix. Appendices shall be identified by capital letters, for example, APPENDIX A, APPENDIX B and so forth. Pages, paragraphs, illustrations and tables for appendixes shall be consecutively numbered in Arabic numerals preceded by the capital letter of the appendix. For example:

<u>Number</u>	<u>Meaning</u>
A-17	Appendix A, page 17
Figure B-17	Appendix B, figure 17
Table C-17	Appendix C, table 17

## A.2.9 Graphics.

### A.2.9.1 Graphic types.

A.2.9.1.1 Operational and procedural step illustrations. Illustrations depicting operations or procedures may be included as necessary. Operational (figure A-10) or procedural (figure A-11) illustrations shall have one or more text steps with each illustrated step. It is not necessary to illustrate each step of a maintenance procedure, such as the removal of screws with an ordinary screwdriver, lifting off a cover after the screws have been removed, and so forth. Procedural illustrations shall supplement the text by clarifying procedures that are of a special nature or are not obvious. The text step shall be as close to the illustrated step as possible. Steps shall be identified in the order in which they are to be accomplished. Alternate types of operational and procedural step illustrations are acceptable.

A.2.9.1.2 Fault logic diagrams. (**Electronic Equipment TRSs only**.) Fault logic diagrams shall be based on a fault indication observed during troubleshooting. The diagrams shall comprise a branching series of questions pertaining to fault isolation. Each question shall pertain to a further observation or measurement, and shall result in a “yes” or “no” answer, thereby progressively narrowing the possible functional area of the fault. Tolerance values shall be presented in those instances where a definitive “yes” or “no” is not obtained. This progression and elimination shall isolate the functional area of the equipment containing the fault and then refer the user to the portion of the manual containing that information needed to complete the fault isolation and repair. Each diagram shall include or make reference to information necessary to establish the test or operating conditions required for starting the fault isolation procedure. Only three types of blocks shall be used. Shaded blocks (right and bottom border lines weighted) shall contain questions that may be answered from observation, without changing test setup and without special equipment. Single-line blocks shall contain questions requiring measurement by special setup of external test equipment. Double-line boxes (conclusion boxes) shall list the functional area within an equipment that is the probable source of malfunction and shall reference a procedure or another diagram for further isolation or correction of a fault (see figure A-12).

A.2.9.1.3 Flowcharts. (**Electronic Equipment TRSs only**.) The flowchart shall be developed using the following procedure and symbology.

- a. General flow. The general flow of the flowchart shall be top-to-bottom and left-to-right. A portion of the flow may be contrary to the general flow if no intermediate blocks are involved (see figure A-13).
- b. Terminal blocks. These blocks are used to show the starting and ending points of a flow (see figure A-14). START blocks shall have a vertical exiting line. EXIT and COMPLETE blocks shall have vertical or horizontal entry lines. The EXIT block shall be accompanied by text explaining the reason for the EXIT.

MIL-DTL-24784C(NAVY)  
APPENDIX A

- c. Annotation or comment block. These blocks are used to provide additional descriptive clarification, comments, or explanatory notes (see figure A-15). The dashed line is connected to the dashed outline of the symbol corresponding to the data contained inside. This block is inserted with the dashed line intersecting flowchart flow at the point appropriate to the content of the block.
- d. Process blocks. These blocks define an operation to be performed (see figure A-16). These blocks shall have only one entry line and one exiting line. Entry lines and exiting lines shall be vertical or horizontal; however, entry lines shall never enter the bottom of a process block and exiting lines shall never leave the top of a process block (see figure A-13). Process blocks shall never be used in place of decision blocks.
- e. Decision blocks. These blocks are used to provide two or more paths resulting from specific condition related decisions (see figure A-17). Decision blocks where the exiting line choice is dependent on a “yes” or “no” decision shall normally have only two exiting lines. These blocks may have more than two exiting lines if each path is clearly defined by the decision required to select that path. There shall be only one entry line (either from the top or at the side) to a decision block. Entry and exiting lines shall not occupy the same side of a decision block. Exiting lines shall not occupy the top of a decision block. Exiting lines shall be labeled by decision criteria. Do not include question marks in decision blocks.
- f. On-page connectors. These connectors shall be used to join two ends of a line when it is inconvenient to draw a single continuous line between two points on a single sheet (see figure A-18). These connectors shall be shown by a circle enclosing a capital letter. The letter used in the on-drawing connectors shall start with “A” and proceed alphabetically on each figure. The same letter shall be used in the starting and ending connectors at both ends of an implied line of communication. The same letter shall be used in multiple starting connectors when their respective ending connectors are the same point. Connectors shall have exiting or entry lines consisting of vectored arrows that indicate that the connector is used as a starting or ending connector. A single arrowhead with multiple entry lines may be used when required to ensure clarity (see figure A-19). The exiting from a starting connector and the entry line to an ending connector shall show the direction of the corresponding connector and path of the implied line between.
- g. Off-page connectors. These connectors shall be used to show flow continuity between sheets of the same figure or of different figures. These connectors shall be shown by an irregular pentagon enclosing a number and a capital letter (see figure A-20). The number contained by the off-page connector shall indicate the destination sheet (for the output connector) and the origin sheet (for the input connector). The letters used in off-page connectors shall start with “A” and proceed alphabetically in each figure, using the same letter in the output and input connectors at each end of an implied line continuation. The same letter shall be used in multiple output connectors when their respective input connectors are the same point. The entry line to an output off-page connector shall enter the side of the connector opposite the point. The exiting line from an input off-page connector shall leave from the point of the connector. When off-page connectors are used to show flow continuity between figures, the figure number or title (as applicable) of the corresponding connector location shall be shown outside each off-page connector symbol (see figure A-21). If more than one of the output connectors is located on another figure, two or more input connectors shall be placed at the entry point so that figure number or title (as applicable) of all output connectors are shown (see figure A-21).
- h. Arrowheads. Arrowheads shall be used to indicate the direction of flow. All block or connector entry lines shall have arrowheads. Arrowheads shall be used at all line intersections to clearly show direction of flow (see figure A-22).
- i. Line intersections. Lines shall not cross except when an intersection is intended. On-drawing connectors shall be employed to prevent line crossings where intersections are not intended. See figure A-22.

#### A.2.9.2 General graphic requirements.

A.2.9.2.1 Scale. Illustrations shall be prepared to as small a scale as possible consistent with effective use of space, with all essential detail legible; be same size as areas they shall occupy in the manual or, be of such oversize as to permit uniform reduction to this size.

A.2.9.2.2 Color in illustrations. When specified by the acquiring activity (see 6.2), only the Pantone® Matching System (PMS) colors and variations of use identified in table A-I shall be used.

MIL-DTL-24784C(NAVY)  
APPENDIX A

TABLE A-I. Printing colors and variations.

Color	Pantone PMS number	Acceptable for use as			
		Solid area	Solid thin line	40-percent screened area	40-percent screened line
Red	185	Yes	Yes	Yes	Yes
Yellow	108	Yes	Yes	No	No
Green	354	Yes	Yes	Yes	Yes
Blue	299	Yes	Yes	Yes	Yes
Orange	151	Yes	Yes	No	No
Purple	253	Yes	Yes	No	No
Black	-	Yes	Yes	Yes	Yes

The corresponding colors from the web-safe 216 color palette for use in page-based electronic TMs are identified in table A-II.

TABLE A-II. Web-safe colors for page-based electronic TMs.

Color	Hexadecimal Value	RGB Values		
		R:	G:	B:
Red	FF0033	255	000	051
Yellow	FFFF33	255	255	051
Green	00CC33	000	204	051
Blue	00CCFF	000	204	255
Orange	FF9933	255	153	051
Purple	CC33CC	204	051	204
Black	000000	000	000	000

A.2.9.2.3 Illustration placement. Each illustration shall be included as part of a paragraph or follow as closely as possible to its first reference in the narrative text.

A.2.9.2.4 Turned illustrations. Full-page illustrations, placed sideways on a page, shall be turned 90 degrees counterclockwise. The figure number and title for a turned illustration shall be placed at the bottom of the page with the manual in its normal position. When the majority of illustrations are turned, the figure number and title shall also be turned to appear below the illustration.

A.2.9.2.5 Apron notes. Apron notes for foldout diagrams shall be placed in a final size image area of 7¼ by 10 inches with a minimum letter height of 0.060 inch or equivalent point size. Notes shall be arranged to make best use of the available space. When notes for a given diagram foldout sheet require more than the 7¼ by 10 inch apron, the notes shall be extended with additional columns on the diagram image area if the space permits. If the space does not permit, single pages shall precede and shall contain the additional notes. When additional note sheets are required, the notes shall start on the first additional sheet and be printed as a right-hand page. Note pages may be printed on both sides. Foldout sheets shall not be used for running text. Each sheet of the diagram, including the note sheets, shall contain the figure number, title, and sheet number.

MIL-DTL-24784C(NAVY)  
APPENDIX A

A.2.9.2.6 Foldout pages. Unless otherwise specified by the acquiring activity, foldout pages shall not be included in the manual (see 6.2). Multi-sheet illustrations shall be used where possible, in lieu of foldouts, when usability is not affected. Foldup-foldout pages shall not be used. If approved by the acquiring activity, foldout pages may be prepared and shall meet the following requirements:

- a. Maximum page size for the foldout (including blank apron) shall be 26 by 11 inches with a maximum printable area of 24 by 10 inches. Minimum margins shall be ½-inch top and bottom, and ¼-inch side opposite binding edge.
- b. All foldout pages shall be prepared for printing on one side only.
- c. Full blank aprons shall be used
- d. Foldout pages shall not be spliced.
- e. Foldout pages shall fall at the end of the manual. When specified by the acquiring activity, foldout pages shall fall at the end of chapters or be interspersed within text pages. When foldout pages fall at the end of the manual, such pages shall follow the last chapter, appendix or index, whichever forms the last portion.

A.2.10 Style and format for change packages.

A.2.10.1 Change package content. Each change package shall include the following:

- a. A replacement title page.
- b. A replacement list of effective pages.
- c. A change instruction sheet.
- d. As applicable, replacement pages for the table of contents, general information page(s), list of abbreviations or symbols, system and component diagrams, and text.

A.2.10.1.1 Title page. The original title page (and cover, if required) provided with the basic manual or with the latest published change to the manual, shall be updated to:

- a. Indicate the unique TM identification number (assigned by the Government) for the change letter, for example SE686-CA-MMO-01A. The change identification (change number and date) shall be entered below the original publication date in the lower right-hand corner of the page, for example: CHANGE A 15 July 2004. If the Government does not advise the contractor the exact date to use, the publication date shall be the date at which the last material to be included was received (copy freeze date). The day, month, and year shall be given in that sequence.
- b. Reflect the current distribution statement, warning, and destruction notice. If required, a new title page shall be supplied.
- c. Indicate the current supersedure notice.

A.2.10.1.2 List of effective pages. The list of effective pages shall be updated for each change and shall be developed in accordance with figures A-2 and A-3. On the list of effective pages, above the listing of pages contained in the manual, shall be a list of all published change identification numbers, letters, and dates. The current change shall be included in this list. The list of effective pages shall be a complete list of all manual pages, including title page, the list of effective pages, table of contents pages, list of illustration pages, list of table pages, safety summary pages, blank pages, deleted pages, added pages and foldout pages. The list of effective pages shall include a statement of the total number of pages in the manual. The listing shall be held to a minimum by grouping numbers where applicable. The page numbers for a blank page and the printed side of the sheet shall be listed as separate numbers even though a double number will appear on the printed side of the sheet. Appropriate change numbers shall be placed in the "Change No." column. The words "Deleted" or "blank" shall be placed along side the page number of pages so affected.

A.2.10.1.3 Change instruction sheets. A change instruction sheet (change guide) shall provide instructions for inserting new and revised pages, and for disposing of superseded pages. The Change Guide shall be the first page of a change package. The Change Guide shall be formatted similar to figure A-23 and shall include the following, as applicable:

MIL-DTL-24784C(NAVY)  
APPENDIX A

- a. The authority under which the manual change is acquired and issued.
- b. Reflect the highest classification assigned to any portion within the change package (see 3.5.5).
- c. The TM change identification number and change date.
- d. If other than the change date, a statement shall be included indicating when the change is in effect. If it supersedes an earlier change, a statement of that fact shall be given.
- e. The total number of pages included in the change package.
- f. The manual title.
- g. If an equipment change is involved (field or production change), a statement shall be included indicating the purpose of the change and the extent (serial numbers or conditions of application) to which it applies to the equipment population and identify the alteration by number.
- h. Instructions shall be concise and clear.
- i. When the change applies to the entire equipment population, maintenance support activities shall be instructed not dispose of the superseded pages until it is established that all of the equipment population has been modified.
- j. For changes pertaining to equipment modifications, the user shall be instructed not to insert a change in a manual until the modification has been accomplished.
- k. The method used to identify new and changed material shall be explained.
- l. The instructions shall specify the deleted or added pages.
- m. The instructions shall be followed by a statement that the change instruction sheet shall be inserted in the manual immediately following the front cover and title page for reference purposes and include information for completing the change record page.
- n. Include the disclosure notice, distribution statement, export control notice, and destruction notice as applicable.
- o. If additional change instruction sheet pages are required, the second and subsequent pages shall identify the page(s) as Change Instruction Sheet or Change Guide, centered at the top of the page(s) and shall include the TM number and change identification. For example: "Change Instruction Sheet (or Change Guide) for SE686-XX-MMO-020 Change B." The additional pages shall be numbered consecutively in Arabic numbers and the page number shall be centered at the bottom of each page.
- p. A bar-coded stock number (provided by the Government) for the change package shall appear in the lower left-hand corner of the first page of the change instruction sheet.

A.2.10.1.4 Replacement pages. Changes to an existing manual shall be issued in the form of replacement pages. Pages shall be revised only when significant technical changes are required.

- a. Change pages which replace pages in the manual shall carry the same page number as the page they replace.
- b. Replacement pages shall include all corrections issued in previous changes in addition to all other outstanding corrections required.
- c. If an equipment change does not effect the entire equipment population, the change shall be developed so that it shall describe both the effected and unaffected equipment.
- d. When the equipment nomenclature has been changed because of a production or field change to the equipment, the nomenclature references in the text and illustrations need not be modified merely to include the new nomenclature. Information equivalent to the following shall be included as general information: "Unless otherwise specified, all references in the manual to Radar Set AN/SPS-10 apply equally to Radar Set AN/SPS-10A".
- e. Changes made to any given page of the manual shall require a complete check and correction of associated pages that reflect the subject change.
- f. A change letter shall be used to identify changes and will be assigned by the Government.

MIL-DTL-24784C(NAVY)  
APPENDIX A

- g. The TM identification number shall appear at the top of each replacement page and shall remain the same as the basic manual.
- h. As required, the security classification shall appear on the top (above the manual identification number) and bottom center of each page for pages containing classified information.
- i. As necessary, indices shall be updated to reflect changes and shall be issued as replacement pages.

A.2.10.1.4.1 Additions. All paragraphs and pages shall be added and numbered as follows:

A.2.10.1.4.1.1 Numbering of added material. When paragraphs, illustrations, tables, and pages are added by a change, existing paragraphs, illustrations, tables, and pages shall be renumbered. If this involves renumbering more than 10 paragraphs or affects more than five pages, the following method shall be used:

- a. When paragraphs, figures, tables, or pages are added at the end of a sequence, the next consecutive number shall be used.
- b. When paragraphs are added in the middle of a sequence, paragraphs shall be numbered by adding an alpha character to the preceding paragraph number (for example, 2.1A would be the added paragraph between 2.1 and 2.2).
- c. Added illustrations, tables, and pages shall be numbered by adding a decimal (for example, figure 3-2.1, table 5-1.1, page 3-26.1, and so forth).
- d. When it is necessary to add an illustration, table, and page between items that have already been added by the preceding method, an alpha character shall be used (for example, a page added between page 3-26.2 and 3-26.3 shall be 3-26.2A).
- e. Pages shall not be added between a right-hand (odd numbered) and a left-hand (even numbered) page.
- f. When new material is to be added to a right-hand page, any overrun shall be carried to the left-hand page. The overrun from the left-hand page shall be placed on the added page.
- g. Where material is to be added to a right-hand page (for example, 2-5) and adequate blank space is available on the preceding left-hand page (for example, 2-4), material at the top of 2-5 shall be moved to the bottom of 2-4 and the new material added to 2-5.
- h. When applicable, an added page, such as 1-10.1, shall show that 1-10.2 is blank.

A.2.10.1.4.1.1.1 Multi-sheet illustration. Sheets added to a set of multi-sheet illustrations that fall between existing sheets shall be assigned the preceding number plus a decimal number. For example, if a sheet is added between sheets 2 and 3, the added sheet becomes 2.1. If possible, the new sheet shall be added after the last sheet and be assigned the next consecutive number.

A.2.10.1.4.1.1.2 Index number. Where a change to an illustration adds index numbers between existing numbers, the added numbers shall be the same as the preceding index number with an added alpha character, for example, 22A, 22B, and so forth. Suffixed index numbers need not be eliminated for a non-superseding revision unless the illustration shall be re-drawn.

A.2.10.1.4.2 Deletions.

A.2.10.1.4.2.1 Deleted paragraphs, steps, illustrations, and tables. Where a change deletes a paragraph, step, sub-step, illustration, or table without substituting another, the space formerly occupied by the paragraph, step, sub-step, illustration, or table can be used for other instructions. Allow sufficient space to provide ¼ inch above and below a statement such as “4-2 (Deleted.)”. The table of contents, list of illustrations, list of tables, and index shall be changed as necessary.

A.2.10.1.4.2.2 Deleted pages. When page number continuity is broken by deletion of a page and a blank page results, a statement indicating the deletion shall be placed in the bottom margin (right or left corner, or centered, as space permits) of the preceding page or top margin of the succeeding page. For example: “All data on page 2-5, including figure 2-2 deleted.” This also applies when two back-to-back pages are deleted. The statement shall be used only if the same manual change affects a preceding or succeeding page. A preceding or succeeding page shall not be changed merely to add this statement. In such instances, the list of effective page listings will be adequate.

MIL-DTL-24784C(NAVY)  
APPENDIX A

A.2.10.1.4.2.3 Deleted index numbers. If an index number is deleted from an illustration, the word “(Deleted)” in parentheses shall be placed after the index number.

A.2.10.1.4.3 Change symbols for text and tables. Changes (except as noted below) to the text and tables (including new material on added pages) shall be indicated by a vertical line in the margin extending the entire area of the material affected (outer margin for double column material, margin opposite binding edge for single column material) (see figure A-24). The vertical line change symbol shall be 6-point in width. Previous change symbols on a page shall be deleted when a page is subsequently changed. Symbols shall show current changes only. Change symbols are not required for:

A.2.10.1.4.4 Change symbols for illustrations. Changes to line drawings, charts, illustrations, graphs, diagrams, and schematics shall be indicated by shading and screening to highlight the area containing the changed information. Extensively changed presentations shall be indicated by a screen border around the affected area. For minor changes not suitable for shading or screening, a miniature pointing hand shall be used. Previous change symbols on a page shall be deleted when a page is subsequently changed. Symbols shall show current changes only. See figure A-24.

- a. Front matter.
- b. Blank space resulting from the deletion of text, an illustration or part of an illustration, or a table.
- c. Correction of minor inaccuracies such as spelling, punctuation, relocation of material, renumbered paragraphs, and so forth, unless such correction changes the meaning of instructive information or procedures.
- d. Replacement or addition of a complete part, chapter, or section.

A.2.10.1.4.5 Change page designator. Each page containing changed or added material (including those pages placed at the end of a manual) shall bear the words “Change \_\_” placed at the bottom of the page in the same corner and on the same line as the page number. The change designator shall begin approximately ½ inch to the right of the page number for an even numbered page, and end approximately ½ inch to the left of the page number for an odd numbered page (see figure A-24).

A.2.10.2 FTM. A FTM shall be furnished for changed and added pages. Copy shall be furnished for both sides of the page on which the change is made. When specified by the acquiring activity, the FTM shall consist of the entire TM with the changed and added pages inserted.

A.2.11 Style and format for revisions. When an existing TM is being revised and renumbering of all pages, paragraphs, illustrations and tables does not substantially improve the use of the manual, then added or deleted pages, paragraphs, figures, and tables shall be in accordance with the requirements identified in A.2.10.1.4.1 through A.2.10.1.4.2.3.

A.2.11.1 List of effective pages. When specified by the acquiring activity, a new list of effective pages shall be included for each revision and shall be developed in accordance with A.2.3.2.1.2.

### A.3 DEVELOPMENT OF IP-FORMAT INTERACTIVE ELECTRONIC TECHNICAL MANUALS

A.3.1 General. The following are unique requirements applicable to IP-format IETMs developed in accordance with MIL-DTL-24784/22 and /23. See Appendix B for functionality and presentation requirements.

#### A.3.2 Development products.

A.3.2.1 IETM content plan. When specified by the acquiring activity (see 6.2), an IETM content plan shall be developed for each IETM.

MIL-DTL-24784C(NAVY)  
APPENDIX A

A.3.2.1.1 IETM content plan coverage. An IETM content plan shall be developed with the content and format requirements of the applicable specification sheet. The plan shall portray the planned coverage for each system, subsystem, equipment, and major component, and identify the arrangement of front matter and technical content. The plan shall provide details of the functionality and look and feel of the IETM in accordance with the functionality requirements identified in the TMCR. The plan shall indicate the technical information that will remain in paper format, if applicable, such as large wiring diagrams and schematics. The following information shall be included in the content plan, as applicable:

- a. A brief description of the material to be presented in the front matter shall be developed.
- b. The following types of data shall be provided for each system, subsystem, equipment, and major component information module (IM) and specific information packages (IPs) for each IM. IPs shall be listed by title:
  - (1) IPs for descriptive information (for example, description, theory of operation, use of controls and indicators).
  - (2) Procedural IPs necessary to operate the system.
  - (3) Procedural IPs necessary to perform complete maintenance.
  - (4) IPs for test and troubleshooting.
  - (5) Schematics and wiring information required.
  - (6) Parts information coverage.
  - (7) Supporting information IPs.
- c. A description of the approach to be used in presenting procedural information. If users of a procedure are expected to vary widely in experience and capability, the Government may direct that certain procedures be presented in a dual-level format (see 3.7.1.8.5).
- d. An explanation or initial demonstration of the way the technical content information will be rendered on the display device and an overview of how the user will access the technical information.
- e. A synopsis of the validation approach to the manual content requirements shall be included based on a plan for use as supplied by the Government and the maintenance concept or maintenance plan for the equipment. The synopsis shall indicate coverage on a comprehensive and systematic basis of the most effective and efficient method of performing necessary maintenance. The synopsis shall be correlated to the maintenance concept or plan by direct referencing.
- f. The content plan shall fully enforce all content requirements.
- g. Problems regarding requirements, interpretation, and application shall be identified.
- h. Conflicts between guidance documents shall be highlighted.

A.3.2.1.2 Model manual. When specified by the acquiring activity or approved by the Government, an existing manual covering similar system/equipment may be used and marked up and submitted as an IETM content plan. The text from the model manual may be used verbatim with changes to cover the equipment differences and to correct inconsistencies, unclear wording, or obvious editorial or typographical errors. For all new manuals, the format requirements in this specification shall apply. All inconsistencies, unclear wording, or errors noted in the model manual shall be identified to the Government. All deviations from the model manual shall be approved by the Government.

A.3.2.1.3 Milestone schedule. As an addendum to the content plan, a milestone schedule for development of the IETM shall be furnished for the individual contract. Milestones to be identified shall include, but are not limited to, the following:

- a. IETM content plan submission.
- b. RDC drafting percent completion points.
- c. Schematic preparation.
- d. Illustrated Parts Breakdown (IPB).
- e. Editing.

MIL-DTL-24784C(NAVY)  
APPENDIX A

- f. Composition.
- g. RDC submission.
- h. IPR schedule.
- i. Validation.
- j. PTM submission.
- k. Final submission and delivery.

A.3.2.1.4 IETM content plan updating. The content plan shall be kept up-to-date throughout the development cycle of the IETM. Significant changes to the content plan based on IPRs, shall be submitted to the Government for acceptance. Improved data presentation shall be a prime justification in developing changes to the content plan. The need for a revised content plan shall be determined by the acquiring activity.

A.3.2.1.5 IETM content plan and model manual acceptance. The content plan or model manual shall be submitted to the Government for acceptance prior to development of the IETM. If rejected, the unacceptable portions shall be corrected and resubmitted. The accepted content plan or model manual shall become an addendum to the applicable specification sheet governing the development of the IETM to the extent that it agrees with the requirements of the contract. The accepted document shall be available for review and comparison with the IETM provided at all scheduled IPRs. Acceptance of the content plan or model manual by the Government shall not waive any requirements within the scope of the contract.

### A.3.3 Divisions and arrangement.

A.3.3.1 IETM divisions. IP-format IETMs shall be divided into front matter, IMs, and IPs.

A.3.3.1.1 Information modules (IMs). Information modules (IMs) are the organizational “containers” by which the technical content Information Packages (IPs) are organized. IMs may consist of one or more IPs.

A.3.3.1.2 Information packages (IPs). IPs are used to logically divide all data required for a certain function (for example, descriptive information, operator’s instructions, maintenance, IPB data, and troubleshooting). Each IP shall consist of a title, IP initial setup information (when required), supporting information, and technical content as described in MIL-DTL-24784/22 and /23. These data types can be further divided into paragraphs, tasks and subtasks (procedures).

A.3.3.2 IETM arrangement. Each IP-format IETM shall be arranged as follows:

- a. Front matter.
- b. Technical content IPs.

A.3.3.2.1 Front matter. Front matter shall consist of the following items as applicable. Front matter items shall be made accessible to the user at all times via the Guide Post (see B.4.1.2.2). Front matter shall be displayed full screen, frame-by-frame, or inside a scrollable area. See Appendix B for detailed presentation and display requirements.

- a. Title page.
- b. Revision summary.
- c. Acronyms and abbreviations list.
- d. General information module data (see 3.7.1 of MIL-DTL-24784/22).
- e. Supporting information module data (see 3.7.2 of MIL-DTL-24784/22).
- f. Numerical index of part numbers and reference designation index (see MIL-DTL-24784/23).

A.3.3.2.1.1 Title page. See 3.6 for general requirements. The title page shall be the first information to appear in the main content area of the display when the IETM is launched. **For non-linear IETMs**, if additional space is needed to avoid overcrowding of the title page (first screen), certain information shall appear on the next screen as specified by the acquiring activity.

MIL-DTL-24784C(NAVY)  
APPENDIX A

A.3.3.2.1.2 Revision summary <RevisionSummaryInfo>. When a revision to an IETM is issued, a revision summary shall be provided. The revision summary shall be accessed from the Guide Post (see Appendix B). The revision summary shall contain a list of IPs by title that have been revised and for each IP listed, a brief description of the major changes. Revision summary information is displayed full screen, frame-by-frame, or inside a scrollable area. The titles of revised IPs listed in the revision summary shall be linked to the IP containing the revised information.

A.3.3.2.1.3 Acronyms and abbreviations list <AbbrevList>. A consolidated list shall be prepared to identify and define all abbreviations, acronyms, and uncommon terms used in the IETM. The list shall be accessible from the Guide Post, from a push button or, contained in a pull-down window. The information may be displayed in tables and lists or linked to the specific row(s) in the table or item(s) in a list instead of displaying the entire table or list. If the entire table or list is displayed, the table or list shall be scrollable.

A.3.3.2.2 Table of contents. A list of front matter items and technical content IPs shall be generated and displayed in the Table of Contents (TOC) panel in accordance with Appendix B. The TOC shall be made accessible to the user at all times via the main menu bar. When “Table of Contents” is selected, the front matter and technical content items shall be listed in the TOC panel for subsequent selection by the user. All entries shall be linked to the actual subject matter/IP. Official nomenclature from the parts information shall be used to identify the technical content IPs to be included in the TOC. The subject matter shall be listed by system/subsystem and equipment. To facilitate access, subsystems, subassemblies, equipment, and individual components may be indented and listed under the main system. Further subdivisions shall be included to list all descriptive, operation, troubleshooting, and maintenance tasks for each of the system/subsystem, subassemblies, equipment, and individual components included in the IETM. When the user clicks on an item in the list, this action may bring up a second scrollable list of subject matter entries for the item selected.

A.3.3.2.3 List of illustrations. IETMs containing figures (graphics, illustrations, drawings, and photos) shall include a list of illustrations by title. The list of illustrations shall be generated and displayed in the Table of Contents (TOC) panel in accordance with Appendix B. The security classification, if any, of figure titles shall be indicated. The intent of the list is to allow the user access to the information presented in the figure.

A.3.3.2.4 List of tables. IETMs containing tables shall include a list of tables by table title. The list of tables shall be generated and displayed in the TOC panel in accordance with Appendix B. The security classification, if any, of table titles shall be indicated. The intent of the list is to allow the user access to the information presented in the table.

A.3.3.2.5 List of multimedia. IETMs containing multimedia shall include a list of multimedia by title. The list of multimedia shall be generated and displayed in the TOC panel in accordance with Appendix B. The security classification, if any, of multimedia titles shall be indicated. The intent of the list is to allow the user access to the information presented in the multimedia.

A.3.3.2.6 “How to use this IETM” information <HowToUseEtm>. “How to use this IETM” information is prepared in narrative format and shall be user-invoked from the Main Menu bar (see Appendix B). Information may be displayed full width, frame-by-frame or scrollable. Information shall include:

- a. Information to familiarize the user with the format and special or unusual features or functions of the IETM. Include an explanation of important features of the organization and content and any peculiarities in the basic structure of the IETM.
- b. An explanation of the icons and buttons used in the IETM.
- c. An explanation on how to identify hot spots and how they are used and activated.
- d. If over-sized supporting schematic and wiring diagrams have been authorized and developed, a reference to the supplement they are contained in by TM identification number.
- e. As applicable, an explanation on how and where parts information is available in the IPs, how the parts information is accessed, and if applicable, how the parts can be ordered.
- f. An explanation on how troubleshooting data is presented in the IETM. And, if applicable, an explanation on how failure symptom indexes and malfunction codes correspond to maintenance operational checks and troubleshooting procedures for individual systems and components.

MIL-DTL-24784C(NAVY)  
APPENDIX A

- g. When a standard form is used in the process of performing a task, provide instructions on how these forms are accessed, used, and filled out.
- h. "How to use" information shall not repeat instructions given within the IPs.

A.3.3.2.7 Technical content. See MIL-DTL-24784/22 and /23 for technical content data requirements.

A.3.4 References. References shall be kept to a minimum and shall be limited to Government approved documents such as military specifications and standards, TMs, drawings, engineering change data, and other approved material which will enhance the clarity and support the repair requirements and processes delineated in the manual. As a practical consideration, linking shall be used. Hot spots shall be used to link cross-referenced material. See Appendix B for specific requirements on linking and hot spots.

A.3.4.1 Text references. The text shall reference to:

- a. Illustrations by the word "Figure", the figure number, including section letter and number when applicable, and the sheet number for multi-sheet illustrations, when applicable. For example: "Tolerances are established in accordance with Figure 3."
- b. Items and parts on illustrations by the word "Figure", the figure number, and index number. For example: "(Figure 3, Item 2)". However, when multiple references in a paragraph refer to the same figure, only the first reference needs to include the word "Figure" and figure number. For example:

**"REMOVAL**

1. Remove safety wire from J1, J2, and J3 and remove connectors.
2. Remove four nuts (Figure 2, Item 6), washers (17), and bolts (18) securing valve (1) to mount (20) and remove from mount."

In such cases where a procedure involves referencing to two or more figures, the paragraph lead-in shall contain a statement similar to the following: "Item numbers below refer to Figure 2 unless otherwise indicated." The remaining callouts shall cite the figure number followed by the index number, e.g., "(Figure 5, Item 3)." For example

**"NONREVERSIBLE VALVE**

**Removal**

Removal of the valve will allow access to the impeller. Item numbers below refer to Figure 2 unless otherwise indicated

1. Remove safety wire from J1, J2, and J3 and remove connectors.
  2. Remove four nuts (16), washers (17), and bolts (18) securing valve (1) to mount (20) and remove from mount.
  3. Remove safety wire from locking ring (Figure 3, Item 5).
  4. Unscrew locking ring from valve body (Figure 3, Item 2).
  5. Remove mount (3)."
- c. When reference is made to items in figures by reference designations, the numbers shall be indicated in the following manner: "The ON-OFF switch (S1, Figure 3) on the center console controls the TWT cooling".
  - d. Parts on diagrams by the complete reference designation.
  - e. Tables by table number. For example, "Table 2".
  - f. Paragraphs within an IP by paragraph title.

MIL-DTL-24784C(NAVY)  
APPENDIX A

- g. When reference is made to other IPs, descriptive information, maintenance tasks, or other data within the same manual, it shall be linked and referenced by title, appropriate text or icon. If referenced by title, the title shall be the same as used in the Table of Contents.
- h. Footnotes shall not be used. A note shall be used in lieu of a footnote. There shall be an identifiable indication, such as an icon, to indicate the presence of a note.

A.3.4.2 Frequently used maintenance tasks. Frequently used maintenance tasks, such as applying external electrical or hydraulic power, shall be prepared once as a common maintenance task and linked as a common step in all other maintenance tasks requiring the need of external electrical or hydraulic power. It is not necessary to link supporting graphics to common steps with linked tasks.

A.3.4.3 Frequently used steps within the same maintenance task. When it becomes necessary to reference to another step or group of steps within the same procedure or task or to another procedure or task in the same IP, the reference shall be by the step number(s).

A.3.4.4 Tasks performed by other work centers. Procedures that require performance of tasks by technical personnel other than those normally assigned to the subject task shall be referenced in the introductory information for the IP and in the text. For example, if the primary task is removal of a component of the piping system that is inaccessible without removal of a component of the sewage ejection/holding system, a preparatory step of the procedure shall be, "Remove CHT pump (NAVSEA 0905-LP-092-4060)."

A.3.4.5 Post maintenance action referencing. When required, the last step of a procedure shall reference any post maintenance actions necessary to ensure the initial procedure has been successfully completed. The reference shall be to the procedure title.

A.3.4.6 Maintenance procedure leading to IPB information. When specified by the acquiring activity (see 6.2), hot spots shall be used for individual parts called out on supporting maintenance graphics to link the user to the applicable IPB information.

A.3.5 Use of terminology, nomenclature, numbers, and equations.

A.3.5.1 Abbreviations and acronyms. Abbreviations, acronyms, and unusual terms may be used in any IP text, when applicable. It is not necessary to spell out the words completely after the first use of an acronym or abbreviation. Unless otherwise specified by the acquiring activity (see 6.2), hot spots shall be used to link all abbreviations, acronyms, and uncommon terms to the complete explanation and listing of abbreviations, acronyms, and uncommon terms (see A.3.3.2.1.3).

A.3.6 Numbering.

A.3.6.1 Paragraphs. Paragraphs within an IP shall be unnumbered.

A.3.6.2 Procedural steps. First level procedural steps shall be numbered consecutively with Arabic numerals. Second level procedural steps shall be numbered consecutively with lower case letters. Third level procedural steps shall be numbered consecutively with Arabic numerals enclosed in parenthesis.

A.3.6.3 Tables, illustrations, and multimedia. Tables, figures, and multimedia within an IP shall be numbered consecutively in Arabic numerals. Figure numbers shall be included on all illustrations except inline graphics (example equation). The table, figure, or multimedia number shall not be an integral part of the table, figure, or multimedia. The number and title shall be separated from the table, figure, or multimedia so the text can have the capability of being searched.

#### A.4 DEVELOPMENT OF PAGE-BASED INFORMATION PACKAGE (IP)-FORMAT TECHNICAL MANUALS

A.4.1 General. The following are unique requirements applicable to page-based IP-format TMs developed in accordance with MIL-DTL-24784/22 and /23.

A.4.2 Development products.

MIL-DTL-24784C(NAVY)  
APPENDIX A

A.4.2.1 Book plan. When specified by the acquiring activity (see 6.2), a book plan shall be developed for each TM. The book plan shall be submitted to the Government for acceptance prior to development of the review draft copy (RDC) or the preliminary TM (PTM). If rejected, the unacceptable portions shall be corrected and resubmitted. The book plan shall be maintained by the contractor during the TM development process, and submitted to the Government for acceptance when development is completed.

A.4.2.1.1 Book plan coverage. A book plan shall be developed with the content and format requirements of the applicable specification sheet. The book plan shall portray the planned manual coverage by volume (separately bound segments), division, and so forth. The book plan shall be based on the development of a table of contents for each planned volume and shall include:

- a. A text guide shall list by volume, front matter, each IP, and informative paragraph titles within each IP. A brief statement (outlining the content and intended coverage) shall follow each IP and paragraph title.
- b. A list of illustrations and a list of tables shall be keyed to the text plan. Each illustration and table listed shall be described. The illustration plan shall contain figure numbers, title, information content, and approximate size and nature for all illustrations (such as schematic, line drawing, and exploded view). A sample of each drawing type referenced in the illustration plan shall be included.
- c. An estimated page count for each IP and a statement indicating the scope, depth, or coverage.
- d. Data for the front matter, including a brief description of the material to be presented, shall be developed.
- e. Data required for the technical content portion of the manual shall outline the planned coverage by proposed volumes, divisions, and so forth, in accordance with the content and format requirements of the applicable specification sheet.
- f. A description of the approach to be used in presenting procedural information. If users of a procedure are expected to vary widely in experience and capability, the Government may direct that certain procedures be presented in a dual-level format (see 3.7.1.8.5).
- g. A synopsis of the validation approach to the manual content requirements shall be included based on a plan for use as supplied by the Government and the maintenance concept or maintenance plan for the equipment. The synopsis shall indicate coverage on a comprehensive and systematic basis of the most effective and efficient method of performing necessary maintenance. The synopsis shall be correlated to the maintenance concept or plan by direct referencing.
- h. The book plan shall fully enforce all content requirements.
- i. Problems regarding requirements, interpretation, and application shall be identified.
- j. Conflicts between guidance documents shall be highlighted.

A.4.2.1.2 Model manual. When specified by the acquiring activity or approved by the Government, an existing manual covering similar system/equipment in an IP format shall be used and marked up and submitted as a book plan. The text from the model manual shall be used verbatim with changes to cover the equipment differences and to correct inconsistencies, unclear wording, or obvious editorial or typographical errors. For all new manuals, the format requirements in this specification shall apply. All inconsistencies, unclear wording, or errors noted in the model manual shall be identified to the Government. All deviations from the model manual shall be approved by the Government.

A.4.2.1.3 Milestone schedule. As an addendum to the book plan, a milestone schedule for development of the publication shall be furnished for the individual contract. Milestones to be identified shall include, but are not limited to, the following.

- a. Book plan submission.
- b. RDC drafting percent completion points.
- c. Schematic preparation.
- d. Illustrated Pars Breakdown (IPB).
- e. Editing.
- f. Composition.

MIL-DTL-24784C(NAVY)  
APPENDIX A

- g. RDC submission.
- h. IPR schedule
- i. Validation.
- j. PTM submission.
- k. Final submission and delivery

A.4.2.1.4 Book plan updating. The book plan shall be kept up-to-date throughout the development of the TM RDC or PTM and until the RDC or PTM is accepted. Significant changes to the book plan based on IPRs, etc. shall be submitted to the Government for acceptance. Improved data presentation shall be a prime justification in developing changes to the book plan. The need for a revised book plan shall be determined by the acquiring activity.

A.4.2.1.5 Book plan and model manual acceptance. The book plan or model manual shall be submitted to the Government for acceptance prior to development of the RDC or PTM. If rejected, the unacceptable portions shall be corrected and resubmitted. The accepted book plan or model manual shall become an addendum to the applicable specification sheet governing the development of the TM to the extent that it agrees with the requirements of the contract. The accepted document shall be available for review and comparison with the RDC or PTM at all scheduled IPRs. Acceptance of the book plan or model manual by the Government shall not waive any requirements within the scope of the contract.

#### A.4.3 Divisions and arrangement.

A.4.3.1 TM divisions. IP-format TMs shall be divided into volumes, IMs, IPs, paragraphs, tasks, and subtasks (procedures), as appropriate. Where there is a Volume 1, there shall be a Volume 2. All volumes and IPs shall be titled. Breakout shall be planned to subordinate that which should be subordinated.

A.4.3.1.1 Volumes. When a publication exceeds 1500 printed pages (750 sheets), the manual shall be divided into volumes (separately bound segments). Volumes shall be separated by complete IPs where possible. Each volume shall be identified by a unique TM identification number, title, and subtitles that describe the contents.

A.4.3.1.2 Information modules (IMs). Information Modules (IMs) are the organizational “containers” by which the technical content Information Packages (IPs) are organized. IMs may consist of more than one IP.

A.4.3.1.3 Information packages (IPs). IPs are used to logically divide all data required for a certain function (for example, descriptive information, operator’s instructions, maintenance, IPB data, and troubleshooting). Each IP shall consist of a title, IP initial setup information (when required), supporting information, and technical content as described in MIL-DTL-24784/22 and /23. These data types can be further divided into paragraphs, tasks, and subtasks (procedures).

A.4.3.2 TM arrangement. Each manual shall be arranged according to the following standardized format (as applicable):

- a. Front matter.
- b. Technical content IPs.
- c. Acronyms and abbreviations list (Glossary).
- d. Alphabetical index IP.
- e. TMDER form.

A.4.3.2.1 Front matter. Material preceding the first technical content IP shall consist of the following as applicable, in the order specified:

- a. Cover/title page.
- b. List of effective information packages/pages.
- c. Revision summary.
- d. Table of contents.

MIL-DTL-24784C(NAVY)  
APPENDIX A

- e. List of illustrations.
- f. List of tables.

A.4.3.2.1.1 Cover/title page. The following are unique requirements for printed IP-format TMs. See 3.6 for general requirements applicable to all TM types.

A.4.3.2.1.1.1 Backbone and back cover. When required by the acquiring activity, a backbone and/or back cover for the manual shall be prepared in accordance with figure A-1.

A.4.3.2.1.2 List of effective information packages/pages. A list of effective information packages/pages shall be included (see figure A-25). The list shall back up the title page and shall be numbered. When the last page is a right-hand page, it shall not be backed up and shall list the next succeeding page as blank, for example, “ii/(iii blank)”. The list shall be a complete list of all manual pages and information packages, including title page, the list of effective information packages/pages, table of contents pages, list of illustration pages, list of table pages, blank pages, deleted pages, added pages, foldout pages, glossaries, and indices. The list shall include a statement of the total number of pages in the manual. The listing shall be held to a minimum by grouping numbers where applicable. The page numbers for a blank page and the printed side of the sheet shall be listed as separate numbers even though a double number will appear on the printed side of the sheet. When applicable, the list shall be updated for each change or revision.

A.4.3.2.1.2.1 List of effective information packages/pages for multi-volume manuals. A list of effective information packages/pages covering all volumes shall be included in Volume 1. In a multi-volume manual, each of the volumes, except Volume 1, shall include a list of effective information packages/pages for information packages and pages provided in that particular volume.

A.4.3.2.1.3 Revision summary <RevisionSummaryInfo>. When a revision to a TM is issued, a revision summary shall be provided. The revision summary shall contain a list of IPs by title that have been revised and for each IP listed, a brief description of the major changes. For multi-volume TMs, only Volume 1 or the first manual of the set shall contain a revision summary. Entries shall indicate the volume in which the referenced material appears.

A.4.3.2.1.4 Table of contents. A Table of Contents listing front matter and the technical content IPs and associated paragraphs in the same order and with the exact titles, with the IP number and page number, shall be placed at the beginning of each publication. The Table of Contents shall be in “traditional” order (for example, in the order of occurrence). Users shall be able to initially access information by function according to the type of data the user is seeking, for example, by description IPs, operation IPs, maintenance IPs, testing and troubleshooting IPs, etc. Once the Table of Contents is accessed by function, additional entries may be indented under each primary entry in the list in more detail (for example, Testing and Troubleshooting of Gas Turbine Starter/Auxiliary Power Unit as the primary entry with Fuel Sprayers indented as a subentry). In publications containing alphabetical indexes, only primary and first subordinate paragraphs shall be listed in the Table of Contents. There shall be no table of contents preceding individual IPs. Each manual or volume in a set of manuals shall contain its own table of contents. Volume 1 or the first manual of the set shall contain a complete table of contents covering the entire set. Entries shall indicate the volume in which the referenced material appears. Layout shall be in accordance with figure A-26.

A.4.3.2.1.5 List of illustrations. Publications containing graphics (including illustrations, drawings, charts, and graphs) with assigned figure numbers shall have a list of illustrations showing the figure number, title, and IP number and page number of each figure. This list shall include foldout pages, schematics, and so forth. The security classification, if any, of illustration titles shall be indicated. Layout shall be in accordance with figure A-27. Each manual or volume in a set of manuals shall contain its own list of illustrations. In addition, Volume 1 or the first manual of the set shall contain a list of illustrations for all volumes or manuals in the set.

A.4.3.2.1.6 List of tables. Publications containing tables (including charts assigned table numbers) shall have a list of tables showing the table number, title, and IP number and page number of each table. The security classification, if any, of table titles shall be indicated. Layout shall be in accordance with figure A-27. Each manual or volume in a set of manuals shall contain its own list of tables. In addition, Volume 1 or the first manual of the set shall contain a list of tables for all volumes or manuals in the set. When both are brief, the list of illustrations and list of tables may be included on the same page.

MIL-DTL-24784C(NAVY)  
APPENDIX A

A.4.3.2.2 Technical content. See MIL-DTL-24784/22 and /23 for technical content data requirements.

A.4.3.2.2.1 IP title block. All IPs shall have and begin with a title block. The IP title block (see figure A-28) shall contain the following data:

- a. Maintenance levels. The maintenance level(s) shall be stated, for example: “ORGANIZATIONAL MAINTENANCE.”
- b. IP title. The title shall describe the general subject or maintenance task and follow the maintenance level, for example: “REPAIR.” For the troubleshooting IP, the specific symptom or malfunction may be used when necessary in lieu of a general subject or maintenance task title.
- c. End item nomenclature. The end item nomenclature such as the system, subsystem, or equipment (including AN type designation), shall follow the IP general title. When applicable, the model(s) and part number(s) shall be placed below the nomenclature. When the IP covers more than one model and/or part number, all models and/or part numbers shall be listed.
- d. Effectivity notice. If applicable, an effectivity notice shall be included in the title block.
- e. Supplement notice. If applicable, a cross-reference notice to supplements shall be included, for example: “This IP is incomplete without IP 042 00 contained in confidential supplement, SE105-XX-XXX-010.”

A.4.3.2.3 Acronyms and abbreviations list <AbbrevList>. A consolidated list shall be prepared to identify and define all abbreviations, acronyms, and uncommon terms used in the TM. The list shall be identified as the Glossary and precede the alphabetical index, if any. Each manual or volume in a set of manuals shall contain its own glossary. In addition, Volume 1 or the first manual of the set shall contain a glossary for all volumes or manuals in the set.

A.4.3.2.4 Alphabetical index IP <AlphaIndexIP>. When specified by the acquiring activity (see 6.2), an alphabetical index shall be developed (see figure A-29). The alphabetical index shall begin on a right hand page and shall be located at the end of the publication but be located before foldout page(s). The primary purpose of this index is to provide access to the technical content IPs contained in the manual and further to the primary technical content information contained within each IP.

A.4.3.2.4.1 Development of the alphabetical index IP. The primary consideration in the development of the alphabetical index shall be the accessibility of the data. Entries shall be listed as follows:

- a. IP end item’s nomenclature. Each IP contained in the manual shall be listed by nomenclature and the applicable IP number. The IP end item’s nomenclature shall be identical with the IP title block, except for arrangement of wording.
  - (1) Nomenclature for the assembly/subassembly shall be arranged with the noun name preceding the modifiers; for example, “Power Driven Rotary Vacuum Pump” shall be listed as “Pump, Rotary, Vacuum Power Driven.”
  - (2) Nomenclature shall also be listed under significant modifiers as functional task or element cross-reference entries, for example, “Vacuum Pump, Rotary, Power Driven.”
  - (3) “AN” nomenclature shall not be used as a main entry, but shall be used as a subordinate (cross-reference entry); for example, “Mount, Antenna, Coupler, UHF, MT-1995/A (34A1)” shall be listed as “MT-1995/A UHF Antenna Coupler Mount (34A1).”
  - (4) IP end item’s reference designation shall not be used as a main entry, but shall be listed following applicable entries to improve access to data. This is extremely critical when more than one item has similar nomenclature.
- b. Additional alphabetical index entries. The content of each IP shall be entered under the primary IP nomenclature. Content to be listed shall include, but not be limited to system, subsystem, equipment, and component name entries and each supporting information and maintenance task included in the IP. These subordinate content listings shall be listed alphabetically. For each entry, the IP number and page that the information can be found on shall be included.
- c. Effectivity notice. The effectivity shall be listed as a subordinate entry when the same basic item is covered in more than one IP by effectivity.

MIL-DTL-24784C(NAVY)  
APPENDIX A

A.4.3.2.4.2 Alphabetical index IP for multi-volume TMs. When a TM is divided into volumes due to its thickness, the first volume of the set shall include a complete alphabetical index IP for the entire set. The primary purpose of this index is to provide access to the technical content IPs contained in all the volumes in the set. The alphabetical index IP content requirements are identical to those described in A.4.3.2.4 and A.4.3.2.4.1 except that a publication number column is required.

A.4.3.2.5 TMDER. The three copies of TMDER shall be included at the back of each separately bound volume of a NAVSEA manual. The TMDER is a user activity TM comment sheet and shall be used to provide feedback on corrections and suggested improvements to the methods and procedures specified by a TM.

#### A.4.4 Style and format.

A.4.4.1 Page size, reproduction area, and margins. Manuals shall be prepared in 8½ by 11 inch size with a reproduction area of 7¼ by 10 inches. The binding edge margin shall not be less than 1 inch and the outside edge margin not less than ¼ inch.

A.4.4.2 Column format. Preferred text format is single column (page wide), although double column can be used. Both single and double column formatted IPs can be included in a single TM if it would make the data more readable or comprehensible, however, both formats should not be used in the same IP.

A.4.4.3 Text placement. Left justification shall be used for all lines of text displayed as sentences or paragraphs. Text shall not be wrapped around an illustration.

A.4.4.4 Type style, capitalization, leading, and vertical spacing. Type style, size (font), and capitalization shall be as identified in figure A-8. Layout shall conserve space without lessening usability or clarity of material. Blank pages and spaces shall be avoided whenever possible. Leading and vertical spacing as indicated by figure A-8 shall be used for best legibility and conservation of space. Text shall be single spaced (double spaced between procedural text). Double spacing of text within a paragraph, or similar wastefulness, is unacceptable. Layout practices shall not result in:

- a. The first line of a paragraph being at the bottom of a page or column.
- b. The last line of a paragraph being at the top of a new page.
- c. A sidehead falling on the last line of a page or column.
- d. Dangers, warnings, cautions, and notes being divided so that first lines or group of icons appear on one page and remaining lines or group of icons on another. For double column, first lines or group of icons may appear in the left column with remaining lines in the right column on the same page.
- e. Dangers, warnings, cautions, and notes being separated from the paragraph that they apply to. For double column, dangers, warnings, cautions, and notes may appear in the left column with applicable paragraphs in the right column on the same page.
- f. Undesirable location of an illustration or table.

A.4.4.5 Margin data. Margin data (generally the running heads and feet) shall be placed outside that portion of the page used for the IP title block, narrative text, full-page tabular data or full-page illustrations, but within the reproduction area dimensions of the page. When applicable, margin data also consists of the security classification, figure number and figure title.

A.4.4.5.1 Running heads and feet. Complete running heads and feet shall be included on all pages except title pages or pages otherwise blank. Blank pages that back up classified pages shall be marked with the security classification of the backed up page.

##### A.4.4.5.1.1 Running heads.

A.4.4.5.1.1.1 Security classification. The security classification, including unclassified pages, of classified manuals shall be at the top center of each page in bold face type in accordance with SECNAVINST 5510.36. For foldouts, the security classification shall be marked in bold face type, ¾ inch from the right-hand edge and repeated continuously to the left with 4 inches of space between each marking.

MIL-DTL-24784C(NAVY)  
APPENDIX A

A.4.4.5.1.1.2 TM identification number. The TM identification number, as assigned by the Government, shall be in bold face type at the extreme upper left corner of the reproducible area and outer segment (page unit) of each foldout page.

A.4.4.5.1.1.3 IP number. The IP number shall be placed on each page of the IP in the extreme upper right corner of the reproduction area.

A.4.4.5.1.2 Running feet.

A.4.4.5.1.2.1 Page number. Page numbers shall be located at the lower outer edge ending at the outside margin and shall be in bold face type. Even numbers shall be assigned to left-hand pages and odd numbers to right-hand pages. The page number for a foldout page shall be so placed (lower outer edge ending at the outside margin) that the number shall be visible when the printed page is folded.

A.4.4.5.1.2.2 Security classification. The security classification, including unclassified pages, of classified manuals shall be at the bottom center of each page in bold face type in accordance with SECNAVINST 5510.36. For foldouts, the security classification shall be marked in bold face type,  $\frac{3}{4}$  inch from the right-hand edge and repeated continuously to the left with 4 inches of space between each marking.

A.4.4.5.1.2.3 Foldout figure number and title. The figure number and title for a foldout page shall be placed in the lower outer corner of the page, so that the number is visible when the printed page is folded.

A.4.4.6 Paragraph titles. Paragraphs and subparagraphs shall have titles. The title shall begin at the left margin. The paragraph title shall describe that paragraph's contents.

A.4.4.6.1 Paragraph title format. Paragraph and subparagraph titles shall be formatted as follows:

- a. Primary paragraph titles shall be bold and capital case. Block text shall start on a separate line and shall have a blank line between the title and text block.
- b. Subparagraph level 1 titles shall be bold and title case. Block text shall start on a separate line and shall have a blank line between the title and text block.
- c. Subparagraph level 2 titles shall be bold, title case, and end with a period. Block text shall start immediately after the title.
- d. Subparagraph level 3 titles shall indent the first line 5 spaces and the remaining text flush left. The title shall be bold, title case, and end with a period. Block text shall start immediately after the title.
- e. Subparagraph level 4 titles shall indent the first line 10 spaces and the remaining text flush left. The title shall be bold, capital case, and end with a period. Block text shall start immediately after the title.

A.4.4.7 Procedural steps. Procedural steps, sub-steps, and checklist items shall be formatted as follows:

- a. First level procedural steps shall be numbered consecutively with Arabic numerals, no title, and block indented under first word of the step.
- b. Second level procedural steps shall be numbered consecutively with lower case letters, no title, and block indented under first word of the step.
- c. Third level procedural steps shall be numbered consecutively with Arabic numerals enclosed in parenthesis, no title, and block indented under first word of the step.

A.4.4.8 Footnotes. Footnotes shall not be used. Notes shall be used when applicable.

A.4.5 References. References shall be kept to a minimum and shall be limited to Government approved documents such as military specifications and standards, TMs, drawings, engineering change data, and other approved material which will enhance the clarity and support the repair requirements and processes delineated in the manual. Referencing shall conform to the following:

- a. Where a small amount of information is needed (fewer than two pages), the applicable material shall be copied verbatim.

MIL-DTL-24784C(NAVY)  
APPENDIX A

- b. Where a large amount of material is required (more than two pages), the applicable material shall be referenced fully, including the publication number and title. Reference to alternative repair procedures and drawings required to refurbish parts is acceptable if that refurbishment information is not routinely required.

A.4.5.1 Text references. The text shall reference to:

- a. Illustrations by the word “Figure”, the figure number, including section letter and number when applicable, and the sheet number for multi-sheet illustrations, when applicable.
- b. Items and parts on illustrations by the word “Figure”, the figure number, followed by the index number. For example: “(Figure 3, Item 2)”. However, when multiple references in a paragraph refer to the same figure, only the first reference needs to include the word “Figure” and figure number. For example:

**“2-5 Removal**

Removal of the valve will allow access to the impeller.

1. Remove safety wire from J1, J2, and J3 and remove connectors.
2. Remove four nuts (Figure 2, Item 16), washers (17), and bolts (18) securing valve (1) to mount (20) and remove from mount.”

In such cases where a procedure involves two or more figures, the paragraph lead-in shall contain a statement similar to the following: “Item numbers below refer to Figure 2 unless otherwise indicated.” The remaining callouts shall cite the index number followed by the figure number, e.g., “(Figure 2, Item 3).” For example:

**“2-5 Removal**

Removal of the valve will allow access to the impeller. Item numbers below refer to Figure 2 unless otherwise indicated.

1. Remove safety wire from J1, J2, and J3 and remove connectors.
2. Remove four nuts (16), washers (17), and bolts (18) securing valve (1) to mount (20) and remove from mount.
3. Remove safety wire from locking ring (Figure 3, Item 3).
4. Unscrew locking ring from valve body (Figure 3, Item 5).
5. Remove mount (3).”

- c. When reference is made to items in figures by reference designations, the numbers shall be indicated in the following manner: “The ON-OFF switch (S1, Figure 3) on the center console controls the TWT cooling.”
- d. Parts on diagrams by enough of their reference designation to identify the item. For example, Resistor A6R11.
- e. Tables by table number. For example, “Table 2”.
- f. Other supporting paragraphs by exact paragraph title (without the paragraph number) in capital letters, followed by the TM identification number in parentheses.
- g. Paragraphs within an IP by paragraph title and number.
- h. When reference is made to other IPs, descriptive information, maintenance tasks, or other data within the same manual, it shall be by IP number and title, and paragraph title, or appropriate text (as applicable). The title shall be the same as used in the Table of Contents.

MIL-DTL-24784C(NAVY)  
APPENDIX A

A.4.5.2 Frequently used maintenance tasks. Frequently used maintenance tasks, such as applying external electrical or hydraulic power, shall be prepared once as a common maintenance task and then referenced as a common step in all other maintenance tasks requiring the need for external electrical or hydraulic power. It is not necessary to include supporting graphics to common steps for referenced tasks.

A.4.5.3 Frequently used steps within the same maintenance task. When it becomes necessary to reference to another step or group of steps within the same procedure or task or to another procedure or task in the same IP, the reference shall be by the step number(s).

A.4.5.4 Tasks performed by other work centers. Procedures that require performance of tasks by technical personnel other than those normally assigned to the subject task shall be referenced in the introductory information for the IP and in the text. For example, if the primary task is removal of a component of the piping system that is inaccessible without removal of a component of the sewage ejection/holding system, a preparatory step of the procedure shall be, "Remove CHT pump (NAVSEA 0905-LP-092-4060)."

A.4.5.5 Post maintenance action referencing. When required, the last step of a procedure shall reference any post maintenance actions necessary to ensure the initial procedure has been successfully completed. The reference shall be to the procedure title and the associated IP number. For example, the last step would read "Service hydraulic system (IP 017 00)."

A.4.6 Use of terminology, nomenclature, numbers, and equations.

A.4.6.1 Abbreviations and acronyms. Use of abbreviations and acronyms shall be held to a minimum and each shall be spelled out the first time it appears in each IP where confusion may exist or usability will be enhanced. An excellent rule to follow is; "when in doubt, spell it out."

A.4.7 Tabular material.

A.4.7.1 Table titles. Tables shall be assigned table titles. The title shall follow two spaces after the table number and shall be centered above the applicable table. The first letter of the first word and of each principal word shall be capitalized. Full-page tables, placed sideways on a page, shall be turned 90 degrees counterclockwise. The table number and title for a turned table shall also be turned 90 degrees counterclockwise to stay centered above the table. Table titles shall begin with an identifying name when applicable. For example:

"Table 3. Guidance System Test Points."

The title shall be short and describe the contents or purpose of the table. Tables applicable to one Service, in a manual that will be used by more than one Service, shall be identified. For example:

"Table 2 (Navy Only). Fuel Indicator Correction Factors."

A.4.7.2 Continued table material. When a table is continued on a following page, the number and title shall be repeated at the head of the columns on all following pages of the table, followed by a dash and the word "Continued." Table head titles shall also be repeated. The above information shall not be repeated on a following page when the page is a foot page of a head to foot tabular arrangement. When a table entry is continued, the entry or its identifying number or letter from the first column shall be repeated in the first column followed by a dash and the abbreviation "Cont".

A.4.7.3 Footnotes in tables. Footnotes shall be placed immediately below the table in which they are referenced. If a table is continued onto other pages, all footnotes shall be placed at the bottom of the page on which they are referenced or at the end of the table and the directory note "See footnotes at end of table" shall be placed at the bottom of pages containing footnote references. For footnotes coming before the end of the table, and for a directory note, a 1-inch horizontal rule shall be placed flush left below the table and the footnote or directory note placed under the rule. Footnotes at the end of the table shall be started on the second line below the closing rule. All table notes and footnotes shall be indented five spaces from the left margin of the table and carry over lines shall return to the left margin of the table.

MIL-DTL-24784C(NAVY)  
APPENDIX A

A.4.7.4 Table format. Tables designated as “**standard information**” tables in MIL-DTL-24784/22 and /23 shall have no deviations to the number of columns and the titles in the column headings. The table format and table headings are automatically generated by the applicable DTD and style sheet used for the information.

A.4.8 Numbering.

A.4.8.1 Cover and title pages. The cover and title page shall not be numbered.

A.4.8.2 Front matter. Lower case Roman numerals (in sequence i, ii, iii, and so forth) shall be used in numbering front matter pages (List of effective information packages/pages, Table of Contents, Revision Summary, List of Illustrations, and List of Tables).

A.4.8.3 Volumes. Volumes shall be identified sequentially by a unique TM identification number as provided by the Government, and include subtitles indicative of volume content.

A.4.8.4 IP number. Each IP shall be assigned a permanent number. The IP number shall be considered permanent upon distribution of the basic issue of the manual and shall not change. IP numbers may be changed only when a complete revision to a manual is authorized by the acquiring activity. The IP number shall be placed on each page of the IP in the extreme upper right corner of the reproduction area.

A.4.8.4.1 IP numbering system. Each IP number shall be a five-digit number, beginning with the number 001 00. There shall be one blank space between the third and fourth numerals. The basic IP number is identified by the first three digits of the IP number. The last two digits can be used to add IPs that reflect related coverage for the same basic descriptive information or operational or maintenance task when there is a permanent configuration difference, different support equipment, or preferred and alternate procedures required. Normally all technical content IP's last two digits shall be assigned “00,” indicating all required coverage for the IP subject (task). If additional IPs are required to provide permanent configuration differences, different support equipment, or preferred and alternate procedures for the same IP subject contained in the “00” IP, the additional IPs shall be assigned as “01,” “02,” “03,” and so forth.

A.4.8.5 Paragraphs. Primary paragraphs within an IP shall be numbered consecutively in Arabic numerals beginning with the number 1-1, 2-1, 3-1, etc. When subordinate paragraphs are required, they shall be assigned consecutive Arabic numerals under their primary paragraph (i.e., 1-2, 1-3, 2-2, 2-3, etc.).

A.4.8.6 Procedural steps. First level procedural steps shall be numbered consecutively with Arabic numerals. Second level procedural steps shall be numbered consecutively with lower case letters. Third level procedural steps shall be numbered consecutively with Arabic numerals enclosed in parenthesis.

A.4.8.7 Pages, tables, and illustrations. The pages of each IP shall be numbered consecutively in Arabic numerals beginning with the number 1. Tables and figures within an IP shall be numbered consecutively in Arabic numerals beginning with the number 1.

A.4.8.8 Blank pages. Blank pages shall be assigned a page number, but the number and the word “blank” shall appear in parentheses on the preceding page following the preceding page number (for example, “15/(16 blank)”).

A.4.8.9 Foldout figure numbers. Foldouts that are placed at the end of each IP, shall start with the next number after the last standard size illustration figure number in the IP.

A.4.8.10 Foldout page numbers. Foldout illustrations shall be page numbered with Arabic numerals. The first foldout page of an IP shall be assigned the next number after the last standard size text or illustration page number of the IP. The page number for a foldout page shall be placed so that the number shall be visible when the printed page is folded. The reverse side of foldout pages shall be blank. Each foldout page number shall include a blank page notation (for example, “27/(28 blank)”).

A.4.8.11 Footnotes. Numbering of footnotes to tables shall be independent of that of footnotes to the text. Consecutive superior numbers beginning with “1” shall be used (in tables, superior lowercase letters, asterisks or other designation may be used where numbers could cause confusion). Footnote numbers and text shall be separated by two spaces. The numbering system shall be per IP or table, as applicable. Footnotes to the text shall be placed at the bottom of the page on which they appear.

MIL-DTL-24784C(NAVY)  
APPENDIX A

A.4.8.12 Glossary. The page numbers for an independent glossary shall be consecutively numbered in Arabic numerals with the word “Glossary” preceding the page number. For example: “Glossary 1.”

A.4.9 Graphics.

A.4.9.1 General graphic requirements.

A.4.9.1.1 Scale. Illustrations shall be prepared to as small a scale as possible consistent with effective use of space, with all essential detail legible; be same size as areas they shall occupy in the manual or, be of such oversize as to permit uniform reduction to this size.

A.4.9.1.2 Color in illustrations. When specified by the acquiring activity (see 6.2), only the Pantone® PMS colors and variations of use identified in table A-III shall be used.

TABLE A-III. Printing colors and variations.

Color	Pantone PMS number	Acceptable for use as			
		Solid area	Solid thin line	40-percent screened area	40-percent screened line
Red	185	Yes	Yes	Yes	Yes
Yellow	108	Yes	Yes	No	No
Green	354	Yes	Yes	Yes	Yes
Blue	299	Yes	Yes	Yes	Yes
Orange	151	Yes	Yes	No	No
Purple	253	Yes	Yes	No	No
Black	-	Yes	Yes	Yes	Yes

The corresponding colors from the web-safe 216 color palette for use in page-based electronic TMs are identified in table A-IV.

TABLE A-IV. Web-safe colors for page-based electronic TMs.

Color	Hexadecimal Value	RGB Values		
		R:	G:	B:
Red	FF0033	255	000	051
Yellow	FFFF33	255	255	051
Green	00CC33	000	204	051
Blue	00CCFF	000	204	255
Orange	FF9933	255	153	051
Purple	CC33CC	204	051	204
Black	000000	000	000	000

A.4.9.1.3 Illustration placement. Each illustration shall be included as part of a paragraph or follow as closely as possible to its first reference in the narrative text or be placed at the end of the IP. Use of foldout illustrations is discouraged. However, when an illustration does require a foldout sheet, such as for a large schematic diagram, it may be located at the end of the IP or be interspersed within text pages and shall be printed with an apron.

MIL-DTL-24784C(NAVY)  
APPENDIX A

A.4.9.1.4 Illustration titles. Full-page illustrations, placed sideways on a page, shall be turned 90 degrees counterclockwise. The figure number and title for a turned illustration shall be placed at the bottom of the page with the manual in its normal position. When the majority of illustrations are turned, the figure number and title shall also be turned to appear below the illustration.

A.4.9.1.5 Legends. Legends shall not be used in an Illustrated Parts Breakdown illustration. Legends shall be included on, adjacent to, or facing the artwork. When index numbers are used, a legend consisting of their numerical listing and their identification shall be included.

A.4.9.1.6 Apron notes. Apron notes for foldout diagrams shall be placed in a final size image area of 7¼ by 10 inches with a minimum letter height of 0.060 inch or equivalent point size. Notes shall be arranged to make best use of the available space. When notes for a given diagram foldout sheet require more than the 7¼ by 10 inch apron, the notes shall be extended with additional columns on the diagram image area if the space permits. If the space does not permit, single pages shall precede and shall contain the additional notes. When additional note sheets are required, the notes shall start on the first additional sheet and be printed as a right-hand page; note pages may be printed on both sides. Foldout sheets shall not be used for running text. Each sheet of the diagram, including the note sheets, shall contain the figure number, title, and sheet number.

A.4.9.1.7 Multiple page notes. For multiple page note pages applicable to illustrations, each note page shall be consecutively numbered front and back. Multiple note pages shall not be delineated as being part of (or Sheet X of X) an overall notes page, but illustrations shall be delineated as being Sheet    of    an overall illustration, as applicable. Notes shall precede the illustration or appear on the illustration apron, as applicable. Notes pages shall be of the single sheet type.

A.4.9.1.8 Foldout pages. Unless otherwise specified by the acquiring activity (see 6.2), foldout pages shall not be included in the manual. Multi-sheet illustrations shall be used where possible, in lieu of foldouts, when usability is not affected. Foldup-foldout pages shall not be used. If approved by the acquiring activity, foldout pages may be prepared and shall meet the following requirements:

- a. Maximum page size for the foldout (including blank apron) shall be 26 by 11 inches with a maximum printable area of 16 by 10 inches. Minimum margins shall be ½ inch top and bottom, and ¼ inch side opposite binding edge.
- b. All foldout pages shall be prepared for printing on one side only.
- c. Full blank aprons shall be used.
- d. Foldout pages shall not be spliced.
- e. When specified by the acquiring activity, foldout pages shall fall at the end of IPs or be interspersed within text pages.

A.4.10 Style and format for change packages.

A.4.10.1 Change package content. Each change package shall include the following:

- a. A replacement title page.
- b. A replacement list of effective information packages/pages.
- c. A change instruction sheet.
- d. As applicable, replacement pages for the table of contents, general information page(s), list of abbreviations or symbols, system and component diagrams, and text.

A.4.10.1.1 Title page. The original title page (and cover, if required) provided with the basic manual or with the latest published change to the manual, shall be updated to:

- a. Indicate the unique TM identification number (assigned by the Government) for the change, for example SE686-CA-MMO-01A. The change identification (change letter and date) shall be entered below the original publication date in the lower right-hand corner of the page, for example: CHANGE A 15 July 2004. If the Government does not advise the contractor the exact date to use, the publication date shall be the date at which the last material to be included was received (copy freeze date). The day, month, and year shall be given in that sequence.

MIL-DTL-24784C(NAVY)  
APPENDIX A

- b. Reflect the current distribution statement, warning, and destruction notice. If required, a new cover shall be supplied.
- c. Indicate the current supersedure notice.

A.4.10.1.2 List of effective information packages/pages. The list of effective information packages/pages shall be updated for each change (see figure A-25). On the list of effective information packages/pages, above the list of pages contained in the manual, shall be a list of all published change identification numbers and dates. The current change shall be included in this list. This list of effective information packages/pages shall be a complete list of all manual pages and information packages, including title page, the list of effective information packages/pages, table of contents pages, list of illustration pages, list of table pages, blank pages, deleted pages, added pages, foldout pages, glossaries, and indices. The list shall include a statement of the total number of pages in the manual. The listing shall be held to a minimum by grouping numbers where applicable. The page numbers for a blank page and the printed side of the sheet shall be listed as separate numbers even though a double number will appear on the printed side of the sheet. Appropriate change numbers shall be placed in the "Change No." column. The words "Deleted" or "blank" shall be placed along side the page number of pages so affected.

A.4.10.1.3 Change instruction sheets. A change instruction sheet (change guide) shall provide instructions for inserting new and revised pages, and for disposing of superseded pages. The Change Guide shall be the first page of a change package. The Change Guide shall be formatted similar to figure A-23 and shall include the following, as applicable:

- a. The authority under which the manual change is acquired and issued.
- b. Reflect the highest classification assigned to any portion within the change package (see 3.5.5).
- c. The TM change identification number and change date.
- d. If other than the change date, a statement shall be included indicating when the change is in effect. If it supersedes an earlier change, a statement of that fact shall be given.
- e. The total number of pages included in the change package.
- f. The manual title.
- g. If an equipment change is involved (field or production change), a statement shall be included indicating the purpose of the change and the extent (serial numbers or conditions of application) to which it applies to the equipment population and identify the alteration by number.
- h. Clear and concise instructions on information packages/pages to be removed and inserted or deleted.
- i. When the change applies to the entire equipment population, maintenance support activities shall be instructed not dispose of the superseded pages until it is established that all of the equipment population has been modified.
- j. For changes pertaining to equipment modifications, the user shall be instructed not to insert a change in a manual until the modification has been accomplished.
- k. The method used to identify new and changed material shall be explained.
- l. The instructions shall specify the deleted or added pages.
- m. The instructions shall be followed by a statement that the change instruction sheet shall be inserted in the manual immediately following the front cover and title page for reference purposes.
- n. Include the disclosure notice, distribution statement, export control notice, and destruction notice as applicable.
- o. If additional change instruction sheet pages are required, the second and subsequent pages shall identify the page(s) as Change Instruction Sheet or Change Guide, centered at the top of the page(s) and shall include the TM number and change identification. For example: "Change Instruction Sheet (or Change Guide) for SE686-XX-MMO-020 Change B." The additional pages shall be numbered consecutively in Arabic numbers and the page number shall be centered at the bottom of each page.
- p. A bar-coded stock number (provided by the Government) for the change package shall appear in the lower left-hand corner of the first page of the change instruction sheet.

MIL-DTL-24784C(NAVY)  
APPENDIX A

A.4.10.1.4 Replacement pages. Changes to an existing manual shall be issued in the form of replacement pages. Pages shall be revised only when significant technical changes are required.

- a. Change pages which replace pages in the manual shall carry the same page number as the page they replace.
- b. Replacement pages shall include all corrections issued in previous changes in addition to all other outstanding corrections required.
- c. If an equipment change does not effect the entire equipment population, the change shall be developed so that it shall describe both the effected and unaffected equipment.
- d. When the equipment nomenclature has been changed because of a production or field change to the equipment, the nomenclature references in the text and illustrations need not be modified merely to include the new nomenclature. Information equivalent to the following shall be included as general information: "Unless otherwise specified, all references in the manual to Radar Set AN/SPS-10 apply equally to Radar Set AN/SPS-10A".
- e. Changes made to any given page of the manual shall require a complete check and correction of associated pages that reflect the subject change.
- f. A change letter shall be used to identify changes and will be assigned by the Government.
- g. The TM identification number shall appear at the top of each replacement page and shall remain the same as the basic manual.
- h. As required, the security classification shall appear on the top (above the manual identification number) and bottom center of each page for pages containing classified information.
- i. As necessary, indices shall be updated to reflect changes and shall be issued as replacement pages.

A.4.10.1.4.1 Additions. All paragraphs and pages shall be added and numbered as follows:

A.4.10.1.4.1.1 Numbering of added material. When paragraphs, illustrations, tables, and pages are added by a change, existing paragraphs, illustrations, tables, and pages shall be renumbered. If this involves renumbering more than 10 paragraphs or affects more than five pages, the following method shall be used:

- a. When additional information packages are required, they shall be numbered in accordance with A.4.8.4.1.
- b. When paragraphs, figures, tables, or pages are added at the end of a sequence, the next consecutive number shall be used.
- c. When a paragraph, figure, table, or page is inserted between an existing paragraph, figure, table, or page, the inserted item shall be numbered the same as the preceding item with an alpha character at the end of the number. For example, a paragraph added between paragraphs 2-3 and 2-4 becomes 2-3A, and a figure added between figures 2 and 3 becomes figure 2A.
- d. Pages shall not be added between a right-hand (odd numbered) and a left-hand (even numbered) page.
- e. When new material is to be added to a right-hand page, any overrun shall be carried to the left-hand page. The overrun from the left-hand page shall be placed on the added page.
- f. Where material is to be added to a right-hand page and adequate blank space is available on the preceding left-hand page, material at the top of the right-hand page shall be moved to the bottom of left-hand page and the new material added to the right-hand page.

A.4.10.1.4.1.1.1 Multi-sheet illustration. Sheets added to a set of multi-sheet illustrations that fall between existing sheets shall be assigned the preceding number plus an alpha character. For example, if a sheet is added between sheets 2 and 3, the added sheet becomes 2A. If possible, the new sheet shall be added after the last sheet and be assigned the next consecutive number.

A.4.10.1.4.1.1.2 Index number. Where a change to an illustration adds index numbers between existing numbers, the added numbers shall be assigned the preceding index number with added alpha characters. For example, an index number added between index numbers 22 and 23 becomes index 22A. Suffixed index numbers need not be eliminated for a non-superseding revision unless the illustration is to be re-drawn.

MIL-DTL-24784C(NAVY)  
APPENDIX AA.4.10.1.4.2 Deletions.

A.4.10.1.4.2.1 Deleted paragraphs, steps, illustrations, and tables. Where a change deletes a paragraph, step, sub-step, illustration, or table without substituting another, the space formerly occupied by the paragraph, step, sub-step, illustration, or table can be used for other instructions. Allow sufficient space to provide ¼ inch above and below a statement such as “Figure 4 (Deleted.)”. The table of contents, list of illustrations, list of tables, and index shall be changed as necessary.

A.4.10.1.4.2.2 Deleted pages. When page number continuity is broken by deletion of a page and a blank page results, a statement indicating the deletion shall be placed in the bottom margin (right or left corner, or centered, as space permits) of the preceding page or top margin of the succeeding page. For example: “All data on page 5, including Figure 2 deleted.” This also applies when two back-to-back pages are deleted. The statement shall be used only if the same manual change affects a preceding or succeeding page. A preceding or succeeding page shall not be changed merely to add this statement.

A.4.10.1.4.2.3 Deleted index numbers. If an index number is deleted from an illustration, the word “(Deleted)” in parentheses shall be placed after the index number.

A.4.10.1.4.3 Change symbols for text and tables. Changes (except as noted below) to the text and tables (including new material on added pages) shall be indicated by a vertical line in the margin extending the entire area of the material affected (outer margin for double column material, margin opposite binding edge for single column material) (see figure A-24). The vertical line change symbol shall be 6-point in width. Previous change symbols on a page shall be deleted when a page is subsequently changed. Symbols shall show current changes only. Change symbols are not required for:

- a. Front matter.
- b. Blank space resulting from the deletion of text, an illustration or part of an illustration, or a table.
- c. Correction of minor inaccuracies such as spelling, punctuation, relocation of material, renumbered paragraphs, and so forth, unless such correction changes the meaning of instructive information or procedures.
- d. Replacement or addition of a complete information package.

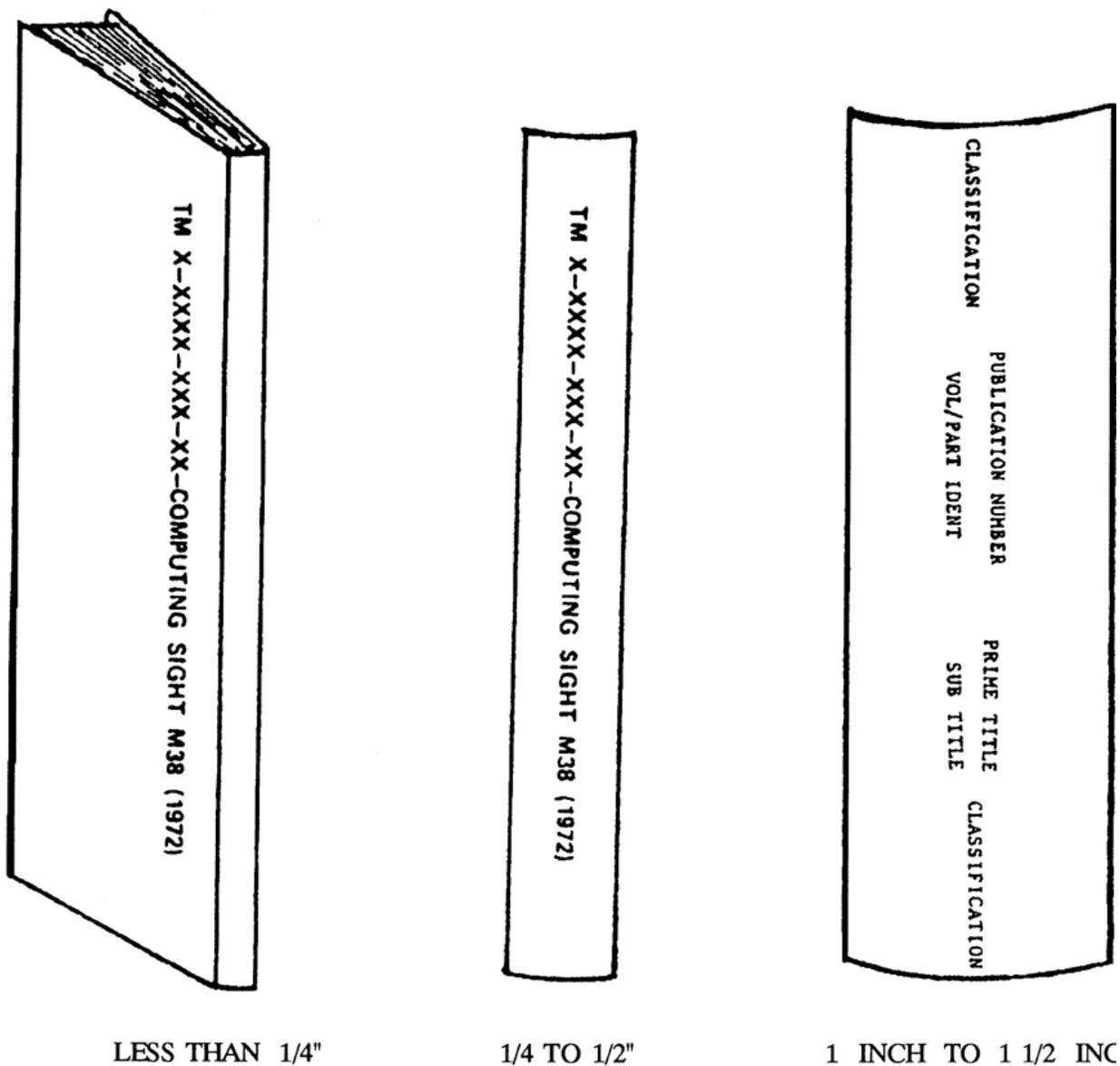
A.4.10.1.4.4 Change symbols for illustrations. Changes to line drawings, charts, illustrations, graphs, diagrams, and schematics shall be indicated by shading and screening to highlight the area containing the changed information. Extensively changed presentations shall be indicated by a screen border around the affected area. For minor changes not suitable for shading or screening, a miniature pointing hand shall be used. Previous change symbols on a page shall be deleted when a page is subsequently changed. Symbols shall show current changes only. See figure A-24.

A.4.10.1.4.5 Change page designator. Each page containing changed or added material shall bear the words “Change \_\_” placed at the bottom of the page in the same corner and on the same line as the page number. The change designator shall begin approximately ½ inch to the right of the page number for an even numbered page, and end approximately ½ inch to the left of the page number for an odd numbered page (see figure A-24).

A.4.10.1.5 FTM. A FTM shall be furnished for changed and added pages. Copy shall be furnished for both sides of the page on which the change is made. When specified by the acquiring activity, the FTM shall consist of the entire TM with the changed and added pages inserted.

A.4.10.2 Style and format for revisions. When an existing TM is being revised and renumbering of all pages, paragraphs, illustrations and tables does not substantially improve the use of the manual, then added or deleted pages, paragraphs, figures, and tables shall be in accordance with the requirements identified in A.4.10.1.4.1 through A.4.10.1.4.2.3.

MIL-DTL-24784C(NAVY)  
APPENDIX A



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE A-1. Example backbone and back cover.

MIL-DTL-24784C(NAVY)  
APPENDIX A

## LIST OF EFFECTIVE PAGES

Dispose of superseded pages in accordance with applicable regulations.

Dates of issue for original and subsequent revisions:

Original..... 1 July 1997  
Revision 1..... 15 October 2000  
Revision 2..... 1 June 2005

TOTAL NUMBER OF PAGES IN THIS TECHNICAL MANUAL IS 416, CONSISTING OF THE FOLLOWING:

Page No.	Page No.
Title and A	8-1 and 8-2
Foreword-1	9-1
Foreword-2 blank	9-2 blank
i thru ix	9-3/(9-4 blank)
x blank	9-5/(9-6 blank)
1-1 thru 1-10	9-7/(9-8 blank)
2-1 thru 2-5	9-9/(9-10 blank)
2-6 blank	9-11/(9-12 blank)
3-1 thru 3-41	9-13
3-42 blank	9-14 blank
3-43/(3-44 blank)	9-15 thru 9-111
3-45	9-112 blank
3-46 blank	9-113/(9-114 blank)
3-47/(3-48 blank)	9-115/(9-116 blank)
4-1	9-117/(9-118 blank)
4-2 blank	9-119/(9-120 blank)
5-1 thru 5-45	9-121/(9-122 blank)
5-46 blank	9-123/(9-124 blank)
6-1 thru 6-131	9-125/(9-126 blank)
6-132 blank	9-127/(9-128 blank)
7-1 thru 7-17	Glossary-1 thru Glossary-7
7-18 blank	Glossary-8 blank

Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE A-2. Example list of effective pages (for new or revised TM).

MIL-DTL-24784C(NAVY)  
APPENDIX A

**LIST OF EFFECTIVE PAGES**

INSERT LATEST CHANGED PAGES. DESTROY SUPERSEDED PAGES.

Dates of issue for original and changed pages are:

Original.....0 ..... 1 January 1988	Change .....4..... 6 July 1989
Change.....1 ..... 19 September 1988	Change .....5..... 25 September 1989
Change.....2 ..... 20 December 1988	Change .....6..... 27 December 1989
Change.....3 ..... 21 February 1989	Change .....7..... 29 March 1990

TOTAL NUMBER OF PAGES IN THIS PUBLICATION IS 376, CONSISTING OF THE FOLLOWING:

Page No.	*Change No.	Page No.	*Change No.	Page No.	*Change No.
Title.....	7	3-41.....	0	4-48.....	0
A - B.....	7	3-42 blank.....	0	4-49 - 4-51.....	6
i-ii.....	2	3-43.....	0	4-52 - 4-54.....	0
iii.....	7	3-44.....	6	4-55.....	2
iv - viii.....	2	3-45.....	0	4-56 blank.....	0
ix - x.....	0	3-46.....	2	4-57.....	2
1-1 - 1-2.....	0	3-47 - 3-54.....	7	4-58 - 4-59.....	0
1-3.....	3	4-1 - 4-2.....	0	4-60.....	7
1-4 blank.....	0	4-3.....	5	4-61 - 4-64.....	0
2-1 - 2-2.....	0	4-4.....	0	4-65.....	2
2-3.....	2	4-5.....	7	4-66.....	0
2-4 - 2-8.....	0	4-6.....	0	4-67.....	2
3-1.....	5	4-7.....	5	4-68.....	0
3-2 blank.....	0	4-8 4-9.....	0	5-1/6-1 - 6-4.....	0
3-3 - 3-4.....	7	4-10.....	2	A-1 - A-4.....	7
3-5.....	2	4-11.....	0	Glossary 1 - Glossary 3.....	0
3-6.....	4	4-12 - 4-13.....	3	Glossary 4 blank.....	0
3-7.....	0	4-14 - 4-15.....	0	Index 1 - Index 2.....	2
3-8.....	4	4-16.....	3	Index 3.....	0
3-9 - 3-10.....	0	4-17.....	0	Index 4 - Index 5 Added.....	7
3-11.....	4	4-18 - 4-19.....	3	Index 6 blank.....	7
3-12 - 3-18.....	0	4-20.....	0		
3-19.....	2	4-21 - 4-22.....	6		
3-20 blank.....	2	4-23 - 4-29.....	0		
3-21.....	0	4-30 blank.....	0		
3-22 - 3-23.....	5	4-31.....	2		
3-24 blank.....	0	4-32 - 4-33.....	0		
3-25.....	2	4-34.....	2		
3-26 blank.....	0	4-34 - 4-37.....	0		
3-27.....	4	4-38.....	2		
3-28 blank.....	0	4-39.....	0		
3-29 - 3-30.....	0	4-40.....	3		
3-31 - 3-32.....	2	4-41.....	2		
3-32.1 Added.....	7	4-42 - 4-43.....	0		
3-32.2 blank.....	7	4-44.....	3		
3-33.....	5	4-45.....	0		
3-34 - 3-35.....	5	4-46.....	2		
3-36 - 3-38.....	0	4-46.1 Added.....	7		
3-39 - 3-40.....	5	4-46.2 blank.....	7		
		4-43.3 - 4-16.4 Deleted.....	2		
		4-47.....	1		

\*Zero in this column indicates an original page

A Change 7

Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE A-3. Example list of effective pages (for TM with change pages).

MIL-DTL-24784C(NAVY)  
APPENDIX A

## TABLE OF CONTENTS

Chapter/Paragraph	Title	Page
	LIST OF ILLUSTRATIONS .....	v
	LIST OF TABLES .....	vii
	FOREWORD .....	viii
1	GENERAL INFORMATION AND SAFETY PRECAUTIONS .....	1-1
1.1	SAFETY SUMMARY .....	1-1
1.2	SAFETY PRECAUTIONS .....	1-1
1.3	INTRODUCTION .....	1-1
1.4	FUNCTIONAL DESCRIPTION .....	1-3
1.5	PHYSICAL DESCRIPTION .....	1-4
2	OPERATION .....	2-1
2.1	INTRODUCTION .....	2-1
2.2	CONTROLS AND INDICATORS .....	2-1
2.2.1	Power Control Panel .....	2-1
2.2.2	Operator Panel .....	2-2
2.2.3	Trackball Assembly .....	2-3
2.3	OPERATING PROCEDURES .....	2-5
2.3.1	Pre-operating Procedure .....	2-7
2.3.2	Power-On Procedure .....	2-12
2.3.3	Power-Off Procedure .....	2-13
3	FUNCTIONAL DESCRIPTION .....	3-1
3.1	INTRODUCTION .....	3-1
3.1.1	Configuration Variants .....	3-1
3.2	FUNCTIONAL DESCRIPTION .....	3-3
3.2.1	Simplified Functional Description .....	3-3
3.2.2	Operator Panel .....	3-3
3.2.3	Trackball Assembly .....	3-4

Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE A-4. Example table of contents.

MIL-DTL-24784C(NAVY)  
APPENDIX A

## LIST OF ILLUSTRATIONS

Figure	Title	Page
1-1	Equipment Cabinet.....	1-1
2-1	Power Control Panel .....	2-13
5-1	Basic Fault Isolation Flowchart.....	5-12
5-2	Radar Test Pattern .....	5-16
5-3	Over-Temperature Fault Isolation Flowchart.....	5-17
5-4	Battery Backup Fault Isolation Flowchart.....	5-19
6-1	Video Switching CCA.....	6-27

## LIST OF TABLES

Table	Title	Page
2-1	Power Control Panel Controls and Indicators .....	2-4
3-1	Pixel Data Format.....	3-14
3-2	Radar Signals .....	3-18
3-3	Analog Video Inputs .....	3-22
6-1	Base Address Switch Settings .....	6-25

Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE A-5. Example list of illustrations and list of tables.

MIL-DTL-24784C(NAVY)  
APPENDIX A

## FOREWORD

This technical manual provides description, operation, and maintenance data for the OJ-XXX Tactical Computer Console. The technical manual is organized as follows:

Chapter 1, Introduction  
Chapter 2, Operation  
Chapter 3, Functional Description  
Chapter 4, Scheduled Maintenance  
Chapter 5, Corrective Maintenance  
Chapter 6, Parts List  
Chapter 7, Internal Cable List

Distance support (anchor desk) is available via the web (<http://www.anchordesk.navy.mil/>) and via the toll free number (1-877-4-1-TOUCH [86824]).

Ships, training activities, supply points, depots, Naval Shipyards and Supervisors of Shipbuilding are requested to arrange for the maximum practical use and evaluation of NAVSEA technical manuals (TMs). All errors, omissions, discrepancies, and suggestions for improvement to NAVSEA TMs shall be submitted as a Technical Manual Deficiency/Evaluation Report (TMDER). All feedback comments shall be thoroughly investigated and originators will be advised of action resulting there from. Three copies of the NAVSEA/SPAWAR Technical Manual Deficiency/Evaluation Report form, NAVSEA 4160/1 are included at the end of each separately bound hardcopy TM. Copies of form NAVSEA 4160/1 may also be downloaded from:  
[https://nsdsa2.phdnswc.navy.mil/tmmp/forms/TMDER\\_BLANK\\_REV\\_7-2003.doc](https://nsdsa2.phdnswc.navy.mil/tmmp/forms/TMDER_BLANK_REV_7-2003.doc)

The following methods are available for generation and submission of TMDERs:

- The most expedient and preferred method of TMDER generation and submission is via the Technical Data Management Information System (TDMIS) website at: <https://mercury.tdmis.navy.mil>. TDMIS accounts can be requested at <https://nsdsa2.phdnswc.navy.mil/>.
- Generate and submit TMDER via the Naval Systems Data Support Activity (NSDSA) website at: <https://nsdsa2.phdnswc.navy.mil/tmder/tmder-generate.asp?lvl=1>.
- When internet access is not available, submit TMDER via hardcopy to:

COMMANDER  
CODE 310 TMDERs  
NAVSURFWARCENDIV NSDSA  
4363 MISSILE WAY, BLDG 1388  
PORT HUENEME, CA 93043-4307

- Urgent priority TM deficiencies shall be reported by Naval message with transmission to Port Hueneme Division, Naval Surface Warfare Center (Code 310), Port Hueneme, CA. Local message handling procedures shall be used. The message shall identify each TM deficiency by TM identification number and title. This method shall be used in those instances where a TM deficiency constitutes an urgent problem, (i.e., involves a condition, which if not corrected, could result in injury to personnel, damage to the equipment or, jeopardy to the safety or success of the mission).

Complete instructions for TMDER generation and submission are detailed on the NSDSA website at: <https://nsdsa2.phdnswc.navy.mil/tmder/tmder.asp?lvl=1>.

Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE A-6. Example foreword.

MIL-DTL-24784C(NAVY)  
APPENDIX A

INDEX	PUBLICATION NUMBER
Subject	Paragraph, Figure Table Number
A	
Air Compressor AS-102	
Description .....	1-24
Installation .....	5-33
Lubrication .....	F 5-30
Removal .....	5-32
Air Compressor Drive Belt	
Installation .....	5-27
Removal .....	5-26
Air Compressor Head	
Installation .....	5-36
Removal .....	5-35
Air Compressor Motor	
Installation .....	5-30
Removal .....	5-29
Air Compressor Power Tray Assembly	
Installation .....	5-39
Removal .....	5-38
Air Conditioner AC-2	
Description .....	1-22
Repair .....	5-388
Air Conditioner Fan Assembly S-3	
Installation .....	5-297
Removal .....	5-296
Air Conditioner Fan Assembly S-3 DC Brush	
Installation .....	5-297C
Removal .....	5-297B
Alarm Subsystem	
Description .....	1-67
B	
Brine Cooler BC-102	
Repair .....	5-391
Brine Pump P-102	
Installation .....	5-177
Removal .....	5-176
Repair .....	5-994
Brine Strainer STR-104	
Installation .....	5-312
Removal .....	5-311
Brine Subsystem	
Description .....	1-59
Servicing .....	5-366
Brush Lifting Solenoid K-16	
Installation .....	5-133
Removal .....	5-132
Change 6    Index 1	

Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE A-7. Example alphabetical index.

MIL-DTL-24784C(NAVY)  
APPENDIX A

Use	Type Style	Capitalization	Leading	Vertical Spacing
Publication Number	San Serif Bold 10	Upper Case	--	36-Points from Top of Page
Information Package Number	San Serif Bold 10	Upper Case	--	36-Points from Top of Page
Page Number	San Serif Bold 10	--	--	36-Points from Bottom of Page
Change Number	San Serif Bold 10	Upper and Lower Case	--	36-Points from Bottom of Page
Security Classification	San Serif Bold 14	Upper Case	--	36-Points from Top and Bottom of Page
Deleted Page Notation	Serif Bold 10	Upper and Lower Case	0	36-Points from Top and Bottom of Page
Part Number, Chapter Number and Title	San Serif Bold 14	Upper Case	0	48-Points Below Publication No.; 18-Points Above Text, Table, or Illustration
Section Number and Title	San Serif Bold 14	Upper Case	0	28-Points Below Publication No.; 24-Points Below Chapter Title; 18-Points Above Text, Table, or Illustration
List of Effective Pages, List of Effective Information Packages/Pages, Table of Contents, List of Illustrations, List of Tables, Foreword/Preface/Introduction, Safety Summary, Index, Glossary, and Appendix Headings	San Serif Bold 14	Upper Case	--	48-Points Below Publication No.; 18-Points Above Text
Information Package Title Block	San Serif Bold 14	Upper Case	--	48-Points Below Publication No.; 18-Points Above Text
Text	Serif 10	Upper and Lower Case	1	18-Points Below Publication No.; Chapter/Section Title, or IP Title Block; 12-Points Above/Below Table or Illustration; 6-Points Above Page No.; 12-Points Above/Below Danger, Warning, Caution, and Note Headings
Emphasis	Italic Bold 10	Upper and Lower Case	1	--
Formulas and Equations	Math 10	Upper and Lower Case	1	12-Points Above/Below Text, Table, or Illustration

FIGURE A-8. Style, capitalization, leading, and vertical spacing.

MIL-DTL-24784C(NAVY)  
APPENDIX A

Use	Type Style	Capitalization	Leading	Vertical Spacing
Primary Sideheads	San Serif 10	Upper Case	2	18-Points Below Publication No., Chapter/Section Title or IP Title Block; 12-Points Above/Below Text, Table or Illustration; 12-Points Above/Below Danger, Warning, Caution, and Note Headings
Subordinate Sideheads	San Serif 10	Upper and Lower Case	2	18-Points Below Publication No., Chapter/Section Title or IP Title Block; 12-Points Above/Below Text, Table or Illustration; 12-Points Above/Below Danger, Warning, Caution, and Note Headings
Figure Number and Title	Serif Bold 10	Upper Case for First Letter of Each Principle Word	2	18-Points Below Illustration and 6-Points Above Page Number
Legend Text	San Serif 8	Upper Case for First Letter of First Word	1	28-Points Above Illustration
Legend on Artwork	San Serif 8	Upper Case	1	As Required
Table No. and Title	Serif Bold 10	Upper Case for First Letter of Each Principle Word	2	18-Points Above Table
Boxhead Titles	Serif 10	Upper Case for First Letter of Each Principle Word	1	--
Table Text	Serif 10	Upper and Lower Case	2	--
Rules	¼ Point Width	--	--	--
Footnotes	Serif 8	Upper and Lower Case	1	18-Points Below Text or Table
Danger, Warning, and Caution (Headings)	San Serif Bold 10 (Boxed)	Upper Case	--	12-Points Above and Below Text
Note (Headings)	San Serif Bold 10	Upper Case	--	12-Points Above and Below Text

FIGURE A-8. Style, capitalization, leading, and vertical spacing - Continued.

MIL-DTL-24784C(NAVY)  
APPENDIX A

Use	Type Style	Capitalization	Leading	Vertical Spacing
Parts List, Numerical Index, and Reference Designation Index Column Heads	Serif 10	Upper Case	1	--
Parts List Text	San Serif 8 or 10	Upper and Lower Case	1	--
Numerical Index and Reference Designation Index Text	San Serif 8 or 10	Upper and Lower Case	1	--
<p style="text-align: center;">NOTE</p> <p>All type sizes may be plus-or-minus one point. Slight variations in spacing and leading are permitted. It is not the intent of this specification to specify the methods or composing equipment to be used, but only to specify required results.</p>				

FIGURE A-8. Style, capitalization, leading, and vertical spacing - Continued.

MIL-DTL-24784C(NAVY)  
APPENDIX A

1.3 PRIMARY SIDEHEAD.

This is a primary paragraph. Primary sideheads stand alone. Primary sideheads may be followed by one, AND ONLY ONE, unnumbered paragraph of text. A primary sidehead or paragraph may be followed by a first subordinate paragraph or a first level procedural step. In TMs, a paragraph is considered one block of text, not several blocks of text.

1.3.1 First Subordinate Sidehead. This is a first subordinate paragraph. Text is run-in with the title; carry over lines return to the left margin. A first subordinate paragraph may be followed by another first subordinate paragraph, a second subordinate paragraph or a first level procedural step.

1.3.1.1 Second Subordinate Sidehead. This is a second subordinate paragraph. Second subordinate paragraphs should, but are not required to, have a title. Text is run-in with the title; carry over lines return to the left margin. A second subordinate paragraph may be followed by another second subordinate paragraph, a third subordinate paragraph or a first level procedural step.

1.3.1.1.1 Third Subordinate Sidehead. This is a third subordinate paragraph. Third subordinate paragraphs should, but are not required to, have a title. Text is run-in with the title; carry over lines return to the left margin. A third subordinate paragraph may be followed by another third subordinate paragraph or a first level procedural step.

1.4 PRIMARY PARAGRAPH FOLLOWED BY PROCEDURAL STEPS.

- a. This is a first level procedural step. Steps do not have titles. The step letter (alpha character) is indented two spaces from the left margin. The text is indented an additional two spaces and is blocked. A first level procedural step may be followed by a series of first level procedural steps or a series of second level procedural steps.
  - (1) This is a second level procedural step. Steps do not have titles. The step number is indented four spaces from the left margin. The text is indented an additional two spaces and is blocked. A second level procedural step may be followed by a series of second level procedural steps or a series of third level procedural steps.
    - (a) This is a third level procedural step. Steps do not have titles. The step letter (alpha character) is indented six spaces from the left margin. The text is indented an additional two spaces and is blocked. A third level procedural step may be followed by a series of third level procedural steps or a series of fourth level procedural steps
      - 1 This is a fourth level procedural step. Steps do not have titles. The step number is indented eight spaces from the left margin. The text is indented an additional two spaces and is blocked. A fourth level procedural step may be followed by a series of fourth level procedural steps.

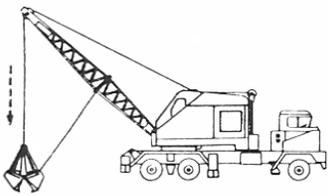
Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE A-9. Example paragraph headings, decimal paragraph numbering, and procedural step numbering.

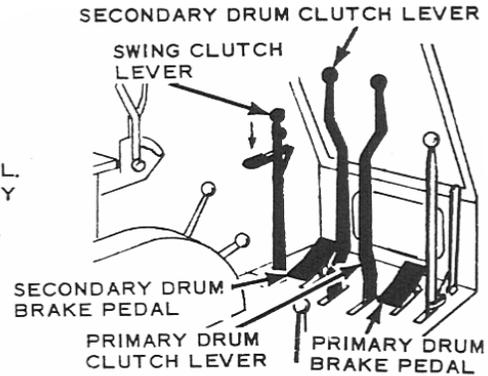
MIL-DTL-24784C(NAVY)  
APPENDIX A

### FILLING THE CLAMSHELL

PULL BACK ON THE DRUM CLUTCH LEVERS UNTIL THE CLAMSHELL BUCKET IS HIGH ENOUGH TO CLEAR THE MATERIAL BEING MOVED, THEN PUSH THE DRUM CLUTCH LEVERS TO NEUTRAL POSITION, APPLYING BOTH BRAKE PEDALS. SWING CLAMSHELL OVER MATERIAL.

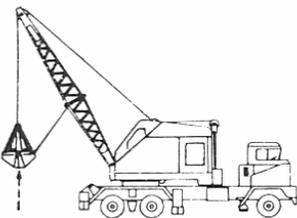


RELEASE THE SECONDARY DRUM BRAKE PEDAL TO OPEN CLAMSHELL BUCKET, THEN RELEASE PRIMARY DRUM BRAKE PEDAL TO LOWER CLAMSHELL BUCKET ONTO MATERIAL.

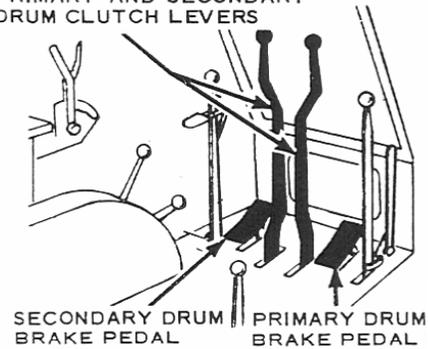


### CLOSING AND HOISTING

TO CLOSE THE CLAMSHELL BUCKET PULL BACK ON THE SECONDARY DRUM CLUTCH LEVER. HOLD THE LEVER UNTIL THE BUCKET IS FILLED WITH MATERIAL AND CLOSED. WHEN THE BUCKET IS CLOSED, RELEASE THE PRIMARY DRUM BRAKE PEDAL AND PULL THE PRIMARY DRUM CLUTCH LEVER BACK. HOLD BOTH LEVERS BACK UNTIL THE LOAD HAS REACHED THE DESIRED HEIGHT. RETURN BOTH DRUM CLUTCH LEVERS TO NEUTRAL AND AT THE SAME TIME APPLY BOTH DRUM BRAKE PEDALS.

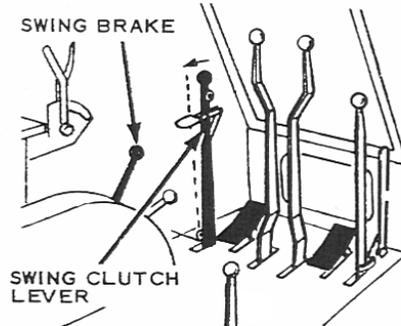
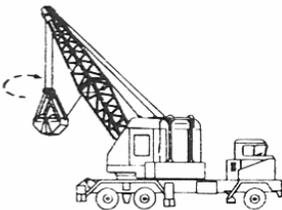


### PRIMARY AND SECONDARY DRUM CLUTCH LEVERS



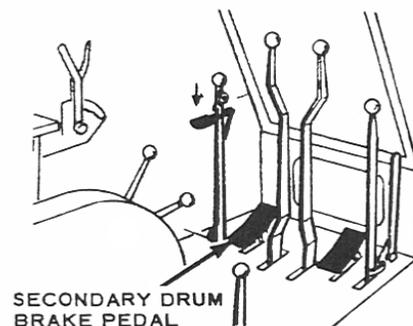
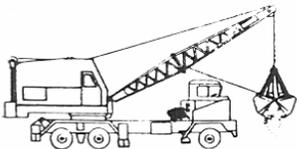
### SWINGING

PUSH THE SWING CLUTCH LEVER FORWARD TO SWING THE CRANE TO THE LEFT. PULL IT TO THE REAR TO GO TO THE RIGHT. SWING SLOWLY AND EVENLY TO AVOID BUCKET WHIPPING. WHEN HANDLING FINE MATERIALS KEEP LOAD ON SECONDARY LINE BUT COORDINATE PRIMARY DRUM TO AVOID EXCESSIVE SLACK IN PRIMARY LINE.



### DUMPING

TO DUMP THE BUCKET, RELEASE THE SECONDARY DRUM BRAKE PEDAL.



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE A-10. Example operational illustrations.

MIL-DTL-24784C(NAVY)  
APPENDIX A

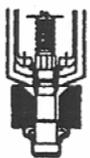
INSTALLATION CYCLE  
DOUBLE ACTION INSTALLION  
(5/32 and 3/16 diameter only)



**Step 1.** During initial part of driving operation, the sleeve is squeezed between head of pin and nose of rivet tool.



**Step 2.** Head of pin upsets sleeve to form a strong, bulbed head on blind side.



**Step 3.** When blind head has been formed, the tool automatically forces locking collar into conical space between recesses in head and locking groove in pin. This locks parts together permanently.



**Step 4.** Pin is broken off in tension at breakneck groove, substantially flush with head of sleeve. There is no projecting pin left to be cut off in a separate operation.

INSTALLATION CYCLE  
SINGLE ACTION INSTALLATION



**Step 1.** During initial part of driving operation, the sleeve is squeezed between head of pin and nose of rivet tool.



**Step 2.** Head of pin upsets sleeve to form a strong, bulbed head on blind side.



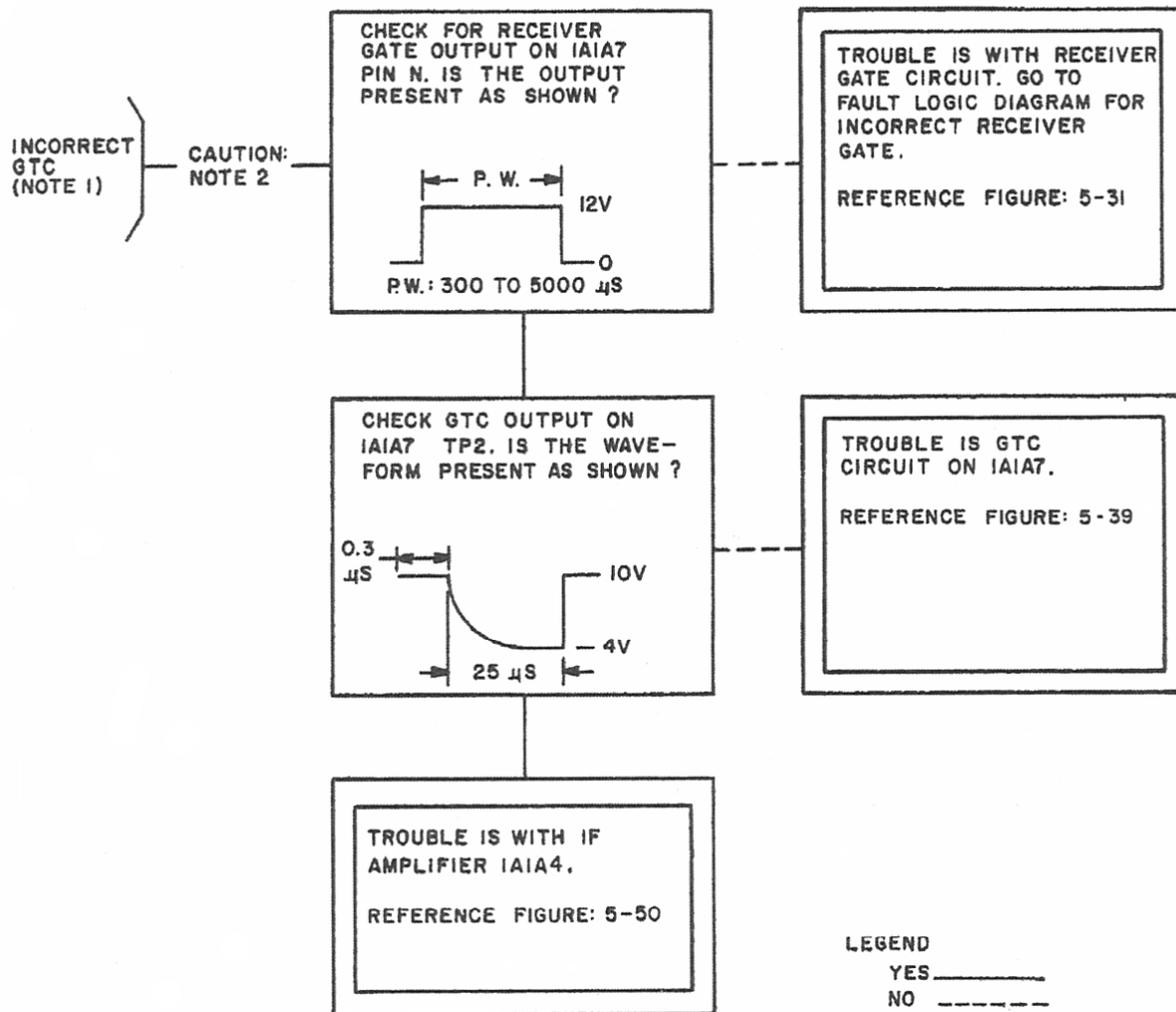
**Step 3.** When blind head has been formed, the tool automatically forces locking collar (at pintail end of sleeve) into conical space between recess in head and locking groove in pin. This locks parts together permanently.



**Step 4.** Pin is broken off in tension at breakneck grooves, substantially flush with head of sleeve. There is no projecting pin left to be cut off in a separate operation.

Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE A-11. Example procedural illustrations.

MIL-DTL-24784C(NAVY)  
APPENDIX A

## NOTES:

## 1. SYSTEM SETUP

AN/UPX-27 NORMAL OPERATING SINGLE CONDITIONS, CHALLENGE ANY MODE, EITHER LOCALLY OR REMOTELY. TERMINATE ALL MEASURED VIDEO OUTPUT CONNECTORS ON THE INTERROGATOR SET WITH 75 OHMS, EXCEPT SUPP OUT (WHICH IS TO BE TERMINATED WITH 100 OHMS).

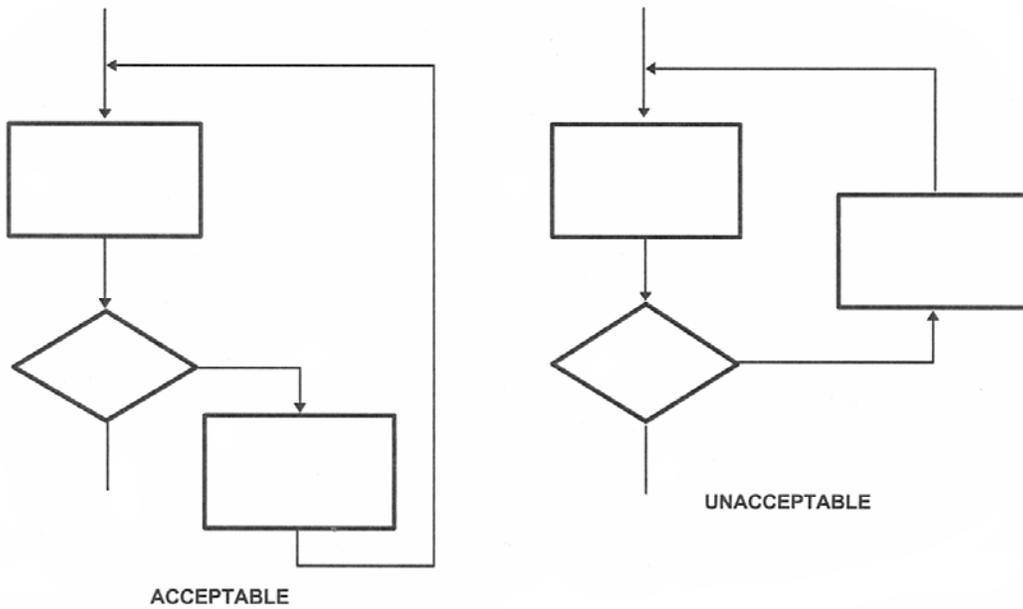
## 2. CAUTION:

DO NOT ENERGIZE EQUIPMENT UNLESS EITHER AN IFF ANTENNA OR SUITABLE DUMMY LOAD IS CONNECTED TO ANTENNA JACK ON FRONT PANEL.

Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

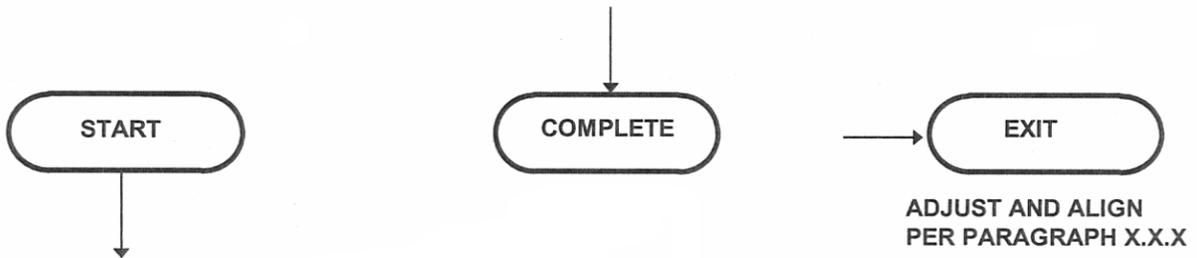
FIGURE A-12. Fault logic diagram (sample).

MIL-DTL-24784C(NAVY)  
APPENDIX A



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE A-13. General flow.



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

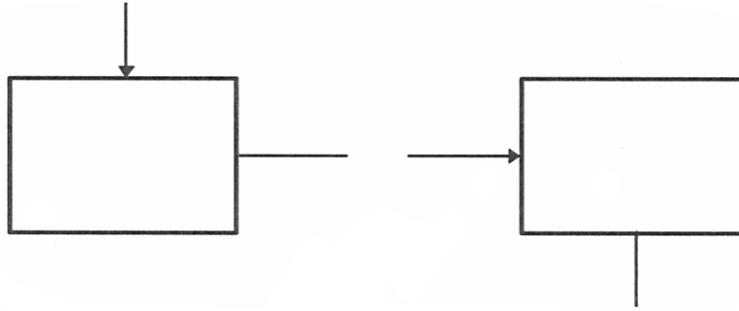
FIGURE A-14. Terminal blocks.



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

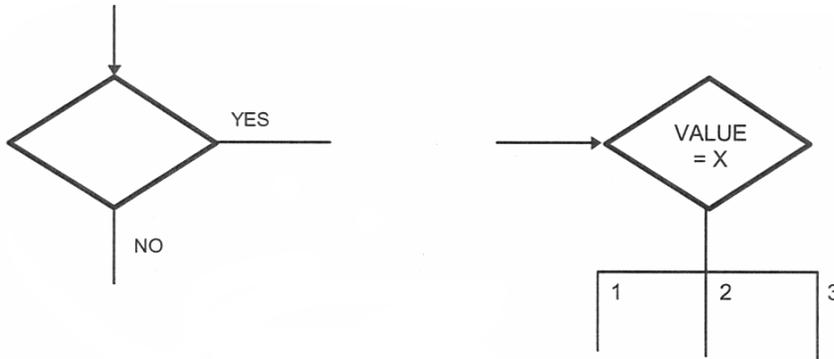
FIGURE A-15. Annotation/comment block.

MIL-DTL-24784C(NAVY)  
APPENDIX A



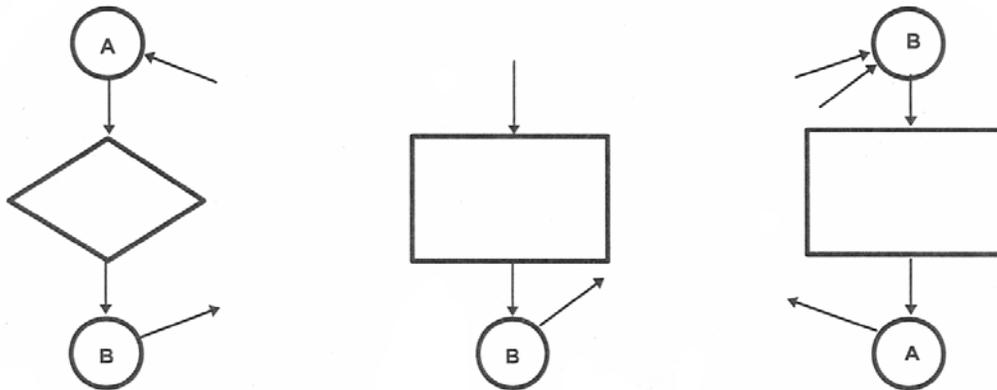
Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE A-16. Process blocks.



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

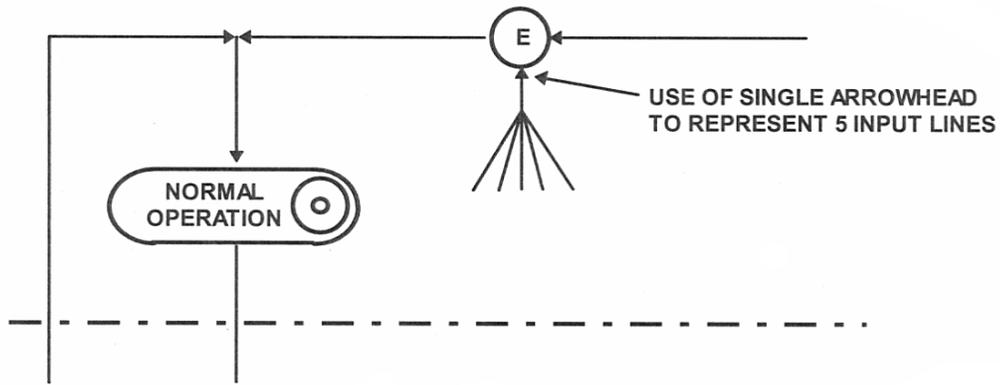
FIGURE A-17. Decision blocks.



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

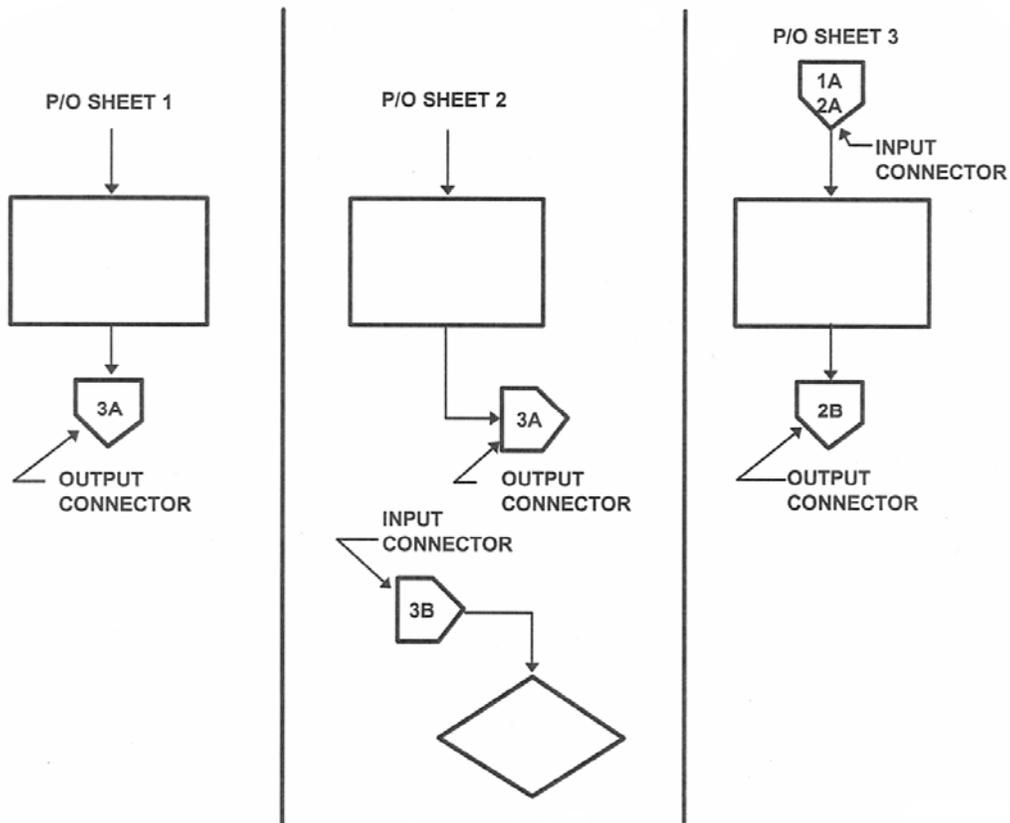
FIGURE A-18. On-page connectors.

MIL-DTL-24784C(NAVY)  
APPENDIX A



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

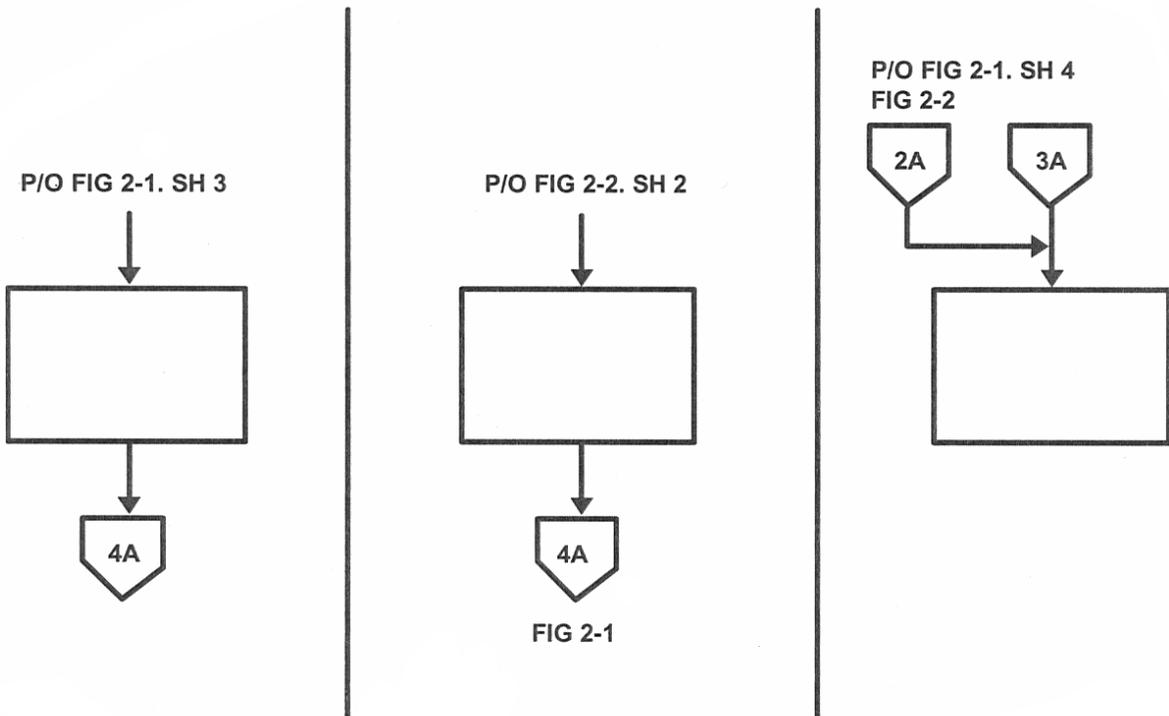
FIGURE A-19. Multiple on-page connector variant.



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

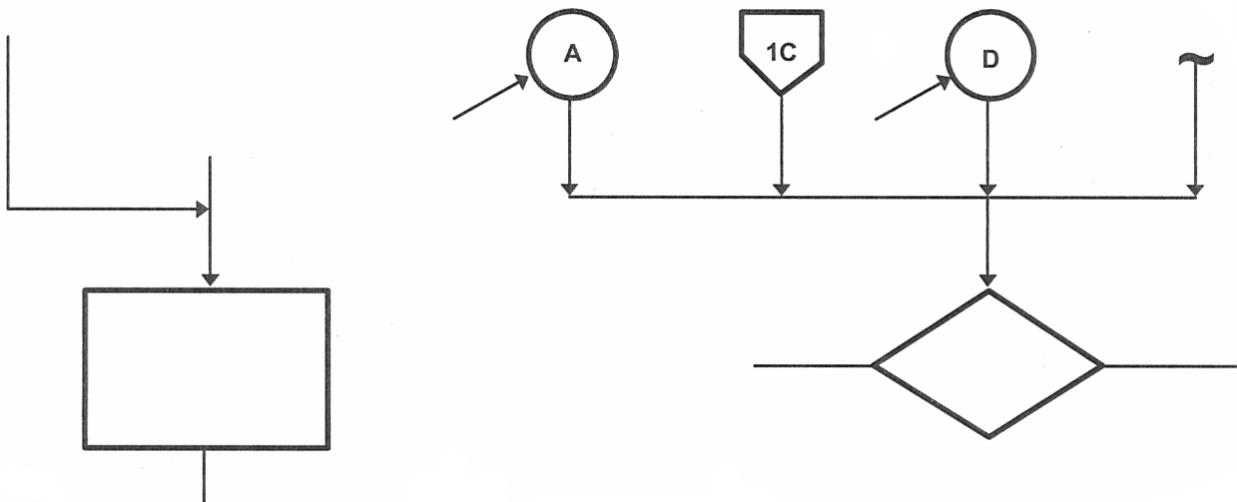
FIGURE A-20. Off-page connectors.

MIL-DTL-24784C(NAVY)  
APPENDIX A



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE A-21. Use of multiple input off-page connectors.



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE A-22. Line intersections.

MIL-DTL-24784C(NAVY)  
APPENDIX A

DEPARTMENT OF THE NAVY  
NAVAL SEA SYSTEMS COMMAND  
WASHINGTON, D.C. 22442-5165

COMBAT SYSTEM CONSOLE  
OJ-XXX(V)/UYQ-XX(V)  
Description, Operation, and Maintenance

SE686-XX-MMO-020  
Change A  
15 August 1998  
Page 1 of 15 pages  
(with enclosures)

1. This is Change A to the Combat System Console Technical Manual SE686-XX-MMO-020. The purpose of this change is to incorporate outstanding Field Change Orders (FCOs 006, 017, and 036) which reflect the qualified production baseline for the OJ-XXX(V) variant.
2. All holders of this technical manual shall incorporate this change upon receipt.

NOTE

The portion of the text affected by this change is indicated by change bars in the outer margin of each changed page. Entire procedures that have been changed are indicated by a change bar in the outer margin next to the specific procedure (paragraph) title.

3. Incorporate the attached enclosures as follows:

<u>Remove</u>	<u>Insert</u>
Title Page/A	Title Page/A
3-9 and 3-10	3-9 and 3-10
5-27 and 5-28	-----
9-17/(9-18 blank)	9-17/(9-18 blank)
-----	9-18a/(9-18b blank)
Glossary-1 and Glossary-2	Glossary-1 and Glossary-2

4. After the attached enclosures have been inserted, record this change on the change record sheet and insert this change guide behind the front cover.

**DISTRIBUTION STATEMENT D:** DISTRIBUTION AUTHORIZED TO DOD AND DOD CONTRACTORS; CRITICAL TECHNOLOGY: 15 AUGUST 1998. OTHER REQUESTS MUST BE REFERRED TO PROGRAM EXECUTIVE OFFICE, EXPEDITIONARY WARFARE (PMS XXX).

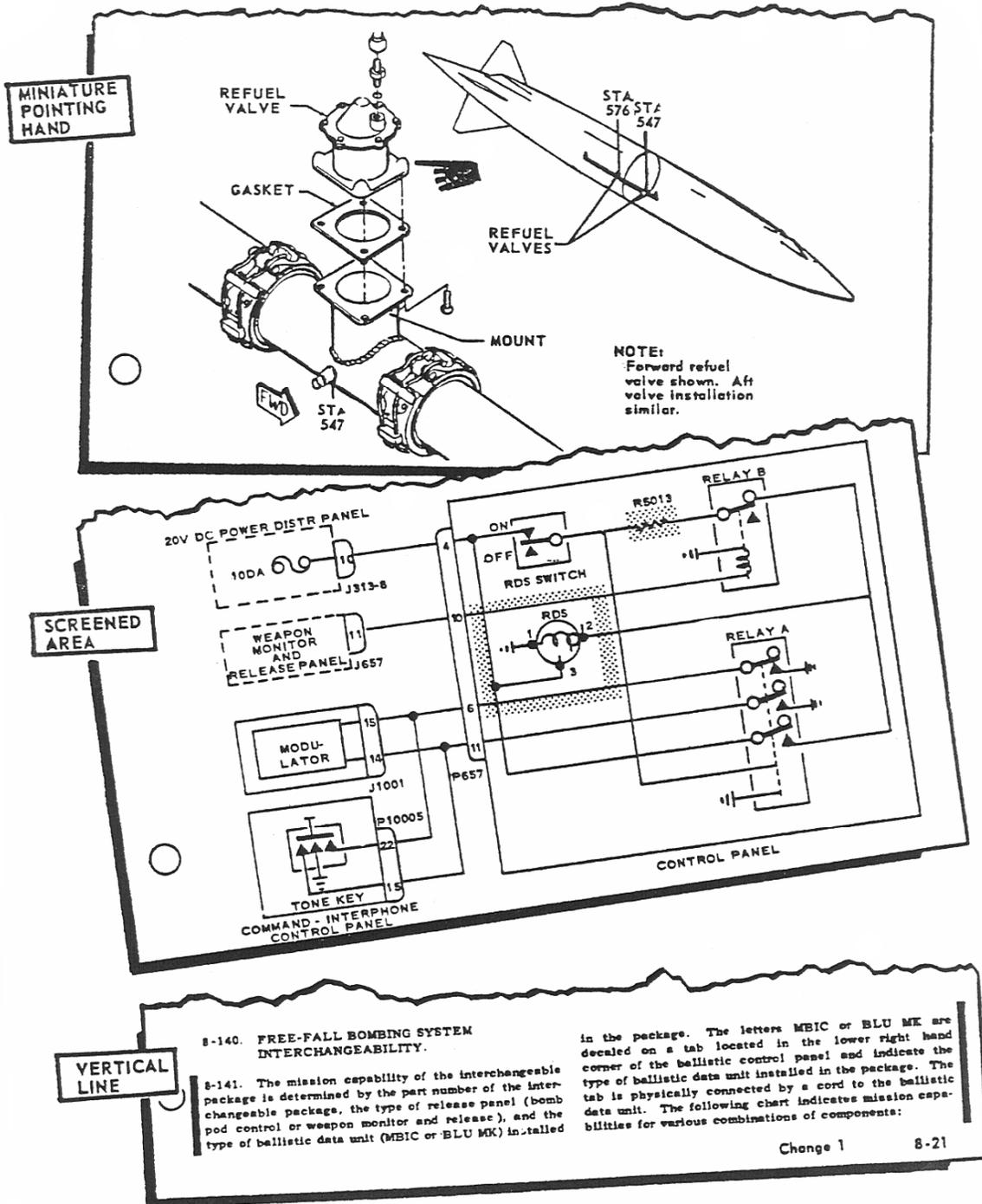
**WARNING:** THIS DOCUMENT CONTAINS TECHNICAL DATA WHOSE EXPORT IS RESTRICTED BY THE ARMS EXPORT CONTROL ACT (TITLE 22, U.S.C. SEC 2751 ET SEQ.) OR THE EXPORT ADMINISTRATION ACT OF 1979, AS AMENDED, TITLE 50, U.S.C., APP. 2401 ET SEQ. VIOLATIONS OF THESE LAWS ARE SUBJECT TO SEVERE CRIMINAL PENALTIES. DISSEMINATE IN ACCORDANCE WITH PROVISIONS OF OPNAVINST 5510.161, REFERENCE (JJ).

**DESTRUCTION NOTICE:** DESTROY BY ANY METHOD THAT WILL PREVENT DISCLOSURE OF CONTENTS OR RECONSTRUCTION OF THE DOCUMENT.

Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE A-23. Example change instruction sheet.

MIL-DTL-24784C(NAVY)  
APPENDIX A



Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE A-24. Example change symbols.

MIL-DTL-24784C(NAVY)  
APPENDIX A

## LIST OF EFFECTIVE INFORMATION PACKAGES/PAGES

Dispose of superseded pages in accordance with applicable regulations.

Dates of issue for original and subsequent revisions or changes:

Original..... 1 November 2007  
Revision 1..... 15 October 2009  
Change A..... 1 December 2010

TOTAL NUMBER OF PAGES IN THIS TECHNICAL MANUAL IS 62, CONSISTING OF THE FOLLOWING:

IP/Page No.	Change No.
Title .....	A
i i thru ix .....	A
x blank .....	0
001 00/1.....	A
2 blank.....	0
002 00/1 thru 6 .....	0
003 00/1 thru 25 .....	0
26 blank .....	0
004 00/1 thru 20 .....	0

FIGURE A-25. Example list of effective information packages/pages.

MIL-DTL-24784C(NAVY)  
APPENDIX A

TABLE OF CONTENTS

<u>Title</u>	<u>IP/Page Number</u>
Revision Summary .....	v
List of Illustrations .....	vii
List of Tables .....	viii
Introduction IP .....	001 00/1
Model Differences IP .....	002 00/1
Safety Precautions IP .....	003 00/1
Reference Publications IP .....	004 00/1
Equipment and Publications Required But Not Supplied IP .....	005 00/1
Operator's Console Physical Arrangement IP .....	006 00/1
Power Supply Components .....	006 00/3
Cooling System Components .....	006 00/5
HSI Components .....	006 00/8
Maintenance Console Physical Arrangement IP .....	007 00/1
System Description IP .....	008 00/1
System/Equipment Characteristics/Capabilities IP .....	009 00/1
Introduction IP .....	010 00/1
Simplified Functional Description IP .....	011 00/1
Power Supply .....	011 00/2
Cooling System .....	011 00/4
HSI System .....	011 00/5
Detailed Functional Description IP .....	012 00/1

Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE A-26. Example table of contents.

MIL-DTL-24784C(NAVY)  
APPENDIX A

## LIST OF ILLUSTRATIONS

<u>Figure</u>	<u>Title</u>	<u>IP/Page Number</u>
1	UYQ-XX Console .....	001 00/2
1	Equipment Cabinet .....	006 00/7
2	Power Control Panel .....	006 00/13
1	Basic Fault Isolation Flowchart .....	019 00/3
2	Radar Test Pattern .....	019 00/16
3	Over-Temperature Fault Isolation Flowchart .....	019 00/17
4	Battery Backup Fault Isolation Flowchart .....	019 00/19

## LIST OF TABLES

<u>Table</u>	<u>Title</u>	<u>IP/Page Number</u>
1	Power Control Panel Controls and Indicators.....	006 00/9
1	Pixel Data Format.....	009 00/9
2	Radar Signals.....	009 00/18
3	Analog Video Inputs.....	009 00/22
4	Base Address Switch Settings .....	009 00/25
1	Console Switch Settings .....	017 00/5
2	Console Door Safety Latch.....	017 00/12

Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE A-27. Example list of illustrations and list of tables.

MIL-DTL-24784C(NAVY)  
APPENDIX A

<p><b>INTERMEDIATE MAINTENANCE</b></p> <p><b>REPAIR</b></p> <p><b>VOICE PROCESSOR ASSEMBLY</b></p> <p><b>EFFECTIVITY: SERIAL NO. 131 AND 132</b></p>

Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE A-28. Example of an information package title block.

MIL-DTL-24784C(NAVY)  
APPENDIX A

SE105-AS-MME-210

022 00

**INTERMEDIATE MAINTENANCE  
SYSTEM MAINTENANCE WITH IPB  
ALPHABETICAL INDEX  
RADAR SYSTEM**

<u>Title</u>	<u>IP/Page Number</u>
Antenna AS-3254/APG-65 (60E-A501).....	008 00
Illustrated Parts Breakdown.....	008 00/5
Illustrated Parts Breakdown, Antenna AS-3254/APG-65 (60E-A501).....	008 00/6
Illustrated Parts Breakdown, Antenna Holding Fixture.....	008 00/10
Installation.....	008 00/3
Removal.....	008 00/2
Repair.....	008 00/4
Gimbal Bumper.....	008 00/4
Installation.....	008 00/4
Removal.....	008 00/4
Upper/Lower Shell Assembly-163985 AND UP.....	008 00/4
Installation.....	008 00/4
Removal.....	008 00/4
Antenna, Flood, (60E-A512).....	011 00
Installation.....	011 00/2
Illustrated Parts Breakdown.....	011 00/2
Removal.....	011 00/1
Array, Planar.....	021 00
Cable Assembly (60W-A539).....	021 00/2
Installation.....	021 00/2
Removal.....	021 00/2
Flexible Waveguides.....	021 00/2
Installation.....	021 00/3
Removal.....	021 00/2
Illustrated Parts Breakdown.....	021 00/4
Repair.....	021 00/2
Screw Replacement.....	021 00/3
Torque Requirements.....	021 00/4
Cable Assembly (60W-A523).....	018 00
Illustrated Parts Breakdown.....	018 00/3
Installation.....	018 00/2
Removal.....	018 00/2
Cable Assembly (60W-A538).....	018 00
Illustrated Parts Breakdown.....	018 00/3
Installation.....	018 00/2
Removal.....	018 00/2

Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE A-29. Example of an alphabetical index information package.

MIL-DTL-24784C(NAVY)  
APPENDIX B

FUNCTIONALITY AND PRESENTATION REQUIREMENTS FOR  
LINEAR AND NON-LINEAR INTERACTIVE ELECTRONIC TECHNICAL MANUALS

## B.1 SCOPE

B.1.1 Scope. This appendix establishes the functionality, style and format requirements for the presentation and display of linear and non-linear NAVSEA Interactive Electronic Technical Manuals (IETMs) (see 6.4.10). Linear IETMs are displayed in a linear or document oriented manner. The sequence of the data presentation is largely predefined by the data author. It is an organization of technical data that replicates the order of information found in a page-based document. There is generally one primary “path” through the technical data. Non-linear IETMs are displayed in a non-linear (frame-based) manner. Non-linear IETMs allow for high levels of interactivity between the data and the user. The sequence of presentation is dictated by inputs from the user, external sources, or events (as in diagnostics). It is an organization of content that does not follow a document or page-based paradigm. There are multiple paths through the data. Individual paths through the data are generally determined based on user or other input via dialog boxes. This appendix is a mandatory part of this specification. The information contained herein is intended for compliance.

## B.2 APPLICABLE DOCUMENTS

B.2.1 General. The documents listed in this section are specified in sections B.3 and B.4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections B.3 and B.4 of this specification, whether or not they are listed.

B.2.1.1 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

### INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO/IEC 8632	-	Information Technology -- Computer Graphics -- Metafile for the Storage and Transfer of Picture Description Information
--------------	---	---

(Copies of this document are available from ISO, 1, rue de Varembe, CH-1211 Geneva 20, Switzerland or online at [www.iso.org](http://www.iso.org).)

B.2.2 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for related specification sheets), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

## B.3 IETM FUNCTIONALITY

B.3.1 Functionality matrix. The functionality matrix (table B-I) contains a list of required (mandatory) and optional IETM features. IETM features identified as optional and optional-recommended shall be selected as specified by the acquiring activity (see 6.2). The matrix shall be used by the acquiring activity to identify and define requirements for IETM performance in language that is accepted and understood by industry. Once the appropriate IETM functionality for the specific project have been selected, the acquisition manager should be able to evaluate the cost associated with expected IETM performance and trade off higher cost functionality requirements with those of a lower cost as necessary. The IETM preparing activity provides pricing information to the acquiring activity based on the requested IETM functionality. The functionality matrix includes the following columns: Complexity factor, functional category, the name of the functionality with a paragraph reference to definitions, and a requirement selection column. The following paragraphs provide an explanation of each column.

MIL-DTL-24784C(NAVY)  
APPENDIX B

TABLE B-I. Functionality matrix.

Complexity factor		Category	Functionality/paragraph	Requirement selection	
Linear	Non-linear			Linear	Non-linear
1	1	Access	Suspend and Resume (B.3.2.66) <b>Prerequisite Functionality:</b> Audit Trail (B.3.2.7)	opt	opt
3	3	Access	Login (B.3.2.38)	opt	opt-r
2	2	Annotation	Global Data Annotation (B.3.2.28)	opt-r	opt-r
1	1	Annotation	Personal Annotation (B.3.2.48) <b>Prerequisite Functionality:</b> Login (B.3.2.38)	opt	opt
1	1	Annotation	Public Annotation (B.3.2.54)	opt-r	opt-r
3	3	Annotation	Redlining Graphics (B.3.2.55) <b>Prerequisite Functionality:</b> Login (B.3.2.38)	opt	opt
2	2	Annotation	Redlining Text (B.3.2.56)	opt	opt
1	1	Delivery and Distribution	CD-ROM (B.3.2.10)	opt-r	opt-r
1	1	Delivery and Distribution	DVD-ROM (B.3.2.17)	opt	opt
2	2	Delivery and Distribution	Network Distribution (B.3.2.43) <b>Prerequisite Functionality:</b> Network Connectivity (B.3.2.42)	opt	opt
1	1	Diagnostics and Prognostics	Diagnostics - User Determined Entry to IETM (B.3.2.13)	opt	opt
2	2	Diagnostics and Prognostics	Diagnostics - Software Driven Entry to IETM (B.3.2.12) <b>Prerequisite Functionality:</b> Dialog-Driven Interaction (B.3.2.14)	opt	opt
N/A	5	Diagnostics and Prognostics	Dynamic Diagnostics (B.3.2.18)	N/A	opt
N/A	5	Diagnostics and Prognostics	Prognostics (B.3.2.53)	N/A	opt
4	4	Diagnostics and Prognostics	System Simulation (B.3.2.67)	opt	opt
4	4	Diagnostics and Prognostics	Wire/Fluid System Tracing (B.3.2.77)	opt	opt
3	3	External Processes	TMDER (B.3.2.71)	req	req
N/A	5	External Processes	Knowledge Management (B.3.2.36) <b>Prerequisite Functionality:</b> Login (B.3.2.38), Maintenance Data Collection (B.3.2.39), Parts Ordering (B.3.2.47), Audit Trail (B.3.2.7), Network Connectivity (B.3.2.42)	N/A	opt
3	3	External Processes	Maintenance Data Collection (B.3.2.39) <b>Prerequisite Functionality:</b> Login (B.3.2.38), Audit Trail (B.3.2.7)	opt	opt

MIL-DTL-24784C(NAVY)  
APPENDIX BTABLE B-I. Functionality matrix - Continued.

Complexity factor		Category	Functionality/paragraph	Requirement selection	
Linear	Non-linear			Linear	Non-linear
3	3	External Processes	Operator Debriefing (B.3.2.45) <b>Prerequisite Functionality:</b> Dialog-Driven Interaction (B.3.2.14)	opt	opt
3	3	External Processes	Parts Ordering (B.3.2.47) <b>Prerequisite Functionality:</b> Network Connectivity (B.3.2.42)	opt	opt
N/A	3	External Processes	Resource Scheduling (B.3.2.57) Prerequisite Functionality: Login (B.3.2.38), Maintenance Data Collection (B.3.2.39), Network Connectivity (B.3.2.42), Audit Trail (B.3.2.7)	N/A	opt
2	2	External Processes	Supporting Technical Data (B.3.2.65)	opt	opt-r
4	4	Graphics	3D Modeling (B.3.2.1) Prerequisite Functionality: Assembly/Disassembly (B.3.2.5)	opt	opt
2	2	Graphics	Assembly/Disassembly (B.3.2.5)	opt	opt
1	1	Graphics	Locator Graphics (B.3.2.37)	opt-r	opt-r
1	1	Graphics	Pan, Zoom, Rotate, Center (B.3.2.46)	opt-r	req
2	2	Graphics	Graphics Selection (B.3.2.30)	opt	opt
2	2	Linking	Hot Reference (B.3.2.32)	opt	opt
3	3	Linking	Hot Spotting (B.3.2.33)	req	req
1	1	Linking	Internal References (B.3.2.35) Prerequisite Functionality: Hot Spotting (B.3.2.33)	req	req
2	2	Linking	Link to Separate Parts Data (B.3.2.35.1) Prerequisite Functionality: Hot Spotting (B.3.2.33), Internal References (B.3.2.35)	req	req
1	1	Linking	Table of Contents, Lists of Illustrations, Tables and Multimedia (B.3.2.35.2) Prerequisite Functionality: Hot Spotting (B.3.2.33), Internal References (B.3.2.35)	req	req
2	2	Navigation and Tracking	Audit Trail (B.3.2.7)	opt	opt-r
N/A	4	Navigation and Tracking	Browse (B.3.2.9)	N/A	opt
3	3	Navigation and Tracking	Dialog-Driven Interaction (B.3.2.14)	opt-r	opt-r
1	1	Navigation and Tracking	Exit (B.3.2.19)	req	req
2	1	Navigation and Tracking	Filter by Configuration (B.3.2.20)	opt	opt

MIL-DTL-24784C(NAVY)  
APPENDIX B

TABLE B-I. Functionality matrix - Continued.

Complexity factor		Category	Functionality/paragraph	Requirement selection	
Linear	Non-linear			Linear	Non-linear
2	1	Navigation and Tracking	Filter by Model Series (B.3.2.21)	opt	opt
2	1	Navigation and Tracking	Filter by Modification (B.3.2.22)	opt	opt
3	3	Navigation and Tracking	Filter by Skill/Maintenance Level (B.3.2.23) Prerequisite Functionality: Login (B.3.2.38)	opt	opt
2	1	Navigation and Tracking	Filter by Unique Identification Code (B.3.2.24)	opt	opt
2	2	Navigation and Tracking	Graphical Navigation (B.3.2.29)	opt	opt
1	1	Navigation and Tracking	History of Traversed Links (B.3.2.31)	req	req
1	1	Navigation and Tracking	Forward and Back (B.3.2.25)	req	req
1	1	Navigation and Tracking	Next and Previous (B.3.2.44)	req	req
2	2	Navigation and Tracking	Search – Context (B.3.2.59) Prerequisite Functionality: Dialog-Driven Interaction (B.3.2.14)	opt	opt
1	1	Navigation and Tracking	Search - Full Text (B.3.2.60) Prerequisite Functionality: Dialog-Driven Interaction (B.3.2.14)	opt-r	opt-r
1	1	Navigation and Tracking	Search - User Defined Boolean (B.3.2.62) Prerequisite Functionality: Dialog-Driven Interaction (B.3.2.14)	opt	opt
4	3	Navigation and Tracking	Search - Across Multiple Databases/Files (B.3.2.58) NOTE: For full text searches across multiple databases, the Prerequisite Functionality Dialog-Driven Interaction (B.3.2.14) is required. For key word searches, the Prerequisite Functionalities are Internal References (B.3.2.35) and Hot Spotting (B.3.2.33).	opt	opt
2	2	Navigation and Tracking	Search - Key Word (B.3.2.61) Prerequisite Functionality: Internal References (B.3.2.35), Hot Spotting (B.3.2.33)	opt	opt
2	2	Navigation and Tracking	Simultaneous Display of Multiple Content Elements (B.3.2.63) Prerequisite Functionality: Internal References (B.3.2.35), Hot Spotting (B.3.2.33)	opt	opt
1	1	Navigation and Tracking	System/Subsystem Navigation (B.3.2.68) Prerequisite Functionality: Internal References (B.3.2.35), Hot Spotting (B.3.2.33)	opt-r	opt-r

MIL-DTL-24784C(NAVY)  
APPENDIX BTABLE B-I. Functionality matrix - Continued.

Complexity factor		Category	Functionality/paragraph	Requirement selection	
Linear	Non-linear			Linear	Non-linear
2	2	Navigation and Tracking	Tear off Window Capability (B.3.2.69)	opt	opt
1	1	Navigation and Tracking	User Creation of Bookmarks (B.3.2.72) Prerequisite Functionality: Login (B.3.2.38), Internal References (B.3.2.35), Hot Spotting (B.3.2.33)	opt	opt-r
3	3	Navigation and Tracking	Voice-Activated Commands (B.3.2.75)	opt	opt
1	2	Printing	Information Package Specific Printing (B.3.2.34)	opt	opt
2	5	Printing	Fully Formatted/Book Version (B.3.2.27)	opt	opt
2	2	Printing	Print Linked Data (B.3.2.51) Prerequisite Functionality: Internal References (B.3.2.35), Hot Spotting (B.3.2.33)	opt	opt
1	1	Printing	Print Currently Displayed Window (B.3.2.50)	req	req
1	1	Printing	Print Screen (B.3.2.52)	req	req
1	1	Special Content	Alerts (B.3.2.3) Prerequisite Functionality: Dialog-Driven Interaction (B.3.2.14)	req	req
4	4	Special Content	Animation (B.3.2.4)	opt	opt
2	2	Special Content	Audio (B.3.2.6)	opt	opt
1	1	Special Content	Context Sensitive Help (Technical Data Help) (B.3.2.11) Prerequisite Functionality: Internal References (B.3.2.35), Hot Spotting (B.3.2.33)	opt	opt
2	2	Special Content	Viewer Help (B.3.2.74)	req	req
3	3	Special Content	Motion Video (B.3.2.40)	opt	opt
1	1	Special Content	Photos (B.3.2.49)	opt	opt
3	3	Special Content	User Training (B.3.2.73) Prerequisite Functionality: Hot Spotting (B.3.2.33)	opt	opt
1	1	Special Content	Text Selection (B.3.2.70)	opt	opt
2	2	Updates	Change Markings (B.3.2.2) Prerequisite Functionality: Hot Spotting (B.3.2.33)	opt	opt
2	2	Updates	Block Cycle Update with Urgent Changes (B.3.2.8)	opt	opt
1	1	Updates	Full Revision (B.3.2.26)	req	req
2	2	Updates	Near Real Time Updates (B.3.2.41) Prerequisite Functionality: Network Distribution (B.3.2.43), Network Connectivity (B.3.2.42)	opt	opt

MIL-DTL-24784C(NAVY)  
APPENDIX B

TABLE B-I. Functionality matrix - Continued.

Complexity factor		Category	Functionality/paragraph	Requirement selection	
Linear	Non-linear			Linear	Non-linear
2	2	User Operation Mode	Network Connectivity (B.3.2.42)	req	req
2	2	User Operation Mode	Network Connectivity - Context Filtering (B.3.2.42.1)	opt	opt
2	2	User Operation Mode	Network Connectivity - Update Capability (Full Revision) (B.3.2.42.2)	opt	opt
4	4	User Operation Mode	Network Connectivity - Update Capability (Partial) (B.3.2.42.3)	opt	opt
1	1	User Operation Mode	Stand Alone Mode (B.3.2.64)	opt	opt
3	3	User Operation Mode	Stand Alone Mode - Context Filtering (B.3.2.64.1)	opt	opt
1	1	User Operation Mode	Stand Alone Mode - Update Capability (Full Revision) (B.3.2.64.2)	opt	opt
4	4	User Operation Mode	Stand Alone Mode - Update Capability (Partial) (B.3.2.64.3)	opt	opt
3	3	User Operation Mode	Stand Alone Mode – Update Through a Network (B.3.2.64.4)	opt	opt
2	3	User Operation Mode	Web Browser Viewable (B.3.2.76)	opt-r	opt-r
1	3	User Operation Mode	Display of Procedural Steps Options (B.3.2.16): <ul style="list-style-type: none"> <li>• Fill display area with steps-scrollable</li> <li>• View one primary step at a time only</li> <li>• View up to three primary steps at a time</li> <li>• View up to three primary steps at a time with a Next button</li> </ul>	opt N/A N/A N/A	opt opt opt opt
N/A	2	User Operation Mode	Display of Procedural Steps in Browse Mode (B.3.2.15) Prerequisite Functionality: Browse (B.3.2.9)	N/A	opt

MIL-DTL-24784C(NAVY)  
APPENDIX B

B.3.1.1 Complexity factor column. The complexity factor is a relatively weighted number assigned to the functionality. The number is used to indicate the complexity of an IETM functionality (for both linear and non-linear IETMs) when compared against other functionalities within that category. The numbers range from 1 to 5, with 1 being the baseline and 5 being the most complex. The functionalities with a complexity factor greater than 1 have been determined to be more difficult to develop than the baseline. For example, the Full Text Search functionality of the Navigation and Tracking functionality category is listed as a 1, while the Key Word Search functionality is listed as a 2. This would mean the Key Word Search functionality is considered to be twice as difficult to develop as the Full Text Search. However, the Global Data Annotation functionality also listed as a 2, is not comparable for complexity measurement against either the Key Word Search or the Full Text Search functionalities because it is in the Annotation functionality category and both of the others are in the Navigation and Tracking functionality category. For some functionalities, linear and non-linear IETMs have differing complexity factors. This is because implementation of the functionality may be more complex in one type of IETM than in the other. In addition, some functionalities that can be implemented in a non-linear IETM cannot be implemented in a linear IETM. In these cases, the complexity factor for the non-linear IETM will have a numeric value, and the complexity factor for the linear IETM will have a value of Not Applicable (N/A).

B.3.1.2 Category column. This column identifies the functionality category group. The category groups are defined as follows:

- a. Access category. Identifies the functionalities that allow or restrict users to view specific IETM data.
- b. Annotation category. Identifies functionalities that add an electronic note or comment, or provide additional explanation of the technical data.
- c. Delivery and distribution category. Identifies the physical media and distribution methods for the IETM.
- d. Diagnostics and prognostics category. Identifies functionalities that utilize or access diagnostic or prognostic information from the system/equipment or IETM user to enhance troubleshooting and fault isolation when presenting specific IETM data.
- e. External processes category. Identifies functionalities where the IETM interacts with external processes to retrieve and transmit information.
- f. Graphics category. Identifies the various levels of graphics display, interactivity, and navigation that can be implemented in IETMs. Examples of these functionalities include:
  - (1) Point and click on a locator graphic for the purpose of drilling down to graphic details.
  - (2) Links to textual or tabular information.
  - (3) Highlighting specific connections in a circuit.
  - (4) System simulation expressed graphically.
  - (5) Full 3D models that can be rotated with parts removed.
  - (6) Links to parts ordering data.
- g. Linking category. Identifies internal and external linking functionalities.
- h. Navigation and tracking category. Identifies functionalities for navigation, interaction, filtering, and tracking.
- i. Printing category. Identifies the various printing functionalities available.
- j. Special content category. Identifies various multi-media options such as audio, motion video, and animation.
- k. Updates category. Identifies methods of technical data delivery after the initial delivery.
- l. User operation mode category. Identifies the various modes in which the IETM can be used in.

B.3.1.3 Functionality/paragraph column. The functionality/paragraph column provides a list of the specific types of IETM functionalities and a reference to the paragraph that further defines each functionality. The term "Prerequisite Functionality" following a functionality means that additional functionality or functionalities cited in the referenced paragraph are required to utilize this functionality.

MIL-DTL-24784C(NAVY)  
APPENDIX B

B.3.1.4 Requirement selection column. The requirement selection column indicates whether the functionality listed in the functionality column is required or optional for a linear and non-linear IETMs. The designation “req” indicates the functionality is required. The designation “opt” indicates the functionality is optional. The designation “opt-r” indicates the functionality is optional but recommended. The designation “N/A” indicates the functionality is not applicable.

B.3.2 Functionality matrix definitions. The following definitions provide the descriptions and range of capabilities for of each of the functionalities identified in the matrix (table B-I) as well as some considerations to be used in making functionality selections where applicable.

B.3.2.1 3D modeling. The modeling of the system with three dimensional, solid object graphical figures that are used to allow virtual assembly, disassembly, removal, and installation of parts of the system using animation, simulation and/or virtual reality concepts. Levels of capability may include fly through (navigation through a three-dimensional model) type viewing.

B.3.2.2 Change markings. Each change in a revision is discretely marked or identified in the IETM. The IETM includes a linked revision summary list. Refer to B.4.3.2.5.12.1 for display of change markings.

B.3.2.3 Alerts. These elements shall be readily identified. Alerts include, but are not limited to, dangers, warnings, and cautions. Alerts such as dangers, warnings, and cautions may require specific operator acknowledgment prior to proceeding with the data being presented. See B.4.3.2.5.9 for alert requirements.

B.3.2.4 Animation. Provides graphical components movement to represent actual function. Animation may be included to show a variety of system functions from theory of operation (e.g., hydraulic flow) to maintenance procedures (e.g., how to access a specific part). Presentation standards must be addressed as well as content, duration, and context of the animation. Animation must not be the primary instruction to perform the task, but if included, would be a supplement to the narrative instruction. Format and file sizes must be taken into account when animation is included.

B.3.2.5 Assembly/disassembly. Graphical figure that allows virtual assembly, disassembly, removal, and installation of parts of the system as shown in figure B-1. These may be implemented through linked drawings or through manipulation of modeled vector graphics.

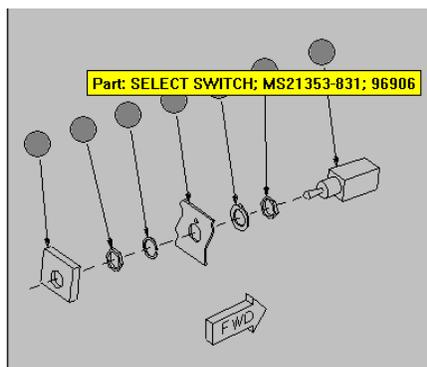


FIGURE B-1. Example of assembly/disassembly graphic.

B.3.2.6 Audio. Provides sound to assist with diagnostics or to notify the user of an action. Examples of audio include operator alerts, presentation clips, or complete audio representation of the data. Audio must not be the primary instruction to perform the task, but if included, would be a supplement to the narrative instruction. Operating environment, format and file sizes must be taken into account when audio is included.

B.3.2.7 Audit trail. Captures all user and IETM interaction. Examples are shown in figure B-2 and figure B-3. Figure B-2 is a procedure checklist, and figure B-3 shows the audit trail of that procedure being performed.

MIL-DTL-24784C(NAVY)  
APPENDIX B

PROCEDURE	
1.	<input type="checkbox"/> Turn off power.
2.	<input type="checkbox"/> Remove protective plate.
3.	<input type="checkbox"/> Remove fuse.
4.	Check fuse.
	a. <input type="checkbox"/> if Bad go to Step 5.
	b. <input type="checkbox"/> if Good go to Step 8.
5.	<input type="checkbox"/> Tag out equipment as Down.
6.	<input type="checkbox"/> Get new fuse.
7.	<input type="checkbox"/> Insert new fuse.
8.	<input type="checkbox"/> Tag in equipment as Functional.

FIGURE B-2. Example of assembly/disassembly graphic.

Job resumed 2004-02-05 10:19Z
<b>Begin Rect: DIAGNOSTICS</b>
<b>Begin Task: DIAGNOSTICS</b>
<b>Step 1: Turn off power</b>
<b>Step 2: Remove protective plate</b>
<b>Step 3: Remove fuse</b>
<b>Step 4: Check fuse</b>
<b>Choice Dialog: IS FUSE GOOD OR BAD?</b>
<b>Selected: BAD</b>
<b>Not Selected: GOOD</b>
<b>Step 5: Tag out equipment as Down</b>
<b>Step 6: Get new fuse</b>
<b>Step 7: Insert new fuse</b>
<b>Step 8: Tag in equipment as Functional</b>
<b>End Task: DIAGNOSTICS</b>

FIGURE B-3. Example of an audit log.

B.3.2.8 Block cycle update with urgent changes. Block cycle updates are the changes from all sources consolidated and issued at regularly scheduled intervals. Urgent changes are the interim updates between scheduled block cycle updates.

MIL-DTL-24784C(NAVY)  
APPENDIX B

B.3.2.9 Browse. Provides the user with the capability to preview an IETM session prior to performing the work or task. Within browse mode there are three functions: browse previous, browse next, and browse exit. During browse mode, the recording of actions is suspended. When browse mode is exited, the user returns to the location where browse mode was started, and the recording of actions resumes.

B.3.2.10 CD-ROM. Distribution and/or delivery is to be accomplished by Compact Disk – Read Only Memory (CD-ROM). Such physical distribution methods typically entail issuing the complete IETM thus replacing the data in use. This functionality requires a CD-ROM compatible drive. When IETMs are distributed on a CD-ROM, information on installing the CD-ROM on the computer and launching the IETM shall be provided. Minimum hardware and software requirements shall be included. The method of operation shall be to perform a software installation to the display device and access the programmed data from the CD-ROM or other distribution media. However, an option to install to the hard drive shall be available. In cases where compressed data is on the CD or medium and needs to be expanded onto the hard drive, the install routine shall determine if sufficient hard drive space is available. All installation routines shall have an un-install option, and when updating to a newer version, shall remove earlier version software/data prior to the installation of updated software/data. Installation history data shall become part of a “read me” file.

B.3.2.11 Context sensitive help (technical data help). Provides help information to the user based on the data being presented or the tasks being performed through a common interface. The type of help pertains to the particular subject matter of the IETM, such as the specific weapon system. Context sensitive help is delivered through pop-ups, dedicated help screens, or pull down menus. Examples include discrepancy reports incorporated and lists of acronyms and abbreviations.

B.3.2.12 Diagnostics - software driven entry to IETM. The appropriate maintenance action starting point is software-determined through use of a system inference or logic engine. The user is provided with the appropriate starting point for fault isolation. Various inputs from personnel, system, and multiple fault codes are analyzed. The analysis determines if there is a relationship between the fault code(s) and information, then tasks appropriate actions as a result.

B.3.2.13 Diagnostics - user determined entry to IETM. Tasking for troubleshooting procedures are primarily textual references. ‘If statements’ (“if a light is on,” as an example) provide alternatives in a narrative form. The user determines the starting point for a maintenance action, through the use of a predefined fault tree or index table.

B.3.2.14 Dialog-driven interaction. Allows the user to directly feed information to the IETM environment. The IETM cues the user to input specific data. The feature indicates that at some point the IETM will respond to the information entered. An example is: During a troubleshooting procedure, a dialog box opens that states “Enter the voltage reading at TP 5”. If the user types in 5 (a nominal value), the IETM jumps to the next step in the procedure. On the other hand, if the user enters 0 (a fault level reading for a short) the IETM might jump to a remove and replace procedure.

B.3.2.15 Display of procedural steps in browse mode. Allows the user to preview the procedural information in its entirety prior to actually performing the procedure. When actually performing the procedure, the user must use one of the viewing options provided in B.3.2.16.

B.3.2.16 Display of procedural steps options. Allows the user to select the way procedural steps are displayed. In linear IETMs, the only option is to fill the screen with scrollable steps. For non-linear IETMs, the user may want to view procedural steps one at a time, three at a time, three at a time with a Next button, or to be able to fill the screen with scrollable steps. When viewing procedural steps one or three steps at a time, all substeps that are applicable to a particular step must also be displayed. A non-linear IETM may allow more than one option.

B.3.2.17 DVD-ROM. Distribution and/or delivery are to be accomplished by Digital Video Disc-Read Only Memory (DVD-ROM). DVD-ROM provides many of the same features of distribution and/or delivery by CD-ROM, but with greater capacity. This functionality requires a DVD-ROM compatible drive.

MIL-DTL-24784C(NAVY)  
APPENDIX B

B.3.2.18 Dynamic diagnostics. Dynamic diagnostics are diagnostic capabilities that use on-board monitoring devices such as Built-In Test (BIT) and/or support/test equipment to provide enhanced capability for fault detection and isolation. Dynamic diagnostics directed fault isolation is based on results returned from the system rather than inputs received from the user. With this type of diagnostics, there are no pre-defined paths in the troubleshooting data and the paths are generally model-based.

B.3.2.19 Exit. Closes the IETM session. The user of the IETM shall always be asked for confirmation that they want to exit the IETM. If Suspend is used, the current state tables and position in the IETM is maintained, otherwise all information concerning state tables and position is cleared.

B.3.2.20 Filter by configuration. A feature that narrows the information presented to the user to that information associated with a specific configuration of the end item. In many cases, a specific end item is changed from the baseline configuration to a different configuration. A user login may be the method used to enter the configuration that the IETM displays.

B.3.2.21 Filter by model series. A feature that narrows the information presented to the user to that associated with a specific model series of the end item. Such filtering may be pre-defined or dynamic. A user login may be the method used to enter the model series that the IETM displays.

B.3.2.22 Filter by modification. A feature that narrows the information presented to the user to that information associated with a specific modification rather than the end item being modified. A user selects specific modification tracking numbers, and the data unique to that modification is presented. For example, MWO (Modification Work Order) 99-0013 upgraded the landing gear left support strut from part number 111500051354-001 to number 111500051354-003. Filtering by MWO number presents the appropriate part and maintenance data as shown in figure B-4.

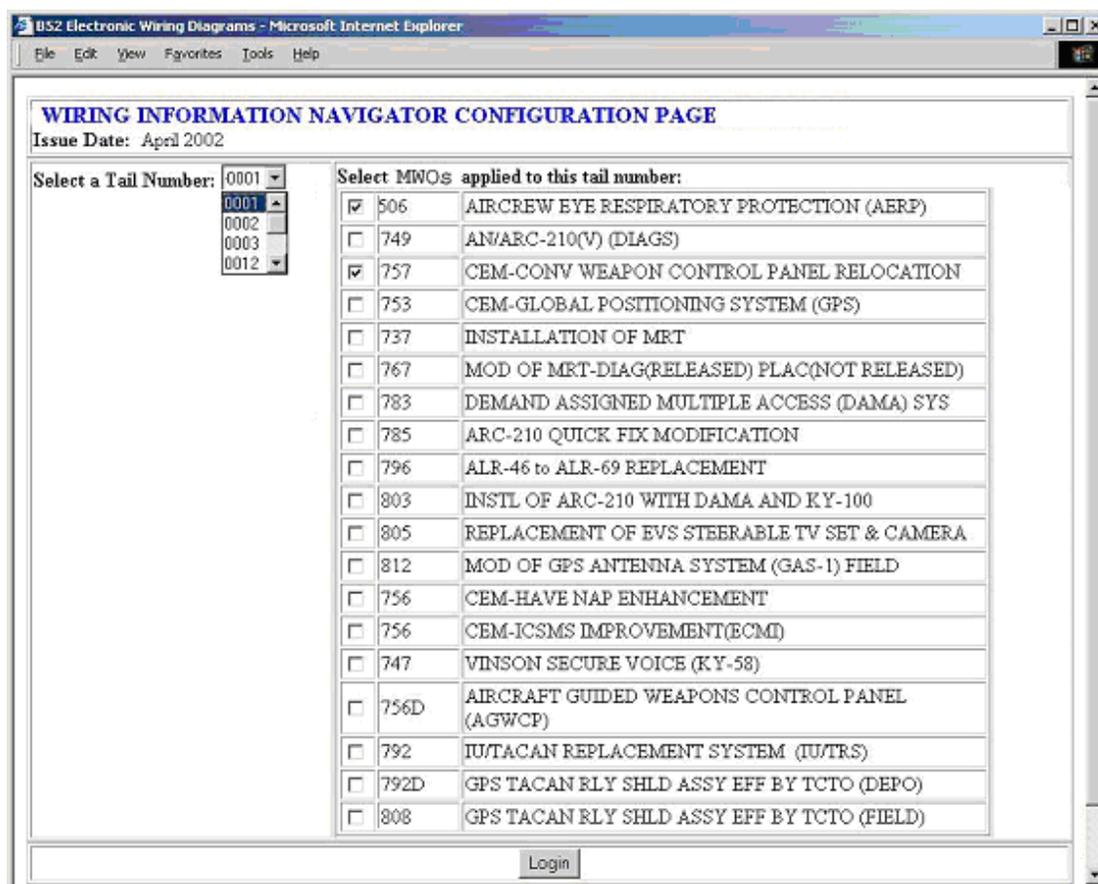


FIGURE B-4. Example of access by modification.

MIL-DTL-24784C(NAVY)  
APPENDIX B

B.3.2.23 Filter by skill/maintenance level. A feature that narrows the information presented to that user's specific user skill or maintenance level. A user login profile may be the method used to access the level of proficiency that the IETM displays.

B.3.2.24 Filter by unique identification code. A feature that narrows the information presented to the user with a unique identifier such as tail number, hull number or Vehicle Identification Number (VIN). A user login may be the method used to enter the identification code that the IETM displays.

B.3.2.25 Forward and back. Forward and back have the same meaning as used in a traditional web browser. These functions permit re-navigation through previously viewed data. For example, a user performs steps 1 through 4 in order. In step 4, the user is asked a branch question. The user answers the question and selects "Next" (see B.3.2.44). The branch question is evaluated and the results are such that the user is taken directly to step 8. If the user selects "Back" at step 8, the user will return to step 4. If the user then selects "Forward" at step 4, the user will go from step 4 to step 8 without having to answer the branch question and have it re-evaluated.

B.3.2.26 Full revision. A full revision is a complete replacement of the data previously distributed.

B.3.2.27 Fully formatted/book version. Provides a fully formatted document printout. Beyond the printed technical data, the following additional information must be printed: time/date stamps, persistent alerts, classification markings, distribution statements, and destruction notices.

B.3.2.28 Global data annotation. Allows local Technical Manual Management Activities (TMMAs) the capability to supplement the general technical information with items unique to that activity. This will be limited in scope and must be approved by the end user's quality assurance process. Such changes shall be made available to the IETM developer. Globally accessible annotation is a one-way feature, in which annotations can only be added and may not be deleted by end users. All end users can view global data annotations. Some examples of global data annotation include:

- a. A quality assurance maintenance supplement indicating a new type of lubricant to use.
- b. Advance Change Notice (ACN) updates to data are provided by annotation.

B.3.2.29 Graphical navigation. Provides the capability to navigate the IETM through graphical representation of the system and its components. An example is: From a graphical overview of the aircraft system, the user selects a wing. A graphical overview of the wing is presented. The user then selects the flaps. A graphical overview of the flaps is presented. The user selects the actuator. Information on the actuator is presented.

B.3.2.30 Graphics selection. Provides the capability to highlight and select graphics for the purpose of copy and paste. Copied graphics could be pasted into editable forms, editable reports, etc. All selectable areas should be displayed and visually highlighted before selection. The user should be given the capability to select a point, area, or the entire graphic by positioning the cursor on or near that point and activating the Select function. Selectable regions of a graphic should be visually distinct and should not adversely affect the appearance of the graphic. The selection of graphical information should include, but is not limited to, the following:

- a. Selecting an individual graphic object, such as a part, displayed in a graphic.
- b. Selecting a pint or rectangular area in a graphic image.

B.3.2.31 History of traversed links. A navigational feature that tracks and lists each location (link) a user sees along the navigational path through an IETM. In many cases, the user has the ability to bring the list up and use each location (link) in the history list as a link back to a point in the path. This feature is useful when flipping back and forth between several data types or components of the unit under maintenance. An example is: The user opens the IETM to the Front Matter (A). The user follows the link to the section on the landing gear (B). The user follows a reference link to an adjustment procedure (C). The history of traversed links will be discretely listed as C, B, A.

B.3.2.32 Hot reference. Hot reference provides the capability to display additional content such as acronyms, tool tip, etc. For example, positioning the mouse over the acronym IETM generates a popup text box with "Interactive Electronic Technical Manual".

MIL-DTL-24784C(NAVY)  
APPENDIX B

B.3.2.33 Hot spotting. This functionality allows the capability for links to be enabled within a graphic as shown in figure B-5. Links may include reference to detail breakouts, next higher assemblies, part ordering information, parts breakdown data, and procedures from logic trees. These can be at various levels and include both raster and vector based graphics. The following are two hot spotting examples:

- a. Links to related graphics. Links can be to breakdown illustrations showing greater detail, next higher assembly, to locator art, etc.
- b. Links to related text. An example is links to procedural information from a logic or troubleshooting tree.

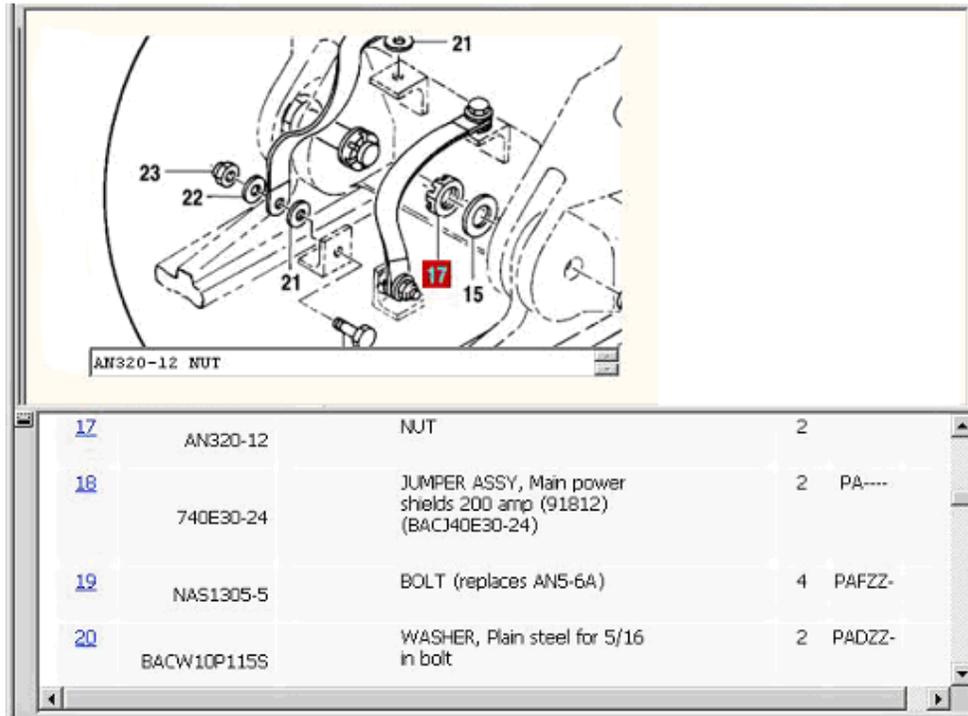


FIGURE B-5. Example of hot spotting.

B.3.2.34 Information package specific printing. Provides the capability to print a discrete information package (IP). Beyond the printed technical data, the following additional information must be printed: time/date stamps, persistent alerts, classification markings, distribution statements, and destruction notices.

B.3.2.35 Internal references. Internal cross-references that link related data that may be accessed from one view in a presentation to another by the operator through navigating icons or links. The complexity required to implement bi-directional links must be taken into account by the developer. After completing an action or procedure, the bi-directional (go sub) link returns to the original referenced link.

B.3.2.35.1 Link to separate parts data. This functionality provides linkage from a maintenance task or narrative to a separate parts data display in the current or separate window.

B.3.2.35.2 Table of contents, lists of illustrations, tables and multimedia. The table of contents includes a list of systems/subsystems or functional groupings and their associated tasks, tests, descriptive information (theory of operation), etc. Other optional lists allow the user to access information presented in a figure (graphic), table (spreadsheet), or multimedia. This may not be desirable or practical for IETMs where graphics are dynamically built.

MIL-DTL-24784C(NAVY)  
APPENDIX B

B.3.2.36 Knowledge management. A knowledge management system models an organization's knowledge assets and environment to enhance its ability to deliver on its mission. It provides for information tracking, access, and synthesis in coordination with organizational culture, values, and guidance. Both tacit and explicit intellectual capital may be leveraged through electronic integration of data, and human interaction (as in locating subject matter expertise and defining communities of practice). This provides leadership with a rapid path to understanding discrete problems and changes from a strategic perspective.

B.3.2.37 Locator graphics. Locator graphics show where a component is located relative to other components as shown in figure B-6 and figure B-7.

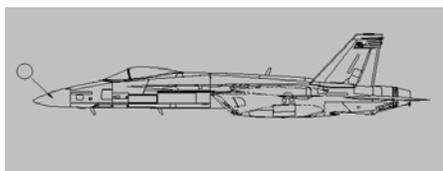


FIGURE B-6. Example of a locator graphic.

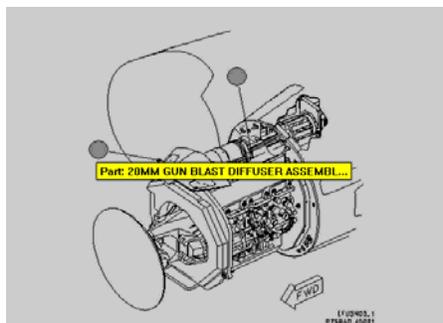


FIGURE B-7. Example of a locator component graphic.

B.3.2.38 Login. Used to identify key information by user (user profile) and/or system. A password for login may be required. It must be determined if specific profiles, user identifications (IDs), roles, and permissions will be required to permit IETM usage. It must be kept in mind, that if there is a higher-level infrastructure controlling access, it must be the controlling authority of IETM. IETM access based on the training and skill of the maintainer would require the IETM system link into the maintainer's training records.

B.3.2.39 Maintenance data collection. This functionality allows for the capture and transmission of configuration change data (for example, removed and installed part number information), tasks authorized, tasks performed, results of that work (for example, state table, audit trail), etc. This update must feed an external data repository or maintenance application.

B.3.2.40 Motion video. Provides video clips to assist in the maintenance action. Motion video may be used to show a unique procedure. Motion video must not be the primary instruction to perform the task, but if included, would supplement the narrative instruction. Format and file sizes must be taken into account when including motion video.

B.3.2.41 Near real time updates. Near real time updates, which are accomplished via network distribution, must be available to the user shortly after authorization. They may be complete or partial updates. The reduction in distribution time results in the maintainer having more up to date data. (See B.3.2.43 for a definition of Network Distribution.)

B.3.2.42 Network connectivity. The end user has access to the IETM via a network infrastructure. The data is downloaded to or viewed on the client device. The device may be disconnected and operated in a stand-alone mode. Some degradation may be experienced when operating in a stand-alone mode. The data changes/revisions are installed on the host server and updates are transmitted via the network.

MIL-DTL-24784C(NAVY)  
APPENDIX B

B.3.2.42.1 Network connectivity - context filtering. When connected to a network, the configuration of a system is readily available to the electronic display device (EDS) via a maintenance management system. The configuration can then be loaded to the EDS for IETM use.

B.3.2.42.2 Network connectivity - update capability (full revision). Data revisions are installed on the host server and updates are transmitted via the network.

B.3.2.42.3 Network connectivity - update capability (partial). This capability entails the update of the data via network distribution that contains only the changed information from the previous release. Downloading the data to the user's EDS is done via the network.

B.3.2.43 Network distribution. Distribution by internet or local intranet consists of direct transfer from one computing system to another. Distribution may be via secure file transfer protocol (FTP), hypertext transfer protocol (HTTP), or other secure transfer protocols. Bandwidth, security, and operational deployment considerations must be addressed.

B.3.2.44 Next and previous. Navigational functions that take the user through a procedure in a sequential manner. For example, a user performs steps 1 through 4 in order. The user is asked a branch question in step 4. The user answers the question and selects "Next". The branch question is evaluated and the results are such that user is taken directly to step 8. If the user selects "Previous" at step 8, the user will go to step 7 and not to step 4 as would occur if the user selected "Back" (see B.3.2.25). If the user returned to step 4 using "Back", the user would have to re-answer the branch question in step 4 in order to use "Next". See figure B-8.

B.3.2.45 Operator debriefing. Includes interface with an operator and/or maintenance debriefing system for selecting task assignments. May also include development of maintenance actions based on operator and system inputs.

B.3.2.46 Pan, zoom, rotate, center. Controls that perform pan, zoom, rotate and center on a graphic. These functionalities are recommended only if the source data quality is such that the resultant graphic operations produce clear images. The pan control allows the user to pan across or up and down a graphic that exceeds the size of the data pane. Vertical and horizontal scroll bars indicate that panning is available. The zoom control allows the user to enlarge (zoom in) or reduce (zoom out) the displayed graphic. The rotate control allows the user to rotate the graphic to view it at a different orientation. Centering allows the user to return the view of the graphic to its original size, location and orientation.

B.3.2.47 Parts ordering. Allows parts ordering capability that is linked with an integrated supply system. This functionality shall not circumvent the supply system protocol.

B.3.2.48 Personal annotation. Personal annotation is added or deleted at the end user's discretion and is retained at the end of the user session. An example of a personal annotation: "Noticed that radome latch broken on left side; notify radar shop."

B.3.2.49 Photos. Photos are included to show a specific visual representation of actual systems. Photos must adhere to presentation standards (such as resolution, file size, and file format). Photos must not be the primary instruction to perform the task, but if included, would supplement the narrative instruction. See 3.7.8.4.14 for requirements on the use of photographs.

B.3.2.50 Print currently displayed window. Provides a print out of only the technical data in the window currently being viewed by the user, including material that is scrolled off the screen. Beyond the printed technical data, the following additional information must be printed: time/date stamps, persistent alerts, classification markings, distribution statements, and destruction notices.

B.3.2.51 Print linked data. Provides a print out of any linked data on a given task/location. Beyond the printed technical data, the following additional information must be printed: time/date stamps, persistent alerts, classification markings, distribution statements, and destruction notices.

B.3.2.52 Print screen. Provides a print of the screen currently being viewed by the user, including information that is scrolled off the screen.

MIL-DTL-24784C(NAVY)  
APPENDIX B

B.3.2.53 Prognostics. Predicts the possible component degradation or impending failure, which allows maintenance personnel to replace components based on their actual condition. The goal is autonomic logistics, which uses electronic information collected from the system to determine, plan, and perform needed maintenance with minimal downtime.

MIL-DTL-24784C(NAVY)  
APPENDIX B

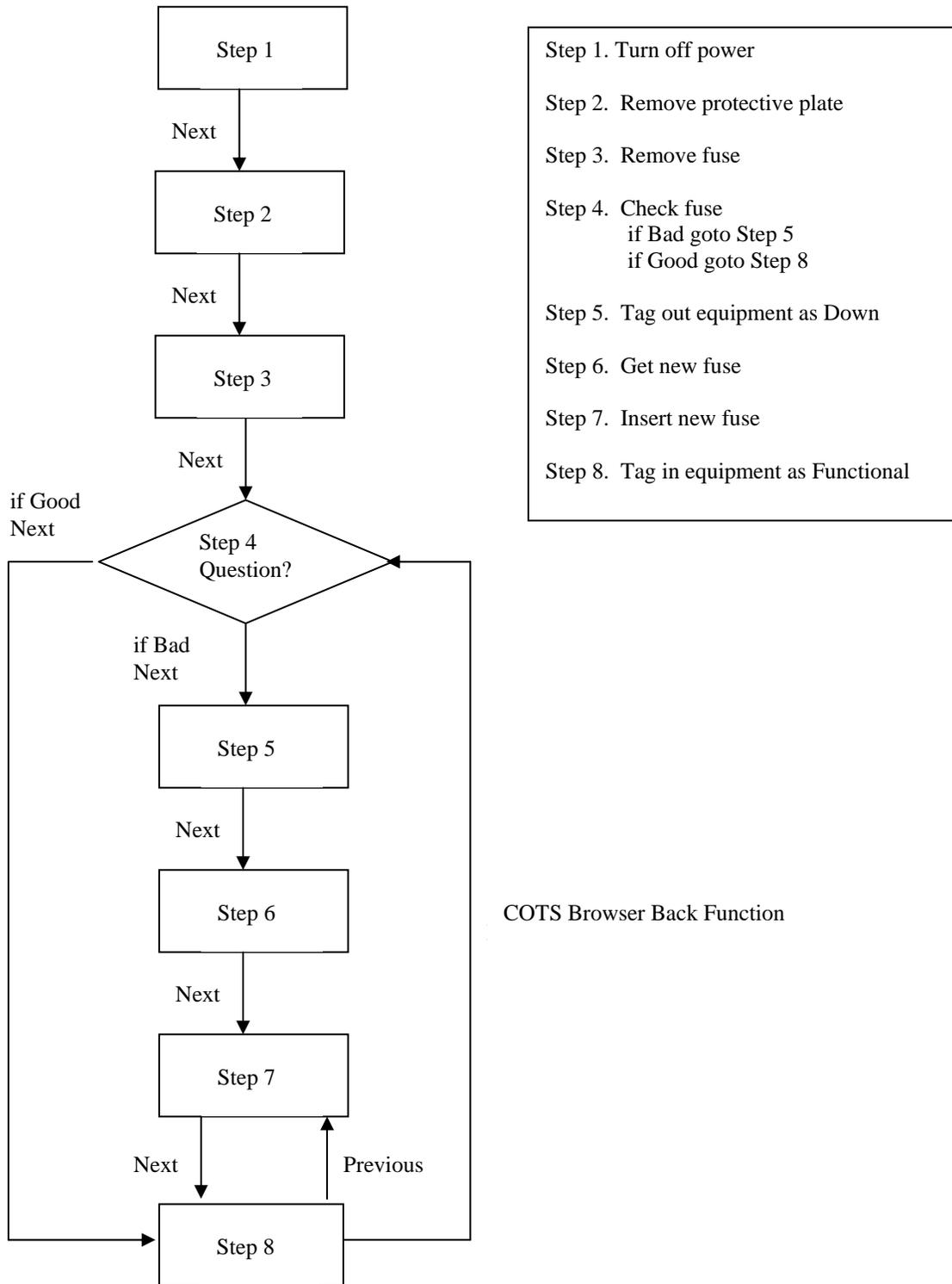


FIGURE B-8. Example of next/previous.

MIL-DTL-24784C(NAVY)  
APPENDIX B

B.3.2.54 Public annotation. A locally submitted annotation which has been approved for display through the local approval process. Pending approval, the annotation is treated as a personal annotation. If the annotation is disapproved it remains a personal annotation. During the approval process, these annotations will also be recommended for submission to the TMMA.

B.3.2.55 Redlining graphics. Provides the capability to annotate graphics through the use of an overlay freehand-type drawing tool as shown in figure B-9. The capability exists to save redline markups and any associated attributes. This functionality is available during a review process and is also available to the end-user.

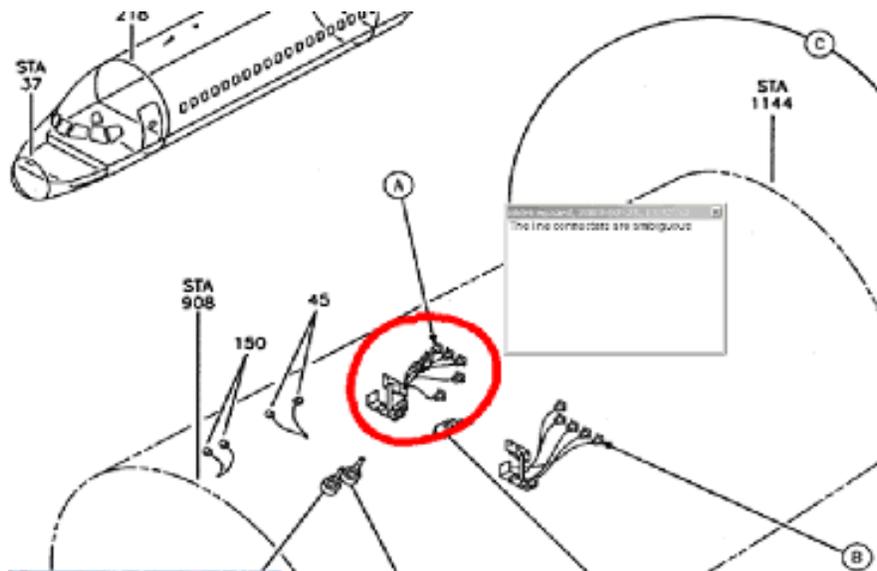


FIGURE B-9. Example of redlining a graphic.

B.3.2.56 Redlining text. Provides capability only during the review process of the source material to annotate text, using markings for deletions and insertions.

B.3.2.57 Resource scheduling. Provides the capability for task planning, resource allocation, execution, monitoring and/or intervention coordinated among cooperating systems by multiple human or software agents (entities). These agents act intelligently against a set of constraints to minimize conflicts and optimally manage the goals of the system users.

B.3.2.58 Search - across multiple databases/files. A search feature that allows the user to perform key word or full text searches across different data collections.

B.3.2.59 Search - context. A feature that will allow the user to search within an IETM or data sources within a particular context (such as parts, steps, or tables). The data source must contain predefined context sensitive elements. An example is shown in figure B-10. For example, the context search is of a maintenance task “Clean” in an IETM. The topic “clean” is selected and then the topic “Maintenance Task” in the context search window is chosen. The search string “solvent” is entered in the search string box. The “Search” button is then clicked on to start the search of the IETM for the term “solvent” within the maintenance task “Clean”.

B.3.2.60 Search - full text. A feature that allows the user to search for any instances of requested words or phrases within an IETM. This feature must not depend upon the predefinition of key words. For example, in searching for “IFF” the user may find “IFF”, “difference”, “TIFF”, etc. depending on the search criteria.

MIL-DTL-24784C(NAVY)  
APPENDIX B

Select a topic to search:

Choose a context to search:

Parts
<b>Maintenance Tasks</b>
Tables
Figures
Alerts

Enter a search string:


 Word Highlighting
FIGURE B-10. Example of a context search.

B.3.2.61 Search - key word. A feature that allows the user to search an IETM for occurrences of a specific word. System specific “key words” are predefined with links to their location in the data. This provides benefits similar to an index in a paper document. Associated advanced features might include (1) links to the portion of the IETM containing the word, (2) a word wheel that narrows the focus of search with each letter typed into a dialog box, and (3) searches across multiple data sources. As an example, a user might search for the term “IFF”. The key word search would locate each pre-identified occurrence of the term in the data. This will find all occurrences of IFF that have been predefined as a key word, but not find all occurrences of the letters “IFF”.

B.3.2.62 Search - user defined Boolean. A feature that permits the logical association of terms to narrow the results of the search by scope (information package, IETM, database, etc.). Commonly supported logic include instances where both x and y appear (Logical AND), instances where neither x nor y appear (Logical NOR), and instances where only x or only y appear (Logical EXCLUSIVE OR).

B.3.2.63 Simultaneous display of multiple content elements. Establishes a relationship between content elements (text, tables, graphics, etc.) allowing simultaneous display. The display of either element must require the display of the other as shown in figure B-11.

MIL-DTL-24784C(NAVY)  
APPENDIX B

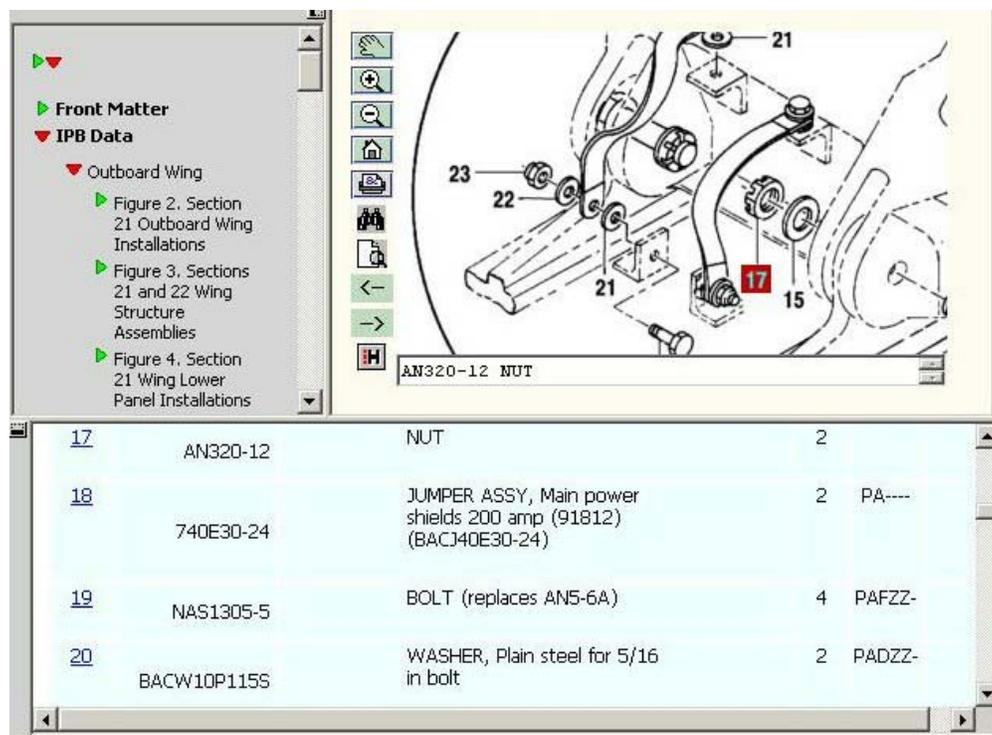


FIGURE B-11. Example of a display of multiple content elements.

**B.3.2.64 Stand alone mode.** The end user will access the IETM via the hard drive or CD-ROM/DVD-ROM drive. Update capabilities must be taken into account (see B.3.2.64.4). In a stand-alone mode, the amount of data requiring loading on to the stand-alone device is considerable and complex. In stand-alone mode, this data may be maintained in multiple locations.

**B.3.2.64.1 Stand alone mode - context filtering.** When in stand-alone mode, the configuration of a system may not be readily available on the EDS. If connected to a maintenance management system, the configuration can be loaded to the EDS prior to disconnection and IETM use. Without a configuration file, the user will be required to answer dialogs (questions) that normally would not be asked in a network connection mode.

**B.3.2.64.2 Stand alone mode - update capability (full revision).** This capability entails the update of the data via CD-ROM/DVD-ROM distribution and contains a complete reissue of the IETM. The update is accomplished via reading the new distribution or downloading the data from the CD-ROM/DVD-ROM to the user's EDS hard drive.

**B.3.2.64.3 Stand alone mode - update capability (partial).** This capability entails the update of the data via CD-ROM/DVD-ROM distribution that contains only the changed information from the previous release.

**B.3.2.64.4 Stand alone mode – update through a network.** This capability entails the update of the data via temporarily connecting the end user to a network for updates (see B.3.2.43).

**B.3.2.65 Supporting technical data.** Includes links to general, part, and process manuals, commodity books, etc. May include links to commercial manuals where applicable. The customer will determine, taking costs into account, whether the links will be context sensitive or whether the links will just call up the linked data source. Context sensitive linking opens the linked data source at the relevant place. If the linked data source is simply called up, the user will need to navigate to the relevant place. Acquisition managers should also define if linked data sources are to be maintained locally, networked, or by linking through a network and internet/intranet. Specific viewers may be needed to view these resources.

MIL-DTL-24784C(NAVY)  
APPENDIX B

B.3.2.66 Suspend and resume. The capability to suspend an IETM session and then provide the user with the ability to resume the session at the point of suspense. This capability extends beyond a user session and retains local data. For example, during the performance of a maintenance task, a part is removed, and the replacement part is not available in supply. The user may decide to suspend the session at the point when the part is removed and subsequently resume the task after the part becomes available.

B.3.2.67 System simulation. Includes the capability to represent the behavior or characteristics of the system function/malfunction to determine or reenact the problem as shown in figure B-12. Capabilities can include identifying continuity in wiring diagrams and circuit simulation for passive and active circuits including activating switches, applying power, etc. These capabilities can also be used to model hydraulic, fuel, pneumatic, and other systems.

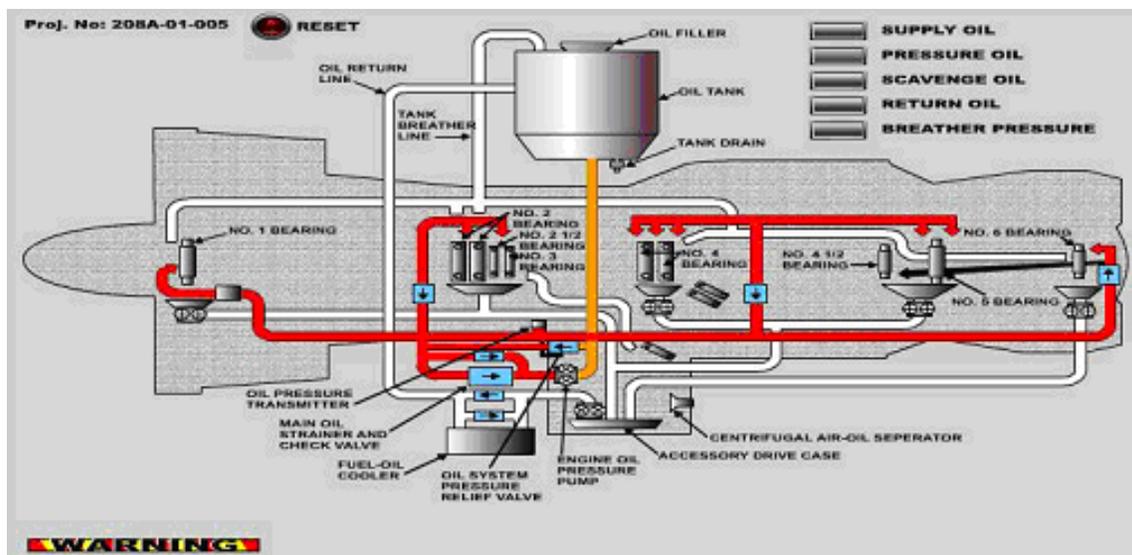


FIGURE B-12. Example of a system simulation.

B.3.2.68 System/subsystem navigation. A navigational feature that allows the user to follow a top-down path through the breakdown structure of a system. The user follows a physical or functional breakdown to the next lower assembly or to the next level of detail. The user can continue to navigate to additional levels of detail. An example is the user would begin the navigation of an IETM at the ship level. Next step would be to go down to the hull. From the hull, the mechanic might pick the electrical system.

B.3.2.69 Tear off window capability. Provides the user with the capability to capture (“tear off”) an image of the existing or an additional pane. The user can then navigate forward and display the “torn off” image on top of the current pane for reference without requiring navigation back to the original pane as shown in figure B-13.

B.3.2.70 Text selection. Provides the capability to highlight and select text for the purpose of copy and paste. Copied text could be pasted into dialog box data entry fields, editable forms, editable reports, etc. All selectable areas should be displayed and visually highlighted before selection.

B.3.2.71 TMDER. The Technical Manual Deficiency/Evaluation Report (TMDER) is used to identify technical and non-technical discrepancies or deficiencies in NAVSEA TMs/IETMs. It provides a method for users to capture and transmit errors and recommended changes about the IETM. TMDERs may be submitted via the following methods:

- a. Paper trail reporting.
- b. Electronic reporting.

MIL-DTL-24784C(NAVY)  
APPENDIX B

**B.3.2.72 User creation of bookmarks.** A navigational feature that allows the user to flag certain locations for later access. It allows users to build their own index of links to specific locations in the data. Associated advanced features include logging in to specific bookmarks, so different people using the same presentation device have their own unique set of bookmarks. This is a digital means of implementing the dog-eared or paper clipped page found in paper manuals. As an example, the maintainer that generally does the preventative maintenance checks and services might have the bookmarks to those tasks. If that maintainer also does the rotor tension adjustment, they could also have a bookmark to that task.

**B.3.2.73 User training.** User training includes the integrating or linking of maintenance and/or operational training on the use of a system or systems with the IETM. Access to the data may be through a link to an external module or may be integrated with the IETM. Advanced capabilities may include monitoring usage and training access for the purpose of tracking user competency. Specific training courseware and/or actions are not necessarily part of the data. User training complexity can range from on-line access during IETM run time by linking to an embedded Computer Based Training (CBT) database to running a complete training lesson.

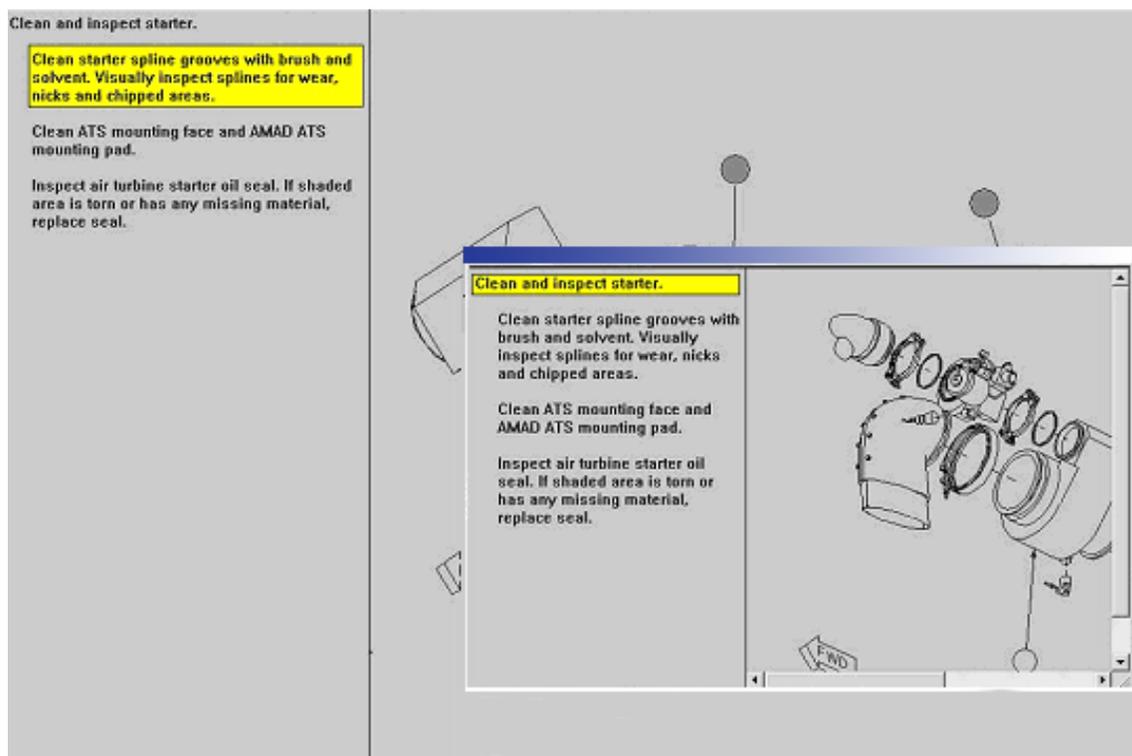


FIGURE B-13. Example of a tear off window.

**B.3.2.74 Viewer help.** Provides help information to the user on the operation of the IETM. An example is when right-clicking via the mouse or hovering the cursor over a particular graphic or menu item will cause a viewer tool tip to pop up, providing help or a description for the specified feature as shown in figure B-14.

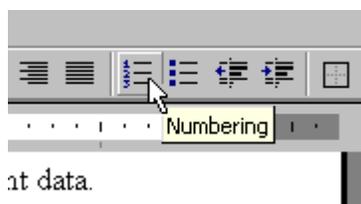


FIGURE B-14. Example of a tool tip.

MIL-DTL-24784C(NAVY)  
APPENDIX B

B.3.2.75 Voice-activated commands. A feature that enables the user to navigate through the IETM by pre-determined voice commands. The complexity of this feature depends upon the extent of voice tagging in the IETM and the quality of the voice recognition software.

B.3.2.76 Web browser viewable. Allows the IETM to be viewed through a Commercial Off-the-Shelf (COTS) web browser. The use of a specific web browser must be identified by the acquiring activity. Different implementations include remote access to an IETM web server, opening static web pages locally, and web server emulation on the client viewer.

B.3.2.77 Wire/fluid system tracing. Provides the capability to select a wire, fluid, pneumatic, or HVAC line, in a diagram or schematic and have continuity highlighted through the circuit or schematic as shown in figure B-15.

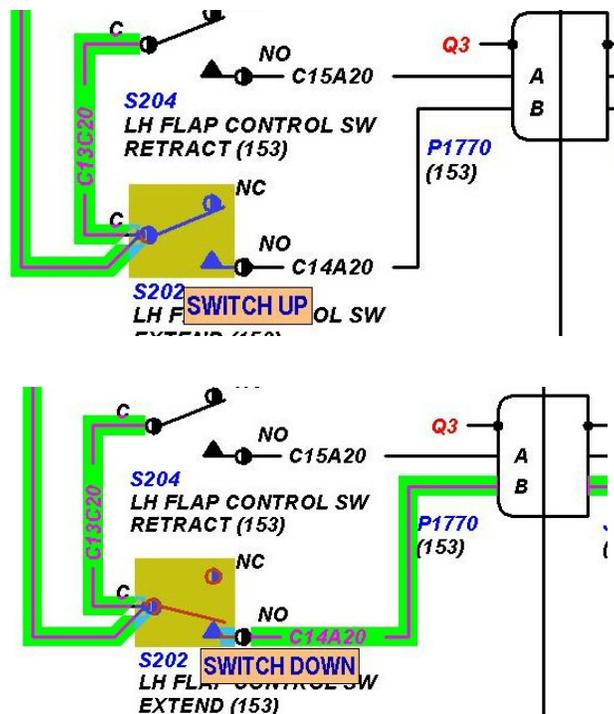


FIGURE B-15. Example of a wire/fluid system tracing.

## B.4 IETM DISPLAY AND PRESENTATION REQUIREMENTS

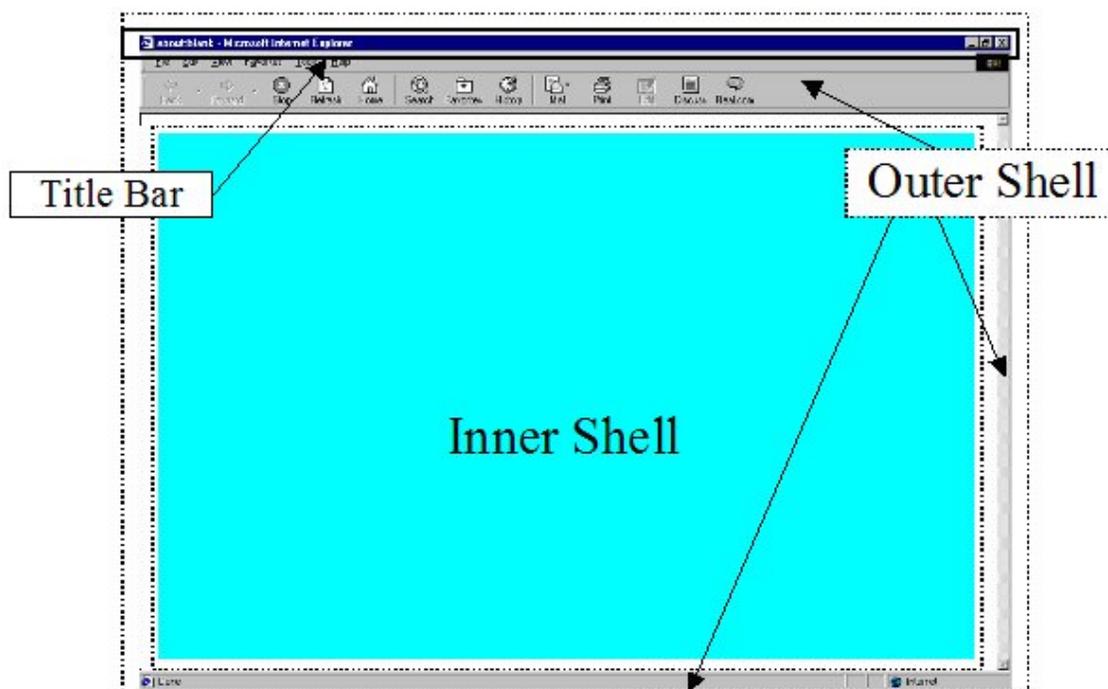
B.4.1 Physical IETM screen layout. The screen shall have an outer shell and an inner shell.

B.4.1.1 Outer shell. The outer shell is the application/browser window and is the portion of the screen that surrounds the inner shell. An example of an outer shell is illustrated in figure B-16. Specific browsers shall not be implied by this example.

B.4.1.1.1 Control of the outer shell. Except for the title bar, the outer shell shall not be modified. As technology changes, the impact on the outer shell is unknown.

B.4.1.1.2 Title bar. A horizontal title bar shall appear at the top of the screen in the outer shell. The title bar shall include the overall classification of the IETM and the TM identification number. The title bar may include the IETM title (following the above required entries).

B.4.1.2 Inner shell. The inner shell (see figure B-16) is the portion of the IETM, within the browser shell, provided as the client application display area. The only portion of the screen area under the developer's control is the inner shell. The general screen area and the specific regions of the inner shell are described in B.4.1.2.1 through B.4.1.2.5.5.

MIL-DTL-24784C(NAVY)  
APPENDIX BFIGURE B-16. Screen layout.

B.4.1.2.1 General screen. Within the inner shell is a guide post in the upper left hand corner and to the right of the guide post is the classification and distribution bar and user navigation panel (see figure B-17). The user navigation panel area is made up of a subtitle bar, a main menu bar, and a project specific bar. To the left below the guide post is a resizable area to display table of contents, list of illustrations, list of tables, etc., as selected in the guide post. The general form is the “inverted L” with the guide post in the upper left hand corner. The status bar is located at the bottom of the inner shell to the right of the resizable display area. The rest of the inner shell contains the main content area. The main content area shall be in accordance with figures B-17 through B-22.

MIL-DTL-24784C(NAVY)  
APPENDIX B



FIGURE B-17. Components of the inner shell.

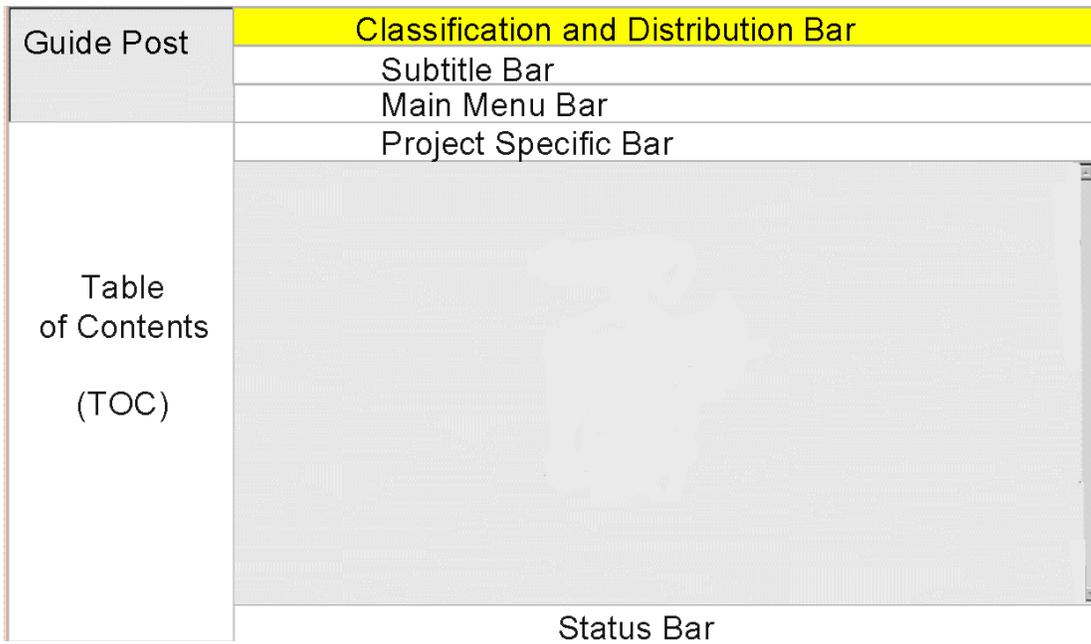


FIGURE B-18. Single main pane layout.

MIL-DTL-24784C(NAVY)  
APPENDIX B

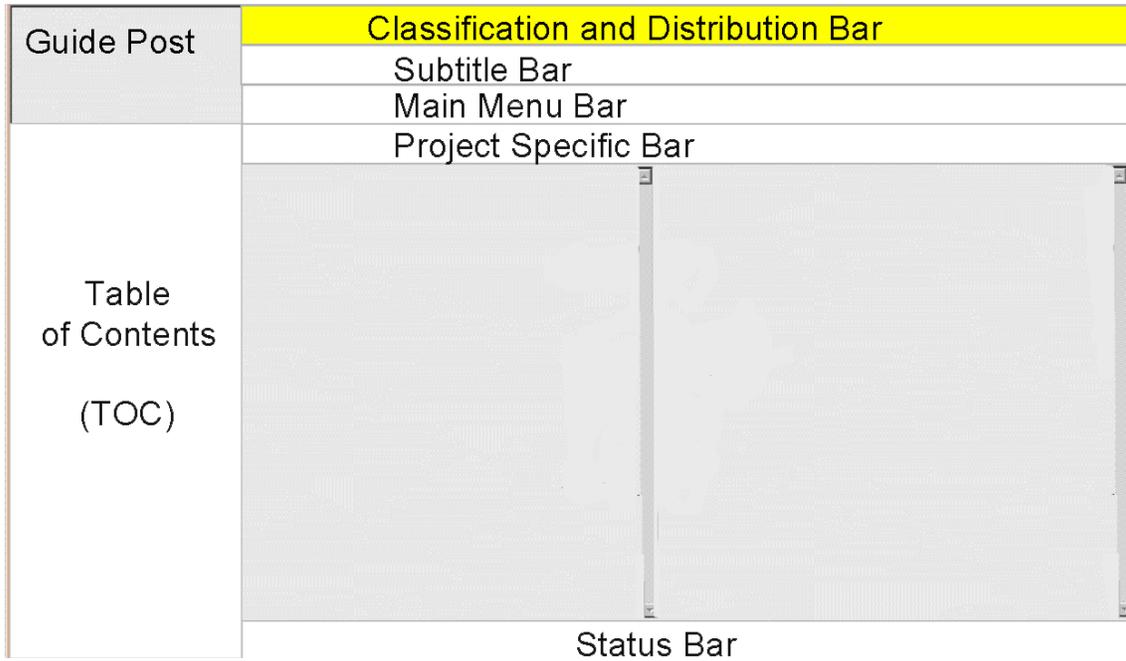


FIGURE B-19. Left/right dual pane layout.



FIGURE B-20. Upper/lower dual pane layout.

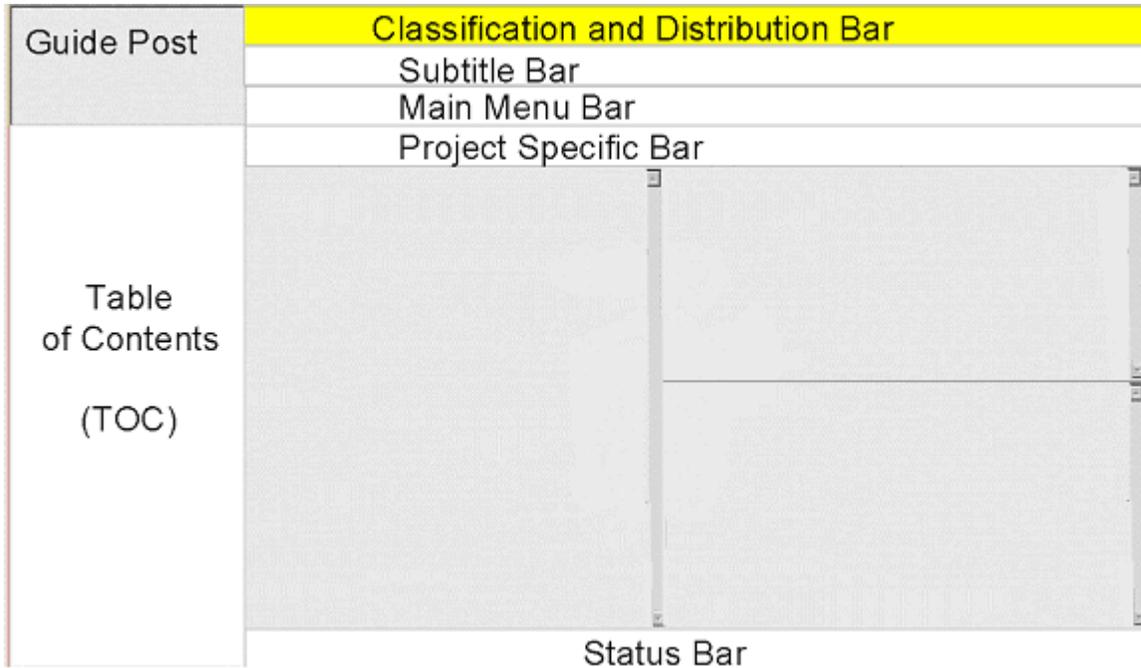
MIL-DTL-24784C(NAVY)  
APPENDIX B

FIGURE B-21. Triple pane layout, left pane with upper and lower right panes.

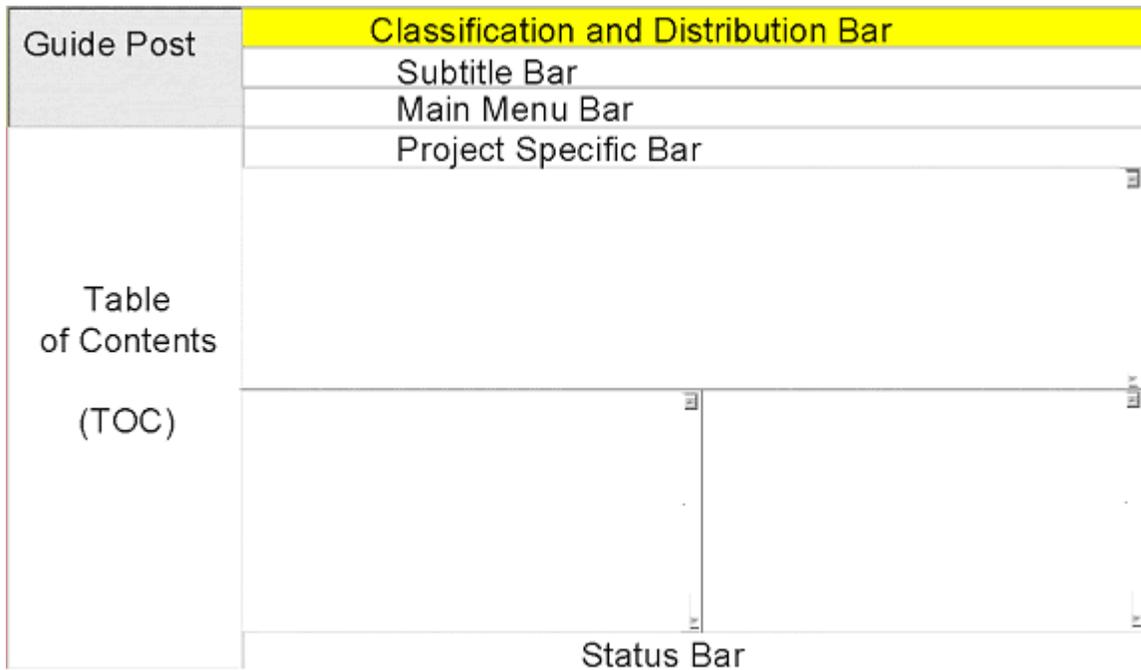


FIGURE B-22. Triple pane layout, upper pane with left and right lower panes.

**B.4.1.2.2 Guide post.** The guide post function provides a special mechanism for navigation and preferences. For example, the guide post may provide a menu allowing the user to toggle screen areas on and off. The guide post may be minimized and visually replaced by a compass rose icon. The user may click on the compass rose icon to restore the guide post. The guide post or compass rose icon must always remain visible. Optionally, a logo may be used to represent the guide post.

MIL-DTL-24784C(NAVY)  
APPENDIX B

B.4.1.2.2.1 Guide post functions. This guide post area (see figure B-17) allows the user to get to and initiate special advanced functions or to return the user to the standard default user interface. Mouse clicking within the guide post shall provide the following functions menu via a pop-up. The following are the required (mandatory) and optional guide post functions (see 6.2):

- a. Reset user interface to standard default? Y/N (optional). If the user interface can be changed, a user should be able to reset the user interface back to the default, defined as the user interface upon normal start-up of the IETM for the first time.
- b. Minimize IETM (optional). This causes the IETM to disappear from the screen and indicate an active application on the application tool bar for the operating system.
- c. Exit IETM (optional). This activates a pop-up that asks if the user wishes to exit the IETM and then, if appropriate, asks if the user wishes to save the session.
- d. Print screen (mandatory). This causes printing of what is on the IETM screen.
- e. Print currently displayed window (mandatory). This causes printing of the present screen including scrolled off information.
- f. Change to page view (optional). This causes the IETM presentation to change to a paged view, usually PDF.
- g. Open new IETM (optional). This causes the IETM system to open another IETM in a separate window.
- h. Suspend and save work/location (optional). This causes the IETM to pause and save the work/location and then allows the user to resume the session.
- i. Resume saved work/location (optional). This causes the IETM to resume a saved session.
- j. Create TMDER (mandatory). This allows the user to create a TMDER for the portion of the IETM currently being used.
- k. Link to Navy Distance Support information (mandatory). This provides the user with information on contacting Navy Distance Support (Anchor Desk) via the web and via the toll free number (1-877-4-1-TOUCH [86824]). If internet connectivity will be available via the IETM, the link to distance support shall be available (<http://www.anchordesk.navy.mil/>).
- l. View revision summary (mandatory). This allows the user to view the revision summary.
- m. Back (optional). Allows navigation back through the previously viewed information. This is part of Forward and Back (B.3.2.25).
- n. Forward (optional). Allows navigation forward through the previously viewed information. This is part of Forward and Back.
- o. Minimize guide post (mandatory). This allows the user to resume if the user accidentally brought up the guide post.
- p. Get to administrative info (mandatory). This allows the user to view the front matter and other administrative information.
- q. End browse mode (optional). If browse mode is implemented, this allows the user to exit from the browse mode.
- r. User navigation panel (tool bar) toggle (optional). An optional toggle capability that turns off the user navigation panel. The guide post (or compass rose for a minimized guide post) and the classification and distribution bar shall remain visible.
- s. Other custom functions available to user (optional). Any custom functions that the IETM provides shall be placed here. These should be listed on the pop-up menu in addition to the mandatory and implemented optional items. This permits the user to obtain these functions in a standard way.

MIL-DTL-24784C(NAVY)  
APPENDIX B

**B.4.1.2.3 Table of contents (TOC) panel.** The area on the left side of the main content area and below the guide post is the area where the TOC shall appear (see figure B-17). This area shall have a resizable right-side border (so that the TOC area can be reduced in size to the left). When the user hovers the cursor over a TOC item, the full name of the TOC item shall appear. Refer to Appendix A for TOC requirements. Access shall be provided via a hierarchical breakdown such as system/subsystem, content functional or physical hierarchy, or by means of graphical interfaces. The list of tables and list of illustrations are displayed in TOC panel and the TOC is hidden. As an option, the TOC may stay persistent and the list of tables and list of illustrations may appear after the last entry in the TOC. Access to multimedia links shall also be displayed in the TOC panel.

**B.4.1.2.3.1 Drill-up/drill-down.** The TOC may have a drill-up/drill-down function. Drill-up/drill-down buttons shall be displayed above the TOC to allow the user to move through the fully expanded TOC. Drill-up moves the user back up through the fully expanded TOC and drill-down moves the user down through the fully expanded TOC. A TOC is fully expanded when all levels of the TOC are displayed.

**B.4.1.2.4 Classification and distribution bar.** The classification and distribution bar shall be mandatory and shall not be toggled on and off. The classification marking for what is currently on the screen shall be displayed in the classification and distribution bar. The classification marking that appears in the title bar of the outer shell is the overall classification of the entire IETM. The distribution statement identifier (for example: "DISTRIBUTION STATEMENT E") is also displayed in the classification and distribution bar.

**B.4.1.2.5 User navigation panel.** The user navigation panel is comprised of the subtitle bar, the main menu bar, and a project specific bar in the sequence shown in figure B-17. Figure B-23 shows the user navigational panel without the optional subtitle bar. The user navigation panel shall:

- a. Provide the necessary choices/options available at the current time.
- b. Have an optional toggle capability to turn it off.
- c. Remain accessible by persistent visible indication.
- d. When a larger viewing area is necessary, the guide post or compass rose icon representing the minimized guide post shall provide the means to restore the user navigation bar.

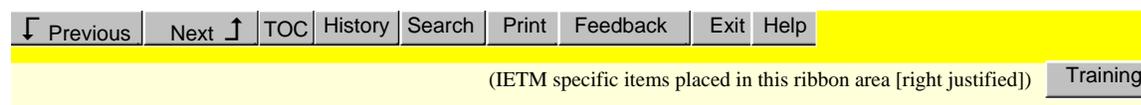


FIGURE B-23. User navigational panel without optional subtitle bar.

**B.4.1.2.5.1 Subtitle bar.** The subtitle bar is optional. When used it shall contain additional identifying information including the title of the information being displayed.

**B.4.1.2.5.2 Main menu bar.** The main menu bar shall provide the user with a comprehensive set of command functions to navigate and sequence through the IETM information. The main menu bar shall provide the following mandatory minimum set of navigation and control functions, which shall be made available to the user and common to all IETMs. The user main menu bar shall be laid out as identified below and shown on figure B-24.

- a. Previous, Next, TOC, History, Search, Print, Feedback, Exit, and Help are required functions and shall appear in exactly this order, left justified, on the main menu bar. When a function is not available it shall be grayed out. This is so users can depend on these items appearing at a standard location in a standard order.
- b. Icons (see figure B-25) are optional and may be used in lieu of the text (Previous, Next, TOC, History, Search, Print, Feedback, Exit, Help).
- c. Additional project specific functions can be added to the main menu bar as an option to using a separate project specific bar (B.4.1.2.5.3). If project specific functions are added to the main menu bar, they will not interfere or replace required functions identified in paragraph a above. Project specific functions will appear to the right of required functions, left justified.

MIL-DTL-24784C(NAVY)  
APPENDIX B

- d. Cascading menus may appear as a child of a function when selected. In a drop-down menu, this appears next to the function selected. There may be several levels of cascading menus. Functions that are not active during any rendering shall be presented as disabled (grayed out).



FIGURE B-24. Main menu bar.

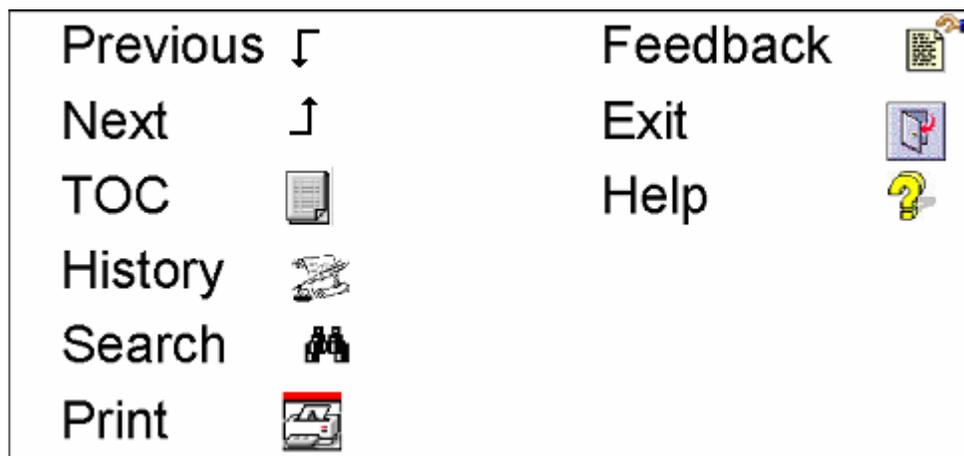


FIGURE B-25. Optional function icons.

B.4.1.2.5.2.1 Previous/next. A navigational function that takes the user through a procedure in a sequential manner. This is not a re-navigation through previously viewed data. An example is: In a non-dynamic procedure a user currently on step 5 would use the Next function to go to step 6. The Previous function would take the user to step 4, irrespective of the navigation path the user has taken.

B.4.1.2.5.2.2 TOC. The TOC function provides access to the table of contents.

B.4.1.2.5.2.3 History. A navigational function that tracks and lists each location (link) a user sees along the navigational path through an IETM. In many cases the reader has the ability to bring the list up and use each location (link) in the history list as a link back to a point in the path. This feature is useful when flipping back and forth between several data types or components of the unit under maintenance. Example: The user opens the IETM to the front matter (A). Follows the link to the section on the landing gear (B). Follows a reference link to an adjustment procedure (C). The history of traversed links will be discretely listed as C, B, A.

B.4.1.2.5.2.4 Search. When specified by the acquiring activity, one or more of the following search functions shall be provided in the IETM (see 6.2).

- a. Context search. A function that allows the user to search within an IETM or data sources within a particular context (such as parts, steps, tables, etc.). The data source must contain predefined context sensitive elements.
- b. Full text search. A navigational function that allows the user to search for any words or phrases within an IETM. This feature does not depend upon the predefinition of key words. For example, in searching for "IFF," the user may find IFF, difference, TIFF, etc., depending on the search criteria.
- c. User defined Boolean search. A search function that permits the logical association of terms to narrow the results of the search by scope (data module, IETM, database, etc.). Commonly supported logic include instances where both x and y appear (Logical AND), instances where neither x nor y appear (Logical NOR), and instances where only x or only y appear (Logical EXCLUSIVE OR).
- d. Across multiple databases/files search. A search function that allows the user to look for key words (assumes common key words) or full text instances in several different data collections, such as databases.

MIL-DTL-24784C(NAVY)  
APPENDIX B

- e. Key word search. A navigational function that allows the user to search an IETM for occurrences of a specific word. System specific key words are predefined with links to their location in the data. Associated advanced features may include:
- (1) Links to the portion of the IETM containing the word.
  - (2) A word wheel that narrows the focus of search with each letter typed into a dialog box.
  - (3) Searches across multiple data sources. An example is: A user might search for the term "IFF". The key word search shall locate each pre-identified occurrence of the term in the data. This shall find all occurrences of IFF that have been predefined as a key word but shall not find all occurrences of the letters IFF.

B.4.1.2.5.2.5 Print. This function brings up print options to the user. These options may be to print the current screen, current selection (by mouse cursor), current information package or entire document. In addition, the traditional options for printer setup may appear.

B.4.1.2.5.2.6 Feedback. This function initiates a feedback sequence of forms, reports and other required administrative and technical data, including TMDERs, Maintenance Corrections Reports (MCRs), and the ordering of repair parts. For an IETM with session control, the audit trail shall be included. This shall be transparent to the end user but useful to administrative and quality assurance personnel.

B.4.1.2.5.2.7 Exit. This function initiates the exit process. The user of the IETM shall always be asked for confirmation before the IETM exit process is completed. If the IETM has session control capabilities such as suspend and resume or browse mode, then additional dialogs shall appear prompting the user of what course of action to take.

B.4.1.2.5.2.8 Help. This function brings up a list of the available help including IETM specific browser help, standard browser help, and help on how to use and navigate through the IETM.

B.4.1.2.5.3 Project specific bar. The project specific bar (see figure B-26) is optional and can be used if additional functions are required. When used, it appears below the main menu bar. The project specific bar shall have a toggle capability for turning the bar on and off. Placement of functions on the project specific bar with respect to main menu bar functions shall be such as to minimize potential for making incorrect selections (for example, the project specific functions may be oriented so that the functions are right justified).

(IETM specific items placed in this ribbon area [right justified]) Training

FIGURE B-26. Project specific bar.

B.4.1.2.5.4 Main content area. The main content area contains the text and graphics of the IETM, specifically excluding the table of contents panel, guide post, classification and distribution bar, user navigation panel and status bar. This area shall not be divided into more than 3 panes (see figures B-18 through B-22).

B.4.1.2.5.5 Status bar. The status bar shall be a horizontal bar located at the bottom of the inner shell (see figure B-17). The status bar shall contain status information including status indicators and icons for active dangers, warnings, cautions, and notes. The status bar may be able to be toggled on and off.

B.4.1.2.6 Additional standard icons. When additional icons are used other than those shown in figure B-25, they shall be the standard icons identified in table B-II. In order to view the icons, the following fonts are required as the standard install for NMCI/IT-21 deployed systems: Webdings, Wingdings, Wingdings 2, and Wingdings 3. When an icon is used, a tool tip must appear when the cursor hovers over the icon, the text must appear next to the icon, or, when noted in table B-II, the text must appear below the icon.

MIL-DTL-24784C(NAVY)  
APPENDIX B

TABLE B-II. Additional standard icons.

Element	Description	Function	Indicator & location	Example
Browse mode	Preview the IETM without executing it. (That is, don't take any automatic actions such as submitting a part order automatically to supply.)	Begin browse mode	Icon: Eyeglasses unselected (Wingdings #036) Location: Project Specific Bar	
		Browse previous	Icon: Double left pointing arrows (Wingdings 3 #072) Location: Project Specific Bar	
		Browse next	Icon: Double right pointing arrows (Wingdings 3 #073) Location: Project Specific Bar	
		Browse mode indicator	Icon: Eyeglasses (Wingdings #036) Text: Browse Mode On Location: Status Bar	 Browse Mode On
			Icon: Eyeglasses (Wingdings #036) with "no or don't" slash (Wingdings 2 #087) Location: Status Bar	 Browse Mode Off
		End browse mode	Icon: Eyeglasses unselected (Wingdings #036) Location: Project Specific Bar	
Links to additional materials	Links to other elements the IETM knows how to get to or return from.	Goto Means that the user cannot return via the IETM to this point (possibly through history, but return here is not guaranteed). Note: Clear the Gosub indication if set.	Icon: Arrow pointing down (Wingdings 3 #135) Text: Goto Location: Within the Main Content area	 Goto
		Gosub Means that the user can return here from the remote location.	Icon: Arrow pointing both left and right (Wingdings 3 #049) Text: Gosub Location: Within the Main Content area	 Gosub

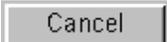
MIL-DTL-24784C(NAVY)  
APPENDIX B

TABLE B-II. Additional standard icons - Continued.

Element	Description	Function	Indicator & location	Example
Links to additional materials – Continued		Gosub in process indication/return icon	Icon: Arrow pointing both left and right (Wingdings 3 #049) Text: Return Location: Within the Main Content area	↔ Return
		Link to external object	Icon: Lightning bolt (Webdings #126) Location: Within the Main Content area	⚡
External links	External systems linked into the IETM.	Link to supply to check on part	Icon: Supply truck (Webdings #118) Text: Supply Location: Within the Main Content area	🚚 Supply
		Link to maintenance administration (e.g., a system to schedule maintenance actions)	Icon: Hammer and wrench (Webdings #064) Text: Maint Admin Location: Within the Main Content area	🔨 Maint Admin
		Call supervisor, QA	Icon: Telephone (Wingdings 2 #039) Text: Call QA/Supervisor Location: Within the Main Content area	☎ Call QA/Supervisor
		Related materials	Icon: Stack of books (Webdings #168) Text: Related Materials Location: Within the Main Content area	📖 Related Materials
Session controls	Controls to allow a user to exit, pause, resume, or abort a session.	Normal exit save and update history. Clear state table.	Icon: Check mark (Wingdings 2 #080) Text: Complete Location: Guide Post	✓ Complete
		Session suspend. Save current state and do not update history.	Icon: Two vertical bars (Webdings #059) Text: Pause Session Location: Guide Post	⏸ Pause Session
		Session resume	Text: Session Resume Location: Guide Post	Session Resume

MIL-DTL-24784C(NAVY)  
APPENDIX B

TABLE B-II. Additional standard icons - Continued.

Element	Description	Function	Indicator & location	Example
Graphic hot spot	For use on graphics with hot spots.	Hot spot indication	Icon: Text or cross-hair (Wingdings #177). When highlighting text for selectable elements (hot spots), use the standard web practice of text that is blue underlined and turns purple after followed. Location: Within the Main Content area	<a href="#">Click Me</a> or 
Search		Search local TOC	Icon: Binoculars (graphic) Text: Search TOC Location: Project Specific Bar	 Search TOC
Working under: Danger, Warning, Caution, Note	In IETMs that can keep track of what dangers, warnings, cautions, and notes are in effect - these symbols are used in the Status Bar to indicate the user is working under one or more of these conditions. Optionally, to indicate that more than one of a particular condition apply, the icon can be displayed with a numeric superscript to indicate how many.	Minimized danger icon indicating danger(s) apply	Icon: Red triangle with "D" Location: Status Bar	
		Minimized warning icon indicating warning(s) apply	Icon: Orange triangle with "W" Location: Status Bar	
		Minimized caution icon indicating caution(s) apply	Icon: Yellow triangle with "C" Location: Status Bar	
		Minimized note icon indicating note(s) apply	Icon: Circle with "i" in middle (Webdings #105) Location: Status Bar	
Feedback (TMDER)		Form cancel	Button with text: Cancel Location: Main Content area, beneath the form	
		Form print	Button with text: Print Location: Main Content area, beneath the form	

MIL-DTL-24784C(NAVY)  
APPENDIX B

TABLE B-II. Additional standard icons - Continued.

Element	Description	Function	Indicator & location	Example
Bookmarks and annotations – creation	Icon used to indicate that a bookmark or annotation can be created.	Public bookmark	Icon: Open book (Wingdings #038) Text: Create Public Bookmark Location: Project Specific Bar	 Create Public Bookmark
		Personal bookmark	Icon: Open book (Wingdings #038) enclosed in greater than (Wingdings #215) and less than (Wingdings #216) symbols Text: Create Personal Bookmark Location: Project Specific Bar	<<  >> Create Personal Bookmark
		Public annotation	Icon: Page with corner folded over (Wingdings #050) Text: Create Public Annotation Location: Project Specific Bar	 Create Public Annotation
		Personal annotation	Icon: Page with corner folded over (Wingdings #050) enclosed in greater than (Wingdings #215) and less than (Wingdings #216) symbols Text: Create Personal Annotation Location: Project Specific Bar	<<  >>Create Personal Annotation

MIL-DTL-24784C(NAVY)  
APPENDIX B

TABLE B-II. Additional standard icons - Continued.

Element	Description	Function	Indicator & location	Example
Bookmarks and annotations - traverse to or read	<p>1) Icon used to indicate that you can go to a public or personal bookmark or to a list of all public bookmarks. Personal bookmarks are only available to the creator of the personal bookmark.</p> <p>2) Icon used to indicate that a public or personal annotation exists, to allow you to read a public, personal, or global data annotation, or to allow you to go to a list of all public annotations. Personal annotations are only available to the creator of the personal annotation.</p>	Public bookmark indicator	Icon: Open book (Wingdings #038) Text: None Location: Within the Main Content area	
		Go to list of all public bookmarks	Icon: Open book (Wingdings #038) Text: Go to Bookmarks List Location: Project Specific Bar	 Go to Bookmarks List
		Personal bookmark indicator	Icon: Open book (Wingdings #038) enclosed in greater than (Wingdings #215) and less than (Wingdings #216) symbols Text: None Location: Within the Main Content Area	
		Public annotation indicator	Icon: Page with corner folded over (Wingdings #050) Text: Read Annotation Location: Within the Main Content area	 Read Annotation
		Go to a list of all public annotations	Icon: Page with corner folded over (Wingdings #050) Text: Go to Annotations List Location: Project Specific Bar	 Go to Annotations List
		Personal annotation indicator	Icon: Page with corner folded over (Wingdings #050) enclosed in greater than (Wingdings #215) and less than (Wingdings #216) symbols Text: Read Personal Annotation Location: Within the Main Content area	 Read Personal Annotation

MIL-DTL-24784C(NAVY)  
APPENDIX B

TABLE B-II. Additional standard icons - Continued.

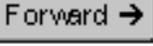
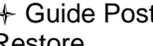
Element	Description	Function	Indicator & location	Example
Bookmarks and annotations - traverse to or read - Continued		Global data annotation indicator	Icon: Globe (Webdings #254) preceding page with corner folded over (Wingdings #050) Text: Read Global Data Annotation Location: Within the Main Content area	  Read Global Data Annotation
Voice input/output control		Toggle on and off voice input recognition	Icon: Ear (Webdings #079) with sound coming in (Webdings 239) Text: Turn Voice Recog On Location: Project Specific Bar	 Turn Voice Recog On
		Voice input on indicator	Icon: Ear (Webdings #079) with sound coming in (Webdings #079) Location: Status Bar	
		Toggle on and off voice output	Icon: Head with sounds coming out (Webdings #151) Text: Turn Voice Output On Location: Project Specific Bar	 Turn Voice Output On
		Voice output on indicator	Icon: Head with sounds coming out (Webdings #151) Location: Status Bar	
Links within IETM		Parts (IPB)	Icon: Number 10 in a circle (Wingdings 2 #126) Text: Parts Location: Project Specific Bar	 Parts
		Diagnostics	Icon: +/- Text: Diagnostics Location: Project Specific Bar	+/- Diagnostics

MIL-DTL-24784C(NAVY)  
APPENDIX BTABLE B-II. Additional standard icons - Continued.

Element	Description	Function	Indicator & location	Example
Links within IETM – Continued		Wiring diagrams	Icon: Off page connector with X inside (Wingdings #214) Text: Wiring Location: Project Specific Bar	 Wiring
		Support equipment	Icon: Waving flag (Wingdings #079) Text: Support Equipment Location: Project Specific Bar	 Support equipment
		Training	Icon: Schoolhouse (Webdings #071) Text: Training Location: Project Specific Bar	 Training
		Link to multimedia	Icon: Clapboard (Webdings #183) Text: Multimedia Location: Within the Main Content area	 Multimedia
		Link to figure	Icon: Painting (Webdings #159) Text: Figure <i>or</i> Figure X, centered below the icon Location: Within the Main Content area where an in-line figure would normally appear	 Figure
		Link to table	Icon: Square surrounded by two additional squares (Wingdings 2 #170) Text: Table <i>or</i> Table X, centered below the icon Location: Within the Main Content area where an in-line table would normally appear	 Table

MIL-DTL-24784C(NAVY)  
APPENDIX B

TABLE B-II. Additional standard icons - Continued.

Element	Description	Function	Indicator & location	Example
General navigation		Next (chronological)	Button with text: Next followed by an arrow pointing right and then up Location: Main Menu Bar	
		Previous (chronological)	Button with text: Previous preceded by an arrow pointing left and then down Location: Main Menu Bar	
		Back (logical)	Button with text: Back preceded by a left pointing arrow. If using a COTS browser with its own Back function, this icon is not needed Location: Project Specific Bar	
		Forward (logical)	Button with text: Forward followed by a right pointing arrow. If using a COTS browser with its own Forward function, this icon is not needed Location: Project Specific Bar	
		Undo	Icon: Curled counter-clockwise arrow (Wingdings 3 # 081) Text: Undo Location: Project Specific Bar	
		Guide Post minimized	Icon: Compass rose (Webdings #108) Text: Guide Post Restore Location: Anywhere - can be moved around to reveal information that is obscured by it.	
		Zoom in (graphic)	Icon: Magnifying glass with + (graphic) Location: Project Specific Bar	

MIL-DTL-24784C(NAVY)  
APPENDIX B

TABLE B-II. Additional standard icons - Continued.

Element	Description	Function	Indicator & location	Example
General navigation – Continued		Zoom out (graphic)	Icon: Magnifying glass with – (graphic) Location: Project Specific Bar	
		Pan graphic	Icon: Hand (Wingdings 2 #078) Location: Project Specific Bar - cursor changes to icon when pan graphic is selected, and returns to normal when pan graphic is deselected.	
		Return to original graphic view	Icon: House (Webdings #072) Location: Project Specific Bar	
		Acronyms/ abbreviations	Icon: AA symbol (Webdings #062) Text: Acronyms/ Abbreviations Location: Within the Main Content area	AA Acronyms/ Abbreviations
		Version information	Icon: Interstate road sign (Webdings #100) Text: Version Info Location: Project Specific Bar	♥ Version Info
		Step completed	Icon: Checkbox (Wingdings 2 #082) Location: Within the Main Content area	<input checked="" type="checkbox"/> Adjust
		Waiting for program action	Icon: Hour glass (Wingdings #054) Location: Replaces cursor	
		Return user interface to default	Icon: Picture frame with panes internal (Webdings #162) with smiley face (Wingdings #074) Location: Guide Post	
Change Markings Toggle		Toggles change markings on and off	Icon: Red crayon (Wingdings 2 #036) Text: Change Markings Location: On the Project Specific Bar	 Change Markings

MIL-DTL-24784C(NAVY)  
APPENDIX B

B.4.2 Screen sizes. The size and resolutions of various display devices such as desktops, laptops, and personal digital assistance devices shall be as provided below.

- a. PC screen size. The minimum screen size that the IETM shall be authored to operate on a desktop or laptop is 800 wide x 600 high pixels. The user interface region inner shell layout templates in figures B-16 through B-22 shall be used.
- b. Personal digital assistant (PDA) and pocket PC screen size. At present there are 3 different resolutions for the PDA and pocket PC. An IETM shall be able to be used at these alternative resolutions.
  - (1) 160 x 160 monochrome and color.
  - (2) 320 x 240 monochrome and color.
  - (3) 320 x 480 monochrome and color.
- c. Electronic book and tablet screen size. The minimum screen size that the IETM shall be authored to operate on an electronic book or tablet is 800 wide x 600 high pixels.

B.4.3 Style and format on the display.

B.4.3.1 Inner shell colors. Consideration shall be given for capabilities of intended display devices. It is recommended to design for the least capable display device (8-bit devices, etc). Unless otherwise specified herein, text shall be black (#000000 or #000033) and background shall be white (#FFFFFF). This aids in support of printing without loss of content. There may be operational exceptions such as night ops and where color has special meaning. In these cases, the safe color palette shown in figure B-27 shall be used. Figure B-27 shows the 216 windows colors with their corresponding HEX values and RGB values.

MIL-DTL-24784C(NAVY)  
APPENDIX B

990033 R: 153 G: 000 B: 051	FF3366 R: 255 G: 051 B: 102	CC0033 R: 204 G: 000 B: 051	FF0033 R: 255 G: 000 B: 051	FF9999 R: 255 G: 153 B: 153	CC3366 R: 204 G: 051 B: 102	FFCCFF R: 255 G: 204 B: 255	CC6699 R: 204 G: 051 B: 153	993366 R: 153 G: 051 B: 102	660033 R: 102 G: 000 B: 051	CC3399 R: 204 G: 051 B: 153	FF99CC R: 255 G: 153 B: 204	FF66CC R: 255 G: 102 B: 204	FF99FF R: 255 G: 153 B: 255	FF6699 R: 255 G: 102 B: 153	CC0066 R: 204 G: 000 B: 102
FF0066 R: 255 G: 000 B: 102	FF3399 R: 255 G: 051 B: 153	FF0099 R: 255 G: 000 B: 051	FF33CC R: 255 G: 051 B: 204	FF00CC R: 255 G: 000 B: 204	FF66FF R: 255 G: 102 B: 255	FF33FF R: 255 G: 051 B: 255	FF00FF R: 255 G: 000 B: 255	CC0099 R: 204 G: 000 B: 153	990066 R: 153 G: 000 B: 102	CC66CC R: 204 G: 102 B: 204	CC33CC R: 204 G: 051 B: 204	CC99FF R: 204 G: 153 B: 255	CC66FF R: 204 G: 102 B: 255	CC33FF R: 204 G: 051 B: 255	993399 R: 153 G: 051 B: 153
CC00CC R: 204 G: 000 B: 204	CC00FF R: 204 G: 000 B: 255	9900CC R: 153 G: 000 B: 204	990099 R: 153 G: 000 B: 153	CC99CC R: 204 G: 153 B: 204	996699 R: 153 G: 102 B: 153	663366 R: 102 G: 051 B: 102	660099 R: 102 G: 000 B: 153	9933CC R: 153 G: 051 B: 204	660066 R: 102 G: 000 B: 102	9900FF R: 153 G: 000 B: 255	9933FF R: 153 G: 051 B: 255	9966CC R: 153 G: 051 B: 204	330033 R: 051 G: 000 B: 051	663399 R: 102 G: 051 B: 153	6633CC R: 102 G: 051 B: 204
6600CC R: 102 G: 000 B: 204	9966FF R: 153 G: 102 B: 255	330066 R: 051 G: 000 B: 102	6600FF R: 102 G: 000 B: 255	6633FF R: 102 G: 051 B: 255	CCCCFF R: 204 G: 204 B: 255	9999FF R: 255 G: 153 B: 255	9999CC R: 153 G: 153 B: 204	6666CC R: 102 G: 102 B: 204	6666FF R: 102 G: 102 B: 255	666699 R: 102 G: 102 B: 153	333366 R: 051 G: 000 B: 102	333399 R: 051 G: 051 B: 153	330099 R: 051 G: 000 B: 153	3300CC R: 051 G: 204 B: 204	3300FF R: 051 G: 204 B: 255
3333FF R: 051 G: 051 B: 255	3333CC R: 051 G: 051 B: 204	0066FF R: 000 G: 102 B: 255	0033FF R: 000 G: 051 B: 255	3366FF R: 051 G: 102 B: 255	3366CC R: 051 G: 102 B: 204	000066 R: 000 G: 000 B: 102	000033 R: 000 G: 000 B: 051	0000FF R: 000 G: 000 B: 255	000099 R: 000 G: 000 B: 153	0033CC R: 000 G: 051 B: 204	0000CC R: 000 G: 000 B: 204	336699 R: 051 G: 102 B: 153	0066CC R: 000 G: 102 B: 204	99CCFF R: 153 G: 204 B: 255	6699FF R: 102 G: 153 B: 255
003366 R: 000 G: 051 B: 102	6699CC R: 102 G: 153 B: 204	006699 R: 000 G: 102 B: 153	3399CC R: 051 G: 153 B: 204	0099CC R: 051 G: 204 B: 204	66CCFF R: 102 G: 204 B: 255	3399FF R: 051 G: 153 B: 255	003399 R: 000 G: 051 B: 153	0099FF R: 000 G: 153 B: 255	33CCFF R: 051 G: 204 B: 255	00CCFF R: 000 G: 204 B: 255	99FFFF R: 153 G: 255 B: 255	66FFFF R: 102 G: 255 B: 255	33FFFF R: 051 G: 255 B: 255	00FFFF R: 000 G: 255 B: 255	00CCCC R: 000 G: 204 B: 204
009999 R: 000 G: 153 B: 153	669999 R: 102 G: 153 B: 153	99CCCC R: 051 G: 204 B: 204	CCFFFF R: 204 G: 255 B: 255	33CCCC R: 051 G: 204 B: 204	66CCCC R: 102 G: 204 B: 204	339999 R: 051 G: 153 B: 153	336666 R: 051 G: 102 B: 102	006666 R: 000 G: 102 B: 102	003333 R: 000 G: 051 B: 204	00FFCC R: 000 G: 255 B: 204	33FFCC R: 051 G: 255 B: 204	33CC99 R: 051 G: 204 B: 153	00CC99 R: 051 G: 204 B: 153	66FFCC R: 102 G: 255 B: 204	99FFCC R: 153 G: 255 B: 204
00FF99 R: 000 G: 255 B: 153	339966 R: 051 G: 153 B: 102	006633 R: 000 G: 102 B: 051	336633 R: 051 G: 102 B: 051	669966 R: 102 G: 153 B: 102	66CC66 R: 102 G: 204 B: 102	99FF99 R: 153 G: 255 B: 153	66FF66 R: 102 G: 255 B: 102	339933 R: 051 G: 153 B: 051	99CC99 R: 153 G: 204 B: 153	66FF99 R: 102 G: 255 B: 153	33FF99 R: 051 G: 153 B: 153	33CC66 R: 051 G: 204 B: 102	00CC66 R: 000 G: 204 B: 102	66CC99 R: 102 G: 204 B: 153	009966 R: 000 G: 153 B: 102
009933 R: 000 G: 153 B: 153	33FF66 R: 051 G: 255 B: 102	00FF66 R: 000 G: 255 B: 102	CCFFCC R: 204 G: 255 B: 204	CCFF99 R: 204 G: 255 B: 153	99FF66 R: 153 G: 255 B: 102	99FF33 R: 153 G: 255 B: 051	00FF33 R: 000 G: 255 B: 051	33FF33 R: 051 G: 255 B: 051	00CC33 R: 000 G: 204 B: 051	33CC33 R: 051 G: 204 B: 051	66FF33 R: 102 G: 255 B: 051	00FF00 R: 000 G: 255 B: 000	66CC33 R: 102 G: 204 B: 051	006600 R: 000 G: 102 B: 000	003300 R: 000 G: 051 B: 000
009900 R: 000 G: 153 B: 000	33FF00 R: 051 G: 255 B: 000	66FF00 R: 102 G: 255 B: 000	99FF00 R: 153 G: 255 B: 000	66CC00 R: 102 G: 204 B: 000	00CC00 R: 000 G: 204 B: 000	33CC00 R: 051 G: 204 B: 000	339900 R: 051 G: 153 B: 000	99CC66 R: 153 G: 204 B: 102	669933 R: 102 G: 153 B: 051	99CC33 R: 153 G: 204 B: 051	336600 R: 051 G: 000 B: 000	669900 R: 102 G: 153 B: 000	99CC00 R: 153 G: 204 B: 000	CCFF66 R: 204 G: 255 B: 102	CCFF33 R: 204 G: 255 B: 051
CCFF00 R: 204 G: 255 B: 000	999900 R: 153 G: 153 B: 000	CCCC00 R: 204 G: 204 B: 000	CCCC33 R: 204 G: 204 B: 051	333300 R: 051 G: 051 B: 000	666600 R: 102 G: 102 B: 000	999933 R: 204 G: 153 B: 051	CCCC66 R: 204 G: 204 B: 102	666633 R: 102 G: 102 B: 051	999966 R: 153 G: 153 B: 102	CCCC99 R: 204 G: 204 B: 153	FFFFCC R: 255 G: 255 B: 204	FFFF99 R: 255 G: 255 B: 153	FFFF66 R: 255 G: 255 B: 102	FFFF33 R: 255 G: 255 B: 051	FFFF00 R: 255 G: 255 B: 000
FFCC00 R: 255 G: 204 B: 000	FFCC66 R: 255 G: 204 B: 102	FFCC33 R: 255 G: 204 B: 051	CC9933 R: 204 G: 153 B: 051	996600 R: 153 G: 102 B: 000	CC9900 R: 204 G: 153 B: 000	FF9900 R: 255 G: 153 B: 000	CC6600 R: 204 G: 102 B: 000	993300 R: 153 G: 051 B: 000	CC6633 R: 204 G: 102 B: 051	663300 R: 102 G: 051 B: 000	FF9966 R: 255 G: 153 B: 102	FF6633 R: 255 G: 102 B: 051	FF9933 R: 255 G: 153 B: 051	FF6600 R: 255 G: 102 B: 000	CC3300 R: 204 G: 051 B: 000
996633 R: 153 G: 102 B: 051	330000 R: 051 G: 000 B: 000	663333 R: 102 G: 051 B: 051	996666 R: 153 G: 102 B: 102	CC9999 R: 204 G: 153 B: 153	993333 R: 153 G: 051 B: 051	CC6666 R: 204 G: 102 B: 102	FFCCCC R: 255 G: 204 B: 204	FF3333 R: 255 G: 051 B: 051	CC3333 R: 204 G: 051 B: 051	FF6666 R: 255 G: 102 B: 102	660000 R: 102 G: 000 B: 000	990000 R: 153 G: 000 B: 000	CC0000 R: 204 G: 000 B: 000	FF0000 R: 255 G: 000 B: 000	FF3300 R: 255 G: 051 B: 000
CC9966 R: 204 G: 153 B: 102	FFCC99 R: 255 G: 204 B: 153	FFFFFF R: 255 G: 255 B: 255	CCCCCC R: 204 G: 204 B: 204	999999 R: 153 G: 153 B: 153	666666 R: 102 G: 102 B: 102	333333 R: 051 G: 051 B: 051	000000 R: 000 G: 000 B: 000								

FIGURE B-27. Inner shell colors.

B.4.3.2 Display of text. Textual information shall be displayed in data panes of the client area. Text shall be displayed in uppercase and lowercase characters. Text shall be single spaced (double spaced between procedural steps).

B.4.3.2.1 Character font. All narrative text, titles, headings, callouts, and special characters shall be sans-serif font. The minimum font size for electronic presentation is 8 points. Table B-III lists the minimum recommended character heights for various reference viewing distances and shall be used to determine the appropriate character font size. Unless otherwise specified by the acquiring activity (see 6.2), the minimum reference viewing distance shall be 36 inches.

MIL-DTL-24784C(NAVY)  
APPENDIX B

TABLE B-III. Minimum and optimal character heights for various viewing distances at viewing angles of 16 and 20 minutes of arc.

Viewing distance (inches)	Minimum character height 16 minutes of arc (inches)	Optimal character height 20 minutes of arc (inches)
18	0.08	0.11
24	0.11	0.14
30	0.14	0.17
36	0.17	0.21
42	0.20	0.24
48	0.22	0.28
54	0.25	0.31
60	0.28	0.35
66	0.31	0.38
72	0.34	0.42

NOTE: The formula used for the above calculations is: Character Height = [(Min of Arc x Viewing Distance)/(57.3 x 60)].

B.4.3.2.2 Custom developed fonts. Fonts that the acquiring activity agrees are needed shall be made available as a library of re-useable fonts that any developer can use and shall be included in the standard deployed NMCI environment (see 6.2).

B.4.3.2.3 Character spacing. Character spacing in textual displays shall be no less than 0.1 character height. Between word spacing for textual displays shall be one character width (em space).

B.4.3.2.4 Line dimensions. Between line spacing for textual display distances 0.33 of character height exclusive of superscripts and subscripts and no less than 0.15 character height when superscripts and subscripts are displayed.

B.4.3.2.5 Text panes. The width of the text pane shall range from 30-60 characters per line.

B.4.3.2.5.1 Margins. Margins shall be required for all text panes to prevent information from being obscured by borders or information in adjacent panes.

B.4.3.2.5.2 Justification. Left justification shall be used for all lines of text displayed as sentences or paragraphs.

B.4.3.2.5.3 Word wrapping. Lines of text shall wrap, so that no line extends beyond the limits of the pane or right margin, including when resized. Lines shall be broken only between individual words or within a word when that word is explicitly hyphenated. If resized text exceeds the text pane area, vertical scrolling shall be used.

B.4.3.2.5.4 Paragraph titles. Paragraphs and subparagraphs shall have titles. The title shall begin at the left margin. The paragraph title shall describe that paragraph's contents.

B.4.3.2.5.4.1 Paragraph title format. Paragraph and subparagraph titles shall be formatted as follows:

- a. Primary paragraph titles shall be bold and capital case. Block text shall start on a separate line and shall have a blank line between the title and text block.
- b. Subparagraph level 1 titles shall be bold and title case. Block text shall start on a separate line and shall have a blank line between the title and text block.

MIL-DTL-24784C(NAVY)  
APPENDIX B

- c. Subparagraph level 2 titles shall be bold, title case and end with a period. Block text shall start immediately after the title.
- d. Subparagraph level 3 titles shall indent the first line 5 spaces and the remaining text flush left. The title shall be bold, title case and end with a period. Block text shall start immediately after the title.
- e. Subparagraph level 4 titles shall indent the first line 10 spaces and the remaining text flush left. The title shall be bold, capital case and end with a period. Block text shall start immediately after the title.

B.4.3.2.5.5 Procedural steps. Procedural steps, sub-steps, and checklist items shall be formatted as follows:

- a. First level procedural steps shall be numbered consecutively with Arabic numerals, no title, and block indented under first word of the step.
- b. Second level procedural steps shall be numbered consecutively with lower case letters, no title, and block indented under first word of the step.
- c. Third level procedural steps shall be numbered consecutively with Arabic numerals enclosed in parenthesis, no title, and block indented under first word of the step.

B.4.3.2.5.6 Display of procedural steps for linear IETMs. For **linear IETMs**, there shall be no limit to the number of steps and substeps that can be displayed at any one time. Unless otherwise specified by the acquiring activity, each step shall include a feature that permits the user to acknowledge that individual steps have been performed, for example, a check box or an icon. For diagnostics, testing, and troubleshooting, where there is a decision point, hot spots to navigate the user to the next step in the process shall be provided. Procedural steps shall be scrollable. As a default the text shall be on the right half of the display with any applicable illustration in-line or selectable. (See B.4.1.2.1 for methods of dividing the data panes.)

B.4.3.2.5.7 Display of procedural steps for non-linear IETMs. For **non-linear IETMs**, procedural steps shall be displayed in one of the methods described below. Unless otherwise specified by the acquiring activity, for each method listed below, acknowledgement that the specified number of steps has been performed shall occur before the next step or set of steps appear on the screen. As a default, the text shall be on the left half of the display with any applicable illustration displayed in the right half or selectable (see B.4.1.2.1 for methods of dividing the data panes). Once a specific method is chosen, it shall be used consistently throughout the IETM.

- a. Unlimited steps. No limit to the number of steps and substeps that appear on a frame. The next set of steps shall be displayed by clicking on the Next button or scrolling. Functionality such as highlighting active steps (bold text), dimming completed steps, or dimming or keeping steps that have yet to be performed in normal text may be used.
- b. One primary step. Only one primary step displayed at a time. The entire procedure (all steps) shall be scrollable in a browse mode feature (see B.3.2.15).
- c. Up to three primary steps. A maximum of up to three primary steps at any one time may be displayed. The entire procedure (all steps) shall be scrollable in a browse mode feature (see B.3.2.15).
- d. Up to three primary steps with a Next button. A maximum of up to three primary steps at any one time may be displayed. Following the performance of each step and after the Next button is selected, the completed steps shall dim and the current step shall appear in bold text. The entire procedure (all steps) shall be scrollable in a browse mode feature (see B.3.2.15).

B.4.3.2.5.8 Display of dangers, warnings, and cautions. Dangers, warnings, and cautions, shall be treated as alerts (see B.4.3.2.5.9) and be displayed in-line. The signal word panel, the message text, and the safety warning symbol or hazardous material symbol (if used) shall be contained within the alert border and displayed as shown in figure B-29. The alert border shall be the same color as the safety background color used for the signal word panel.

MIL-DTL-24784C(NAVY)  
APPENDIX BFIGURE B-28. Display of dangers, warnings, and cautions.

B.4.3.2.5.9 Alerts. Only dangers, warnings, and cautions are considered alerts. See B.4.3.2.5.9.2 for alert display and acknowledgement requirements.

B.4.3.2.5.9.1 Use of common alerts. Common alerts are those alerts that are used (linked to) by many different steps or tasks and /or systems. Common alerts shall be used as much as possible. A common alert shall be prepared once and worded to ensure the alert meaning is consistent wherever it is used. If a common alert requires modification, it shall only be required to be changed once for all uses.

MIL-DTL-24784C(NAVY)  
APPENDIX B

B.4.3.2.5.9.2 Display and acknowledgement of alerts. When specified by the acquiring activity (see 6.2), alerts shall require manual acknowledgement by the user of the IETM. Acknowledgement of alerts requires an audit trail function. Refer to B.3.2.7 for an explanation of the audit trail function. When acknowledgement is required, the in-line dangers, warnings, and cautions shall be acknowledged as follows:

- a. An “OK” push button or check box located under or adjacent to the alert shall be used for acknowledgement. If the procedure being displayed is scrollable, lack of acknowledgement shall not impede scrolling the procedure (see figure B-29). If the procedure being displayed is not scrollable, lack of acknowledgement shall not impede the user from using the NEXT push button to continue with the remainder of the procedure or task.
- b. When multiple alerts are displayed in-line on a frame, an “OK” push button or check box located under or adjacent to each alert shall be used for acknowledgement. Lack of acknowledgement of all of the alerts on that frame shall not impede the viewing of any additional information (see figure B-30).
- c. When an alert or alerts apply to the entire task or procedure, the alert shall be displayed in-line prior to the applicable data. Once the alert has been read or acknowledged, the applicable danger, warning or caution alert icon shall be displayed in the status bar of the inner shell and remain persistent until the entire task or procedure has been completed (see figure B-31). Clicking on the icon at any time during the conduct of the task or procedure shall display the text of the applicable danger, warning, or caution.
- d. When alert acknowledgement is not required, the “OK” push button or the check box shall not be displayed. The viewing of the remainder of the task or procedure shall not be impeded.

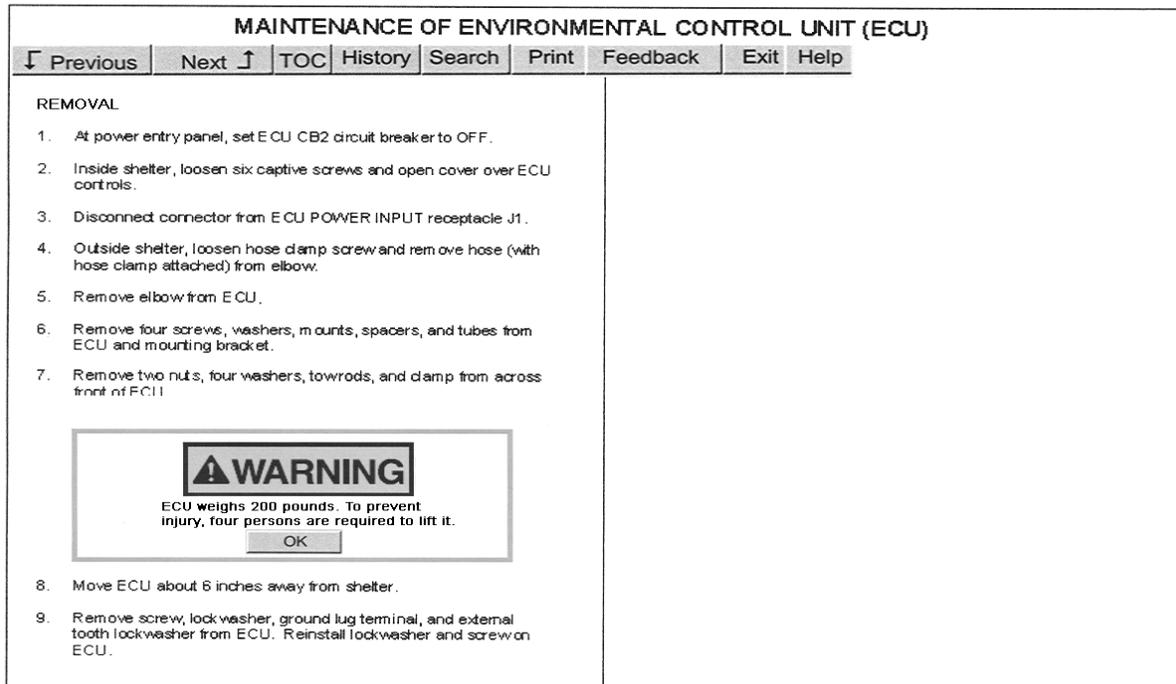


FIGURE B-29. Example of in-line warning alert acknowledgement.



MIL-DTL-24784C(NAVY)  
APPENDIX B

B.4.3.2.5.10 Display of notes. Notes in an IETM shall displayed as shown in figure B-32. Notes shall be displayed in-line prior to the applicable text (see figure B-33). If the note is deemed important enough to require acknowledgement, the note shall be placed in a message dialog box (see figure B-34), and the note shall stay persistent until the user acknowledges the message by clicking on the “OK” push button.



FIGURE B-32. Display of a note.

MEDIA CONVERTER ASSEMBLY REMOVAL AND REPLACEMENT								
↓ Previous	Next ↑	TOC	History	Search	Print	Feedback	Exit	Help
<p>REMOVAL</p> <p>1. On SHF radio (if in use), ensure that BATTERY switch is set to ON.</p>								
<p><b>NOTE</b></p> <p>Turning off the power converter also removes ac power from the router and SHF radio.</p>								
<p>2. On power converter, set POWER switch to OFF.</p>								
<p>3. Disconnect cables from media converter:</p> <p>W033-P2 W034-P2 W043-P2 W044-P2 W050-P2 (power cord)</p>								
<p>4. Remove two hex screws, lockwashers, and flat washers securing media converter mounting bracket to kneewall mounting rail nearest curbside wall.</p>								
<p>5. Remove media converter chassis from mounting bracket.</p>					<p>Figure 5. Media Converter Chassis Removal and Replacement.</p>			

Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE B-33. Example of an in-line note.

MIL-DTL-24784C(NAVY)  
APPENDIX B

**MEDIA CONVERTER ASSEMBLY REMOVAL AND REPLACEMENT**

**REMOVAL**

**NOTE**

Make sure that the crossover switch and BCN termination jumper are set properly.

1. Set switch S1 to X and install BCN termination jumper.
2. Insert module into media converter chassis and secure with two captive screws.
3. Connect cables to media converter as follows:
4. On module 1, connect:
 

W033-P2	to J1
W043-P2	to J2
5. On module 2, connect:
 

W034-P2	to J3
W044-P2	to J4
6. On power converter, set POWER switch to ON.

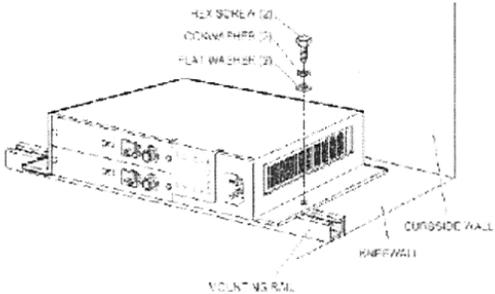


Figure 6. Media Converter Chassis Removal and Replacement.

Note: Sample arrangement only. Size and legibility requirements do not necessarily conform to minimum specification requirements.

FIGURE B-34. Example of a note in a message dialog box.

B.4.3.2.5.11 Security classification markings. An indication of the classification/distribution level of the information being displayed shall be indicated in the classification and distribution bar of the inner shell (see figure B-17). Technical data developed using this specification shall have security classification markings in accordance with SECNAVINST 5510.36. Table B-IV identifies the security classification marking and color requirements for the classification and distribution bar.

MIL-DTL-24784C(NAVY)  
APPENDIX B

TABLE B-IV. Classification and distribution bar security classification marking requirements.

Classification	Text and color requirement	Example
	No text required to indicate unclassified. Green background (color code for block: #00CC33)	
Confidential	“CONFIDENTIAL” centered in the middle of the bar with a light-blue background (color code for block: #00CCFF)	
NOFORN  NOFORN is a distribution restriction and can apply to unclassified and classified data	“NOFORN” centered in the middle of the bar with a light-green or light-blue background or hyphenated with the classification such as “CONFIDENTIAL-NOFORN”	
Secret	“SECRET” in white - centered in the middle of the bar with a red background (color code for block: #FF0033)	
Top Secret	“TOP SECRET” in white - centered in the middle of the bar with an orange background (color code for block: #FF9933)	

B.4.3.2.5.11.1 Displayed data items including graphics (on screen or printed). By placing the classification/distribution in the title tags of the XML source file, the classification markings shall show on the classification and distribution bar and will be printed on a page printed from the browser. Because graphics can be printed separately from the browser print function, classification markings shall be embedded within the graphic at the top and bottom.

B.4.3.2.5.12 Revisions. The user shall have the option to view change markings within the revised IETM. The default for viewing change markings is set to off so that change markings are not displayed unless the user requests them.

B.4.3.2.5.12.1 Display of change markings. When specified by the acquiring activity (see 6.2), change markings to distinguish changed information shall be easily distinguishable on-screen and when printed. Change bars (vertical bar) shall be able to be toggled on or off (see table B-II for standard icons.) See B.4.3.2.5.12.1.1 and B.4.3.2.5.12.1.2 for change marking methods used to identify additions and deletions.

MIL-DTL-24784C(NAVY)  
APPENDIX B

B.4.3.2.5.12.1.1 Identifying additions.

- a. When new information is added within an element, such as new text, the added material shall be in italics and the color red. Example: This is unchanged. *This is changed.* This is unchanged.
- b. When a new numbered element is inserted, it shall be numbered the same as the preceding item with an alpha character at the end of the number. A new element between 1 and 2 becomes *1A*. Example: *1A. New Para Title. This is new.*
- c. Sheets added to a set of multi-sheet illustrations that fall between existing sheets shall be assigned the preceding number plus an alpha character. For example, if a sheet is added between sheets 2 and 3, the added sheet becomes 2A. If possible, the new sheet shall be added after the last sheet and be assigned the next consecutive number.
- d. Where a change to an illustration adds index numbers between existing numbers, the added numbers shall be assigned the preceding index number plus an alpha character. For example, an index number added between index numbers 22 and 23 becomes index 22A. Suffixed index numbers need not be eliminated for a non-superseding revision unless the illustration is to be re-drawn.

B.4.3.2.5.12.1.2 Identifying deletions.

- a. Deleted numbered elements (e.g., steps, list items, tables, figures, etc.) shall have the word (Deleted) in italics and the color red next to the number of the element deleted. Example: Figure 1 (*Deleted*)
- b. Deleted text within an element shall be shown as three red asterisks. Example: This is unchanged. *\*\*\**  
This is unchanged.
- c. If an index number is deleted from an illustration, the word “(Deleted)” in parentheses shall be placed after the index number.

B.4.3.3 Tables. Tabular information shall be displayed as cells of textual information or a graphic. When tables contain textual elements, those elements shall conform to the requirements herein, for textual information. Graphical elements within a table shall conform to the requirements herein, for graphical information.

B.4.3.3.1 Table format. Tables designated as “**standard information**” tables in MIL-DTL-24784/22 shall have no deviations to the number of columns and the titles in the column headings. The table format and table headings are automatically generated by the applicable DTD and style sheet used for the information.

B.4.3.3.2 Display of tables. Tables shall be displayed in a left-to-right, top-to-bottom array of cells. Tables shall have column headers and, if applicable, row headers. Requirements for tables appearing within the body of the IETM (in-line), and those appearing in their own separate window or pane (out-line) shall be in accordance with table B-V.

MIL-DTL-24784C(NAVY)  
APPENDIX B

TABLE B-V. Navigation and display of tables.

Tables – General (mandatory)	Access	View with one click (that is, without an intermediate stop)
	Appearance	May view as in-line or out-line table View with standard web practices
	References	TOC links shall all be one click directly to table Links in the body or table to tables shall be normal hypertext Example: <a href="#">See Table 3</a> See B.4.3.5.3 for use of icon
Table Headers (if used)	Appearance	The header shall not scroll away when rows are scrolled
	Font	Bold and/or larger fonts optional Same font as body is preferred
	Background	No gray background, other colors optional (printing issue)
	Border	Borders shall be same size lines as rest of table
Table Cells (mandatory)	Font	For compression, cell fonts may be smaller but must be controlled by style sheet
	Background	White background, other colors optional but consider printing impact
	Border	Borders shall be single or double lines Note: Small tabular text may have no lines, if controlled by style sheet
	References	Footer reference: Optional link from cell to the bottom applicable footer Example: <a href="#">See Footnote 1 below</a> Hyperlink from table cell shall just be the reference text only, not the entire cell. Each <a href="#">hyperlink</a> , where there are more than one within a cell, shall be individually accessible
Table Footers (if used)	Appearance	Static line at the bottom of the table (separate frame optional)
	Font	Bold and/or smaller fonts optional Example: <b>Footnote 1 – This is an example (linked as a destination from a cell(s) in the main table).</b>
	Background	No gray background; other colors optional (printing issue)
	Border	Borders should be same size lines as rest of table

MIL-DTL-24784C(NAVY)  
APPENDIX B

B.4.3.3.3 Table titles. Tables shall have a title. The title shall be short and describe the contents or purpose of the table. The guidelines listed below shall be followed:

- a. Table titles shall appear centered above the table.
- b. Tables applicable to one Service, in a manual that will be used by more than one Service, shall be identified. For example: “(Navy Only) Guidance System Test Points”.
- c. If the table is scrollable, the table title and all column heads are to be sticky. “Sticky” infers that the table title and column heads shall be continually displayed throughout the scrolling process of the entire table.

B.4.3.3.4 Column spacing. Consistent column spacing shall be maintained within a table. When more than one column of data is displayed, sufficient space shall be provided to clearly distinguish the data.

B.4.3.3.5 Highlighting. The capability to highlight selectable text shall exist within a table. Tables shall display active selections as highlighted areas and the entire highlighted area shall be sensitive to selection by the pointing device. All selectable areas shall be displayed and visually highlighted before selection.

B.4.3.3.6 Selection of tables. The capability to select an individual highlighted cell displayed in a table shall be provided.

B.4.3.3.7 Footnotes in tables. There shall be no footnotes in tables. Footnote data shall be made available (linked) using a hot-spot technique.

B.4.3.4 Graphics.

B.4.3.4.1 Graphic file format. Graphic file formats shall be in accordance with 3.7.8.7.

B.4.3.4.2 Oversized illustrations. As specified by the acquiring activity (see 6.2), certain long-line diagrams (oversized schematics, timing circuit diagrams, test setup diagrams, wiring diagrams, etc.) may require re-authoring to be easily viewed on screen and printed or be delivered as a separately packaged hardcopy supplement (see 3.4.1.2).

B.4.3.4.3 Callouts. When hot-spot techniques are used in conjunction with callouts, an explanation shall be provided in the “How to Use this IETM” portion of the IETM.

B.4.3.4.4 Legends. If used, illustration legends shall be linked from the graphic or contained within the graphic.

B.4.3.4.5 Scale. Graphics shall be displayed to a scale at least as large as its designated minimum size so that all essential detail is legible.

B.4.3.4.6 Display of graphics. Graphics shall be displayed in an assigned data pane of the display window. Two types of graphics shall be displayed: static and interactive. Static graphics shall be displayed in full detail in the graphic area provided, with no ability for manipulation. If a graphic cannot be displayed in its entirety and in full detail, it shall be displayed using interactive graphic display techniques described in this specification (for example, scrolling and zooming). If multiple graphics support one step, they should appear simultaneously as the available display area allows. Graphics shall provide sufficient detail to uniquely identify all maintenance parts including fasteners and consumables associated with the step. The ability to select a portion of a graphic with mouse movement and paste it into another document is optional. The IETM presentation system should provide the user with the ability to view graphic objects with pan, zoom, expand, and magnify.

B.4.3.4.6.1 Display of graphic overlays. Encoded graphics shall be displayed along with any associated callout overlays designed to indicate the specific components of the graphic.

B.4.3.4.6.2 In-line/out-line display of graphics. The use of in-line or out-line strategies for displaying graphics is permissible. Displaying all graphics as in-line maintains the feel of a scrolling document for viewing and printing. However, view-ability of the graphic may be compromised, unless pan/zoom is provided. Alternatively, displaying graphics as out-line allows the source to load much quicker and brings up the graphic in another window or pane that can be toggled. When the graphic is selected, then another window or pane shall open with pan/zoom controls, etc.

MIL-DTL-24784C(NAVY)  
APPENDIX B

B.4.3.4.7 Graphics development. See 3.7.8 for details of graphics development, the types of graphics used, and typical examples of these graphics.

B.4.3.4.8 Color in graphics. Color graphics may be used in IETMs. Although some graphics, such as photographs, may incorporate full color, developers should be aware that not all display devices will display full color. Color graphics shall be viewable in the color safe palette (see figure B-27) colors without loss of meaning. Color graphics also shall be printable in grayscale.

B.4.3.5 Hot spots/links. Links require a single click of a text hot spot or an icon hot spot.

B.4.3.5.1 Link/behavior/navigation. Persistent visual indication of textual link(s) to additional information shall be available. There shall be a visual indication of how the link behaves (such as, goto, gosub, relational). If executing a link that is not a goto or exit link, the ability to return to the link source from the link destination shall be provided.

B.4.3.5.2 Hot spots (selectable elements). All hot spots shall be visually indicated. There shall be an indication of link destination (target) when the cursor passes over the hot spot. Use the standard web practice for text that is [blue underlined](#) initially and turning [purple underlined](#) after the link is followed. There are three acceptable modes of visual indication of hot spots (selectable areas):

- a. Persistent visual indication that an area is hot (used for textual hot spots).
- b. Cursor changing shape/color (used for non-textual hot spots).
- c. Object changes while cursor passes over area (such as, parts callout expands).

B.4.3.5.2.1 Hot spots in graphics. Hot spots for graphics shall be non-persistent in their display. For non-textual hot spots, a cross-hairs (⊕) cursor shall be used when the hot spot is moused over.

B.4.3.5.3 Links to graphics and tables. To view figures or tables when not in-line, use the one click standard web practice of text that is [blue underlined](#) initially and turns [purple underlined](#) after the link is followed. References to in-line objects would bring up the object in a separate panning/zooming window, effectively allowing it to be viewed out-line. Out-line graphics and tables shall be viewed in a separate window or pane. Clicking on a graphic to be presented out -line, shall present the graphic and not send the user to a list of graphics requiring a second mouse click. Reference to a specific table cell or row shall link directly to the referenced cell or row. Reference lists shall also follow standard web practices. Icons may be used in place of the in-line figure or table for large HTML files with many figures or tables to speed up initial loading. The icon would appear in the location where the figure or table would normally be, and the title text (example: Figure 3) shall be centered below the icon. Table of content links to figures and tables shall all be one click. See table B-II for standard icons.

B.4.3.5.4 Links to multimedia. Links to view animation, videos, etc. shall use one click standard web practice of text that is [blue underlined](#) initially and turns [purple underlined](#) after the link is followed. Links shall include type, number (if applicable), and title for example: “See Multimedia 7, Disassembly Procedures”. Icons may also be used for non-textual references, for example, the multimedia icon on a flow diagram to allow the user to start an animation of the flow. See table B-II for standard icons.

B.4.4 User interface. User interface requirements for interactivity within an IETM, searching within an IETM, administrative information, and repurposing of IETM information, are included in B.4.4.1 through B.4.4.13.

B.4.4.1 Session control. Session control is the ability to stop and start an IETM session in the middle of work. This involves saving the state of the session for later reload to re-establish the user session back to where it was before the interruption. When required, IETMs shall support the ‘exit’ (save and update history file) and ‘suspend and resume’ functionality. End (see B.4.1.2.2.1.q) shall only be allowed in ‘browse’ mode on the end-user client. When specified by the acquiring activity (see 6.2), the following functionality shall be provided:

- a. The ability to suspend a session at any time shall be provided.
- b. A resume function (see B.3.2.66) shall be capable of resuming the session at the same point it was suspended.
- c. At the time of resume, the user shall be advised that some key parameters/condition settings may be out-of-date.

MIL-DTL-24784C(NAVY)  
APPENDIX B

- d. The system shall support the two exit modes that are accessed from the exit button on the main menu bar.
  - (1) Complete (save and update history).
  - (2) Suspend (see a above).

**B.4.4.2 Bookmarks and annotations.** Bookmarks provide the ability to mark areas of interest to allow quick access. Annotations are the ability of the system administrator or user to place special remarks within an IETM. Annotations can be public information for all users such as special information that requires rapid deployment to the manual holders like Advance Change Notices (ACNs). Alternately, annotations can be private remarks needed only by the user such as to assist in their training. When an IETM bookmark and annotation function is developed, NMCI requirements shall be explored to determine the path where users can save their annotations. Table B-II details functions and icons that shall be part of the bookmark and annotation function. When specified by the acquiring activity, the following functions shall be provided (see 6.2).

- a. There shall be a persistent visual indication that a bookmark or annotation exists. When the bookmark or annotation is private, the visual indication is only visible to the owner of the private bookmark or annotation.
- b. The default initial presentation of bookmarks and annotations is to appear minimized.
- c. If there are levels of bookmarks and annotations (for example, public, private), they shall be visually differentiated.

**B.4.4.3 Return user interface to default/initial state.** This is the ability to reset a configurable user interface back to a default. That is, if lost, the user can activate the return to the default or initial state. This also applies to simulations and flow tracing. The user shall be given a pop-up asking if he wants to return to the initial default state. The user should answer with the 'yes' button (or the 'y' key) prior to actually returning to the default state. See table B-II for the icon to use for returning the user interface to the default state. This function may be available from the guide post (see B.4.1.2.2.1).

**B.4.4.4 Browsing.** When specified by the acquiring activity (see 6.2), Browse Previous, Browse Next, and Browse Exit functions (see B.3.2.9) shall be provided. These functions shall be required for all systems for which the Next and Previous functions set interactive system variables that are used to effect subsequent navigation through the IETM. These navigation functions shall act as Next and or Previous, but shall not set or reset system variables automatically or through dialogs. Once either Browse Previous or Browse Next is selected, other navigation functions shall not be available until the user returns to the originating window by invoking the Browse Exit function. The presentation system shall provide a distinct visual indication that the system is in browse mode (see table B-II). When either the Browse Previous or the Browse Next function is not logical (such as at the beginning of a string or at a mandatory branch point), only the complementary Browse function shall be active. System variables shall still be set and shall be activated and logged to a temporary state table. It is not necessary to post system variables to the permanent state table when in browse mode. The following browse capability shall be available:

- a. User controlled access mode.
- b. No tracking of activities.
- c. Not rigidly tied to IETM controls.

**B.4.4.5 Dialog boxes.** Dialog boxes shall be used as the principal means by which the user converses with the underlying IETM application software. They shall be displayed in a separate window, which may overlay the primary window, and shall contain a heading and one or more graphical controls (buttons). The types of information to be collected may include, but is not limited to, whether or not specific operations have been performed, the present condition of the system, and the environmental situation. Dialogs shall be one of five kinds: alerts, fill-in-the-blanks, single/multiple choice, selection-in-list, or composite. All dialogs shall contain the OK function and, with the exception of information only alerts, the Cancel function. The OK or the Cancel functions shall finish the user interaction with the dialog box. The layout and arrangement of all dialogs shall allow the user to differentiate between the material they contain and other types of displayed information. See figures B-35 through B-38 for examples of different types of dialogs. Dialog boxes shall adhere to the following requirements:

- a. Both pop-up and in-line dialog boxes in the display frame may be used. Dialog boxes shall appear in a consistent and prominent location on the display.

MIL-DTL-24784C(NAVY)  
APPENDIX B

- b. Dialogs shall be formulated as prompting questions that are intended to be presented by the electronic display system (EDS) to the user.
- c. Dialogs shall be developed so that they require a user to respond for example, enter data, acknowledging an alert, before any subsequent processing is undertaken.
- d. The dialog information in the IETM source data shall be formulated so that, once a dialog is presented to the user and answered, certain assertions about the user's environment are able to be made.
- e. The information associated with dialogs shall permit the EDS to provide actions to follow all completed dialogs. Each of the immediately subsequent procedures available for presentation to the user shall be conditional upon one of the possible answers requested by the prompt.
- f. With the exception of alert dialog boxes, all dialog boxes shall contain an OK function and a Cancel function. Information only alerts only require an acknowledgement, and therefore, only require an OK function. If the user activates the Cancel function, the IETM display shall return to the display that existed immediately prior to the display of the dialog box.
- g. Dialogs may contain a Help function to provide further information about the dialog box.

**B.4.4.5.1 Dialog push buttons.** Dialog boxes shall contain graphical controls called push buttons. Dialog push buttons are used as a means for the user to communicate with the IETM. Push buttons can be: radio buttons as in single-choice dialog boxes, check boxes as in multiple-choice dialog boxes or functions as the selectable function OK on an alert dialog box. A push button shall be a word or graphic icon on the screen used to select or initiate an action. Push buttons shall be large enough to allow positioning of the cursor on the push button. Push buttons or choices shall provide visual feedback when selected. Push buttons shall be found on every type of dialog box. They shall each be single action entities. Push buttons shall indicate selections made or invoke a general action such as Cancel or OK. Push button shapes shall be consistent, such as, box, circle or arrow, with the name of the selection or action written inside of the shape. Common push buttons (OK, Cancel) shall be displayed along the bottom of the dialog box. The common dialog buttons shall correspond to completing the last selection before leaving the dialog box.

**B.4.4.5.1.1 Use of push buttons.** When a dialog box is displayed, the user shall have an opportunity to communicate information to the IETM through push buttons. The user-input information is displayed only and is not actually communicated to the IETM until the user activates the OK function by clicking on the "OK" push button. If the user selects the "Cancel" button, no information shall be sent to the IETM and the IETM shall return to its previous display.

**B.4.4.5.1.2 Presentation of dialog push buttons.** The common push buttons shall be displayed in the following order centered along the bottom of the dialog box: "OK", and where they exist, "Cancel" and "Help". The common dialog buttons shall correspond to a completion of action, which is the last selection the user makes before leaving the dialog box.

**B.4.4.5.2 Dialog cursor movement.** Cursor movement within dialog boxes shall be consistent throughout the IETM. The cursor shall move only to items which require input from the user. The default location of the cursor (the location of the cursor when the dialog box is initially displayed) in a dialog box is at the first selectable item (uppermost). When the selectable only movement mode is used, it shall restrict the allowable cursor locations to the radio buttons, check boxes, fill-in-the-blank spaces, and the push buttons within the dialog box. Cursor movement shall be accomplished through the tab and enter keys and through point and click input from a pointing device such as a mouse, trackball, or stylus. The user shall be able to move the cursor back within the dialog box either via the backspace key or the pointing device. Pressing the enter key shall send all data items which have been entered into the dialog box to the IETM processor, and thus finish the dialog box. Pressing the enter key is functionally equivalent to pressing the "OK" push button.

**B.4.4.5.3 Radio buttons, check boxes, text input, pull-down menus, and other buttons.** Table B-VI provides the maximum dimensions for the applicable buttons and controls.

**B.4.4.5.4 Dialog titles.** All dialog boxes shall contain a dialog title. All titles shall be left justified and the initial letter of major title words shall be capitalized. Titles shall be presented in a distinctive manner so that they cannot be confused with messages, response alternatives, or other text items.

MIL-DTL-24784C(NAVY)  
APPENDIX B

B.4.4.5.5 Dialog box types. Dialog box design throughout the IETM shall remain consistent to preserve a common look and feel.

TABLE B-VI. Dimensions for buttons and controls.

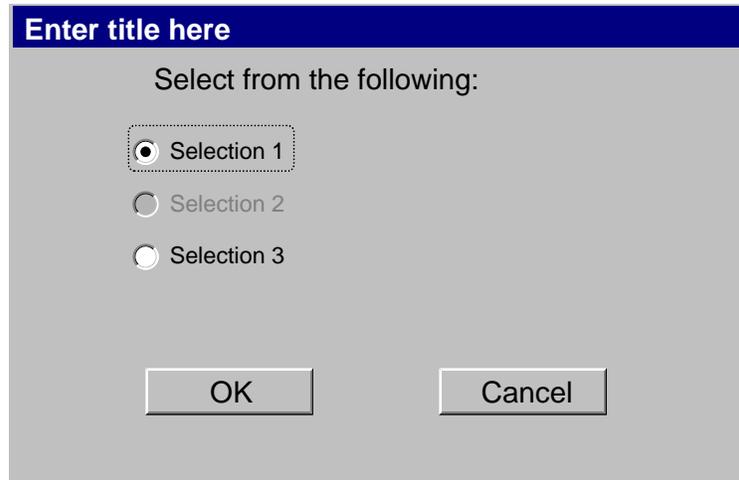
Form Element	Maximum Dimensions
Radio Buttons	11 x 11 pixels with 7 pixels afterwards
Checkboxes	12 x 12 pixels with 6 pixels afterwards
Text Input Field	24 x 169 pixels at 20 points
Text Area	77 initial default height for one row and goes to 80 for 3 rows high x 184 pixels (at 20 columns)
Pull-Down Menu	23 pixels high x longest selectable text within menu
Multiple Selections	38 x 54 pixels
Submit Button	24 x 72 pixels

B.4.4.5.5.1 Fill-in-the-blank dialog box. For all fill-in-the-blank type dialogs, data entries shall be prompted explicitly by displayed labels for data fields. The user shall be given the capability to delete or otherwise change previously filled in entries. Fill-in-the-blank type dialogs (see figure B-35) shall allow input of alphanumeric characters in response to displayed questions and/or data entry fields (for example: inputting user-identification data when signing-on to the computer system). The dialog-box design shall indicate clearly the nature of the required input, limitations on number or type of alphanumeric characters, units (if input is a measurement), and any other required conventions. Wherever possible, the data field label shall be placed on the same line as user input. Labels for data fields shall be distinctive. Field labels shall be placed in close proximity to their respective data entry area and shall end with a colon (:). The Cancel button shall provide the user with the capability to abort the action.

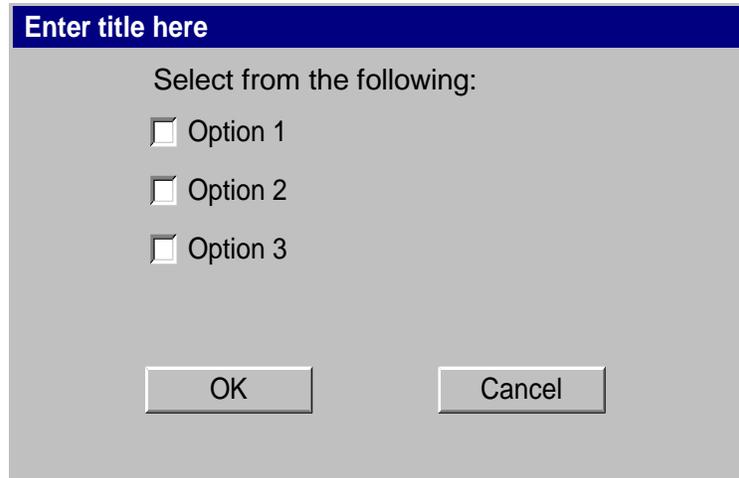
FIGURE B-35. Fill-in-the-blank dialog box.

B.4.4.5.5.2 Single choice dialog box. Single choice dialogs shall be displayed using radio buttons. Radio buttons shall be circles. The user selects the choice by pointing and clicking in the appropriate circle. A filled circle shall indicate that the choice has been made. In a single choice dialog, only one choice can be made. The visual indication to the user that a choice has been made shall be displayed immediately upon selection. Disabled radio buttons will not be selectable but may be visible (see figure B-36). Another method that is acceptable is a combo box with drop down choices, a common example is the entry of the state of residence on a web form such as:

AL

MIL-DTL-24784C(NAVY)  
APPENDIX BFIGURE B-36. Single-choice dialog box.

B.4.4.5.5.3 Multiple choice dialog box. A multiple choice dialog (check boxes) shall be the type of dialog in which one or more selections are able to be made from a group of choices (see figure B-37). Multiple selections shall be made using check boxes. Check boxes shall be grouped into lists of non-mutually exclusive choices. The user shall be given the capability to check one or more of these boxes as needed using the cursor or number selection technique. Each button shall appear as a consistent shape (such as, a square) and shall be marked with a visual indicator when the button is selected. The visual cue for multiple-choice dialogs shall be square check boxes. The visual indicator shall be an X or a checkmark (✓) contained within the square when a choice is made. The visual indicator will appear at the instant of selection. Check boxes shall employ different shapes from radio buttons.

FIGURE B-37. Multiple-choice dialog box.

B.4.4.5.5.4 Composite dialog box. The composite dialog is a dialog box in which the user is presented different types of dialog choices. The composite dialog box may contain any or all in combination of fill-in-the-blank dialogs, single-choice dialogs, and multiple-choice dialogs (see figure B-38).

MIL-DTL-24784C(NAVY)  
APPENDIX B

**User Response**

Data Entry Field  
ENTER TECHNICIAN ID

**MULTIPLE CHOICE: OPTION?:**

Option 1       YES  
 Option 2       NO  
 Option 3       MAYBE

OK      Cancel

FIGURE B-38. Composite dialog box.

B.4.4.6 Context filtering. When specified by the acquiring activity (see 6.2), the IETM shall have the ability to perform context filtering. As a minimum the IETM shall have the ability to perform context filtering on weapon system/equipment effectivity. The system shall provide the user a mechanism for entering/modifying configuration parameters. When specified by the acquiring activity (see 6.2), other filtering such as filtering based on skill level (novice versus expert), maintenance level, etc. shall be provided.

B.4.4.7 Screen stacking. Figure B-39 illustrates screen stacking where multiple windows are opened and overlap each other. Screen stacking can confuse the user of the IETM and shall not be used.

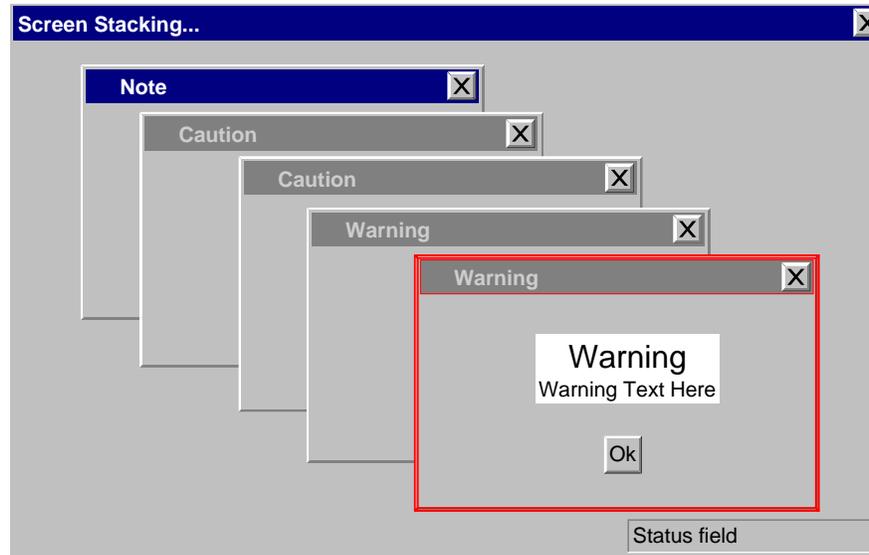


FIGURE B-39. Screen stacking.

B.4.4.8 Response time. The operating system usually handles the system busy indication. If the IETM itself is expected to be busy for more than 2 seconds, the cursor shall change to an hourglass until the busy condition passes. Once the busy condition passes, the cursor shall change back to its previous appearance.

MIL-DTL-24784C(NAVY)  
APPENDIX B

B.4.4.9 Searching. When specified by the acquiring activity (see 6.2), individual IETM search engines shall support the capability to search keywords and full text strings including alphanumeric and hyphenated words. They shall support advanced Boolean searches and the ability to further refine a search within a returned list of possibilities. The user shall be presented with the search options available. Use of the main menu bar standard Search function (see B.4.1.2.5.2.4) or optional search icon (see figure B-25) is required.

B.4.4.10 Technical manual deficiency/evaluation reports (TMDERs). The preferred user interface is the actual electronic form. The TMDER form shall be accessible from the feedback menu button on the main menu bar.

B.4.4.11 Interface to external references and systems. A single user interaction shall electronically link to external references such as to another IETM or to external systems (such as JEDMICS, supply support/parts ordering system).

B.4.4.11.1 Instructions for interactions with IETM utility functions. Information shall be provided which describes procedures for all utility functions included as supplements to the primary functions of the IETM. For example, preparation and submission of associated maintenance action reports to interface with a maintenance management system; accumulation and submission of the IETM deficiency reports citing IETM errors or problems in using the IETM; ordering of needed parts; use for on station training; acquisition of additional IETM discs. Instructions on use of these functions should be included in the body of "How to Use This IETM" information (see A.3.3.2.5).

B.4.4.12 Multimedia presentation. Multimedia includes audio, graphics, video, and animation. Audio, video, and animation techniques shall only be used in an IETM when it results in enhancing the presentation of the information or makes the procedures more effective. Every instance of use shall be discussed with and approved by the acquiring activity before any audio, video, or animation presentation is included in an IETM. Multimedia techniques and standards to be used for presentation shall be in accordance with paragraphs B.4.4.12.1 through B.4.4.12.5. When specified by the acquiring activity (see 6.2), multimedia techniques or animation presentation shall be provided. Table B-II contains the preferred multimedia control icons.

B.4.4.12.1 Multimedia and other items/functions. The textual information for procedures, instructions, or steps shall not be replaced by multimedia. Audio, video clips and animations shall not be played automatically. Audio, video clips and animations shall be manually started by pressing "Play" on a Navy authorized media player. Audio portions of multimedia shall not contain classified information. Developers shall ensure that the multimedia format being delivered is compatible with end users' systems.

B.4.4.12.2 Audio. Recent audio compression algorithms allow for acceptable audio quality using much smaller file sizes. The decision as to which compression format to use shall be based on obtaining acceptable audio quality with the smallest possible file size. Audio shall not be provided for classified information.

B.4.4.12.2.1 Sound. Developers shall use best commercial practices when implementing sound. The user shall take action to hear the sound (no automatic playing of sound). The user shall control muting and volume via system controls (versus embedded controls within the application).

B.4.4.12.2.2 Voice input/output (I/O). Voice I/O shall be used only as supplemental input/output and navigation. Keyboard and pointing devices shall be the primary input, and visual display shall be the primary output. Usually controls are provided within the application and operating system for voice I/O.

B.4.4.12.3 Graphics (photos, grayscale, etc. - other than traditional line-art). Graphic formats that are native to the browser shall be used. For print purposes, 150 or 300 dpi resolution shall be provided.

B.4.4.12.4 Video. Recent streaming video and video compression algorithms allow for acceptable video quality by using much smaller file sizes. Streaming video formats are preferred. Audio portions of videos shall not contain classified information. The user shall take action to hear the sound (no automatic playing of sound).

B.4.4.12.5 Animation. Developers shall use best commercial practices when implementing animation. The decision as to which compression format to use shall be based on obtaining acceptable quality with minimized file size. Streaming formats are preferred. Audio portions of animation shall not contain classified information. The user shall take action to hear the sound (no automatic playing of sound).

MIL-DTL-24784C(NAVY)  
APPENDIX B

B.4.4.13 Re-purposing data and hardcopy output. The data within the IETM shall be presented to allow repurposing or sharing. The capability shall exist to allow the data to be printed, referenced through hyperlinks, and transferred to another product by saving and cutting and pasting.

B.4.4.13.1 IETM printing. IETM printing may involve printing the complete manual or a part, such as an information package, paragraph, table, or graphic. The preferred method is to print the data content of the active window only. All printed output shall have version or revision number and/or a printed date/time stamp. Classification shall appear on printed output. Assume the available printer can print only black-and-white and thus ensure that the use of color lends itself to printing.

B.4.4.13.1.1 Print on demand. A print-on-demand feature shall allow printing of the complete manual or logical parts such as an information package or a set of instructions. Information shall be presented to allow a user to print a logical chunk of data such as a set of instructions, an operating procedure, or a diagram.

B.4.4.13.2 Sharing data. Data sharing can occur before or after publication. Data sharing prior to publication should be via reference, and at publication, the share data should be embedded where used. Post publication data can be shared between logistics products by referencing hyperlinks or copying. Sharing through referencing is the preferred method, but implementation issues evolve with ensuring referenced material is available to the user and managing target links. To reduce management of target links, IDs should be persistent. The data should also be presented to allow sharing through copying either through saving using "Save as" or by "cutting and pasting".

MIL-DTL-24784C(NAVY)

Custodian:  
Navy – SH

Preparing Activity:  
Navy – SH  
(Project TMSS-N241-000)

Review Activity:  
Navy – EC

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <http://assist.daps.dla.mil>.