

INCH-POUND

MIL-STD-3002(MC)

5 August 1998

SUPERSEDING

MIL-I-28947C(MC)

19 May 1993

**DEPARTMENT OF DEFENSE**

**STANDARD PRACTICE**

**PREPARATION OF ILLUSTRATIONS**

**FOR STOCK LIST PUBLICATIONS**



MIL-STD-3002(MC)

FOREWORD

1. This standard is approved for use by all Departments and Agencies of the Department of Defense (DoD).
2. This standard replaces MIL-I-28947C. In accordance with Acquisition Reform Initiatives the preparing activity decided the information concerning illustrations for stock list publications would be best suited as a Standard Practice and not as a specification because it describes "administrative" type information regarding data acquisition and imposes requirements on vendors and is used by vendors.
3. Changes from MIL-I-28947C to this standard are mostly due to restructuring the format in accordance with MIL-STD-962C.
4. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Marine Corps Systems Command, Code PSE-D, 2033 Barnett Avenue, Suite 315, Quantico, VA 22134-5010, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

## MIL-STD-3002(MC)

## CONTENTS

PARAGRAPH	PAGE
1. SCOPE1	
1.1 Scope .....	1
2. APPLICABLE DOCUMENTS .....	1
3. DEFINITIONS .....	1
3.1 Abbreviations and acronyms used in this standard ...	1
3.2 Arrow .....	1
3.3 Assembled view .....	1
3.4 Callout .....	1
3.5 Copy print .....	2
3.6 Exploded view .....	2
3.7 Flow line .....	2
3.8 Lead illustration .....	2
3.9 Leader line .....	2
3.10 Legend .....	2
3.11 Line illustration .....	2
4. GENERAL REQUIREMENTS .....	2
4.1 Restrictions .....	2
4.2 Planning the illustrations .....	3
4.2.1 Method of illustrating .....	3
4.2.1.1 Line illustration .....	3
4.2.1.2 Sizing of illustrations .....	3
4.2.1.3 Assembled view (end item) .....	3
4.2.1.4 Exploded view .....	4
4.2.1.5 Cutaway view .....	4
4.2.1.6 Phantom view .....	4
4.2.1.7 Illustrations other than exploded views .....	4
4.2.1.8 Collection type illustration .....	4
4.2.1.8.1 Component set illustration .....	4
4.2.1.9 Combinations of types of illustrations .....	5
4.2.1.10 Illustrations for repair parts list .....	5
4.2.1.11 Components of an end item .....	5
4.3 Recycled, recovered, or environmentally preferable materials .....	5
5. DETAILED REQUIREMENTS .....	5
5.1 Basic illustration materials .....	5
5.2 Line weights .....	5
5.3 Flow lines .....	5

## MIL-STD-3002(MC)

5.4	Callouts and leader lines	6
5.4.1	Assignment of callouts	6
5.4.2	Cross reference list	6
5.4.3	Identical parts	6
5.4.4	Applying callouts with leader lines	6
5.4.5	Callout size and typeface	7
5.5	Identifying illustrations	7
5.5.1	Figure number	7
5.6	Reproduction of illustrations	7
5.7	Sample illustrations	7
5.8	Preliminary illustrations	8
5.9	Final illustrations	8
6.	NOTES	
6.1	Intended use	8
6.2	Subject term (keyword) listing	8
FIGURES		
1.	End item line illustration	9
2.	Exploded view line illustration	10
3.	Cutaway view and legend	11
4.	Types of phantom views	12
5.	Printed circuit card (1 of 2)	13
5.	Printed circuit card (2 of 2)	14
6.	Collection type	15
7.	Component set	16
8.	Combination of types of illustrations	17
9.	Components of an end item	18
10.	Line illustration details and borders	19
INDEX		20
CONCLUDING MATERIAL		22

## MIL-STD-3002(MC)

## 1. SCOPE

1.1 Scope. This standard establishes the essential requirements for the preparation of illustrations intended for use with manuals prepared by or for the Marine Corps in production of repair parts stock list publications. This includes both stand-alone Marine Corps Stock Lists (SL-3 and SL-4) and the illustrations used in the repair parts list that are part of a technical manual (&P's). It furnishes guidance in planning and selecting style and type of illustration, and establishes requirements for materials sizing, identification, and for the packaging of illustrations.

## 2. APPLICABLE DOCUMENTS

This section is not applicable to this standard.

## 3. DEFINITIONS

3.1 Abbreviations and acronyms used in this standard. The acronyms used in this standard are defined as follows:

- a. CAD - Computer Aided Drafting
- b. DoD - Department of Defense
- c. DPI - Dots per Inch
- d. ILSP - Integrated Logistics Support Plan
- e. PPL -\_\_Provisioning Parts List
- f. PLISN - Provisioning Line Item Sequence Number

3.2 Arrow. A straight black line with an arrowhead on one end, extending from an illustration reference to a part or assembly designated by the arrowhead point (see figure 3).

3.3 Assembled view. A pictorial representation of an exterior view of the assembled equipment without shading.

3.4 Callout. A number used to identify a part on an illustration.

## MIL-STD-3002(MC)

3.5 Copy print. A high quality reproduction of the illustration. Illustrations produced on a computer should be printed on a printer that: (1) has a minimum printing resolution of 400 dots per inch (DPI) and (2) is able to produce sharp, well defined camera-ready quality prints.

3.6 Exploded view. A pictorial representation of the equipment showing parts or components in proportionate size, and grouped in proper relation on a line-of-assembly axis to show assembly or disassembly.

3.7 Flow line. A dashed line (depicted as a common center line) used on an exploded view illustration to relate disassembled parts to each other.

3.8 Lead illustration. An illustration in the front of a publication showing the end item in a three-quarter front or rear view.

3.9 Leader line. A straight black line without an arrowhead extending from a callout to a part or point identified.

3.10 Legend. A tabular identification of all illustrated parts or items. The legend shall provide the following information for each figure: (1) the figure key callout, (2) the name of the item, and (3) the line item number.

3.11 Line illustration. An illustration prepared in black and white by means of ink, film lead, or Computer Aided Drafting (CAD) system, representing the subject by means of lines that will produce a clear, sharp black line image when reproduced.

#### 4. GENERAL REQUIREMENTS

4.1 Restrictions. Illustrations prepared in accordance with this standard shall not employ the following techniques or methods:

- a. The use of color.
- b. The placement of captions or figure titles on illustrations.
- c. The use of credit lines, trade names, manufacturers' or distributors' names, symbols, or trademarks.

## MIL-STD-3002(MC)

d. The use of cartoons.

e. The use of borders around a single illustration shall not be used, but borders may be used to separate multi-section illustrations on the same page (see figure 10).

f. The use of photographs (half tone type) for illustrations.

4.2 Planning the illustrations. Illustrations shall be carefully planned to furnish a pictorial identification of parts, tools, and/or equipment, insuring all important details are shown. The minimum number of illustrations essential for such purposes shall be used.

4.2.1 Method of illustrating. Existing and available illustrations shall be used where the planned illustrations are identical and they meet the requirements of this standard. All illustrations prepared shall be three-dimensional line illustrations except for printed wiring boards and cables. These items do not require a three-dimensional illustration.

4.2.1.1 Line illustration. The conception and treatment of a line illustration should be such to show the subject clearly and concisely. In the preparation of the line illustrations, drafting practices that are used in high-grade commercial instruction books should apply.

4.2.1.2 Sizing of illustrations. An illustration shall be sized to ensure the most efficient use of space in the final publication. An illustration shall be of sufficient size to provide clarity and legibility. The sizing of an illustration will be determined by (1) the number of parts to be called out and, (2) the detail required to show how an assembly is put together.

4.2.1.3 Assembled view (end item). A pictorial representation of the end item used as the lead illustration to identify the equipment covered by the publication (see figure 1). When two or more overall views of the equipment are required, the views shall be selected to reveal different aspects of the equipment or to display surfaces of the assembled equipment which have unique and distinctive features. An assembled view may also be used with an exploded view to show the relationship of exploded parts to a component (see figure 2).

## MIL-STD-3002(MC)

4.2.1.4 Exploded view. A complete parts breakdown of an assembly or component used to identify all individual parts (see figure 2). A partial disassembly may be used when identical parts are attached to a common chassis or panel and the display of the one part is typical of the other. For example, when showing hardware, if all are identical then you may show one exploded (screw, washers and nut) and the others in place. Parts in an exploded view shall be arranged in correct disassembled position and in proportional size to each other. The spacing of parts in an exploded view shall achieve maximum clarity with economy of space. Flow lines shall be used to relate the exploded parts to each other.

4.2.1.5 Cutaway view. With the outside of an item or assembly clearly shown so it may be identified, part of the outer shell or housing is "cut away" clearly showing parts that are on the inside (see figure 3).

4.2.1.6 Phantom view. There are two types of phantom views. (1) Showing an item phantomed in place for location or reference. (2) Illustrating the exterior of an assembly or parts as through clear material with the exterior phantomed and the interior parts or items with bold solid lines. Phantom lines are shown as dashed lines (see figure 4).

4.2.1.7 Illustrations other than exploded views. There is no requirement to show exploded views of assemblies and components which are of basically electronic items such as printed circuit boards and cables. These items require an orthographic view illustration with leader lines and callouts for each item shown on the illustration. Illustrations requiring multiple sheets to clearly show all components shall have a location indicator in the upper left corner of each sheet showing the area illustrated (see figure 5).

4.2.1.8 Collection type illustration. An illustration used for showing groups of items, systems, major combinations of equipment, vehicles, tools, sets, or any assortments used in a components list (SL-3) (see figure 6).

4.2.1.8.1 Component set illustration. An illustration used for showing a component set depicting the empty container and all the components grouped nearby in an orderly manner (see figure 7).



## MIL-STD-3002(MC)

4.2.1.9 Combinations of types of illustrations. An illustration may be used to combine two or more types of views to clarify pictorial data. For example, an exploded view illustration may also show a small assembled view for the purpose of establishing a location or reference (see figure 8).

4.2.1.10 Illustrations for repair parts list. Repair parts illustration shall be sized (7 x 8.5 inches) for printing a full vertical or horizontal page. In manuals prepared by a contractor, the illustrations shall be sized to allow space for a legend on the same page, providing no more than 10 callouts are required to identify the parts. These legends shall be located entirely above or below the space occupied by the line art (see figure 3). Where the inclusion of such a legend is not feasible because of insufficient space on the illustration page, the legend will be placed on the page facing the illustration.

4.2.1.11 Components of an end item. A component illustration shall be used to show all components and accessories that are part of the end item (see figure 9).

4.3 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

## 5. DETAILED REQUIREMENTS

5.1 Basic illustration materials. Illustrations that are produced on a drawing board shall be prepared on durable material such as vellum, which will provide a white background when reproduced photographically. Illustrations produced on a computer should be printed on a printer that: (1) has a minimum printing resolution of 400 DPI, and (2) is able to produce sharp, well defined camera-ready quality prints.

5.2 Line weights. Lines shall have sufficient weight and size to ensure good reproduction. Darker or heavier lines on the outside of objects may be used to give form and depth; however, overemphasis by shading shall be avoided.

5.3 Flow lines. The relationship of parts on an exploded view illustration shall be aided by the use of flow lines. Flow lines

## MIL-STD-3002(MC)

shall be used where they assist in locating parts (see figure 10) or where the main line of exploded parts has been broken into two or more groups for convenience or layout on the page.

5.4 Callouts and leader lines. Callouts consisting of numbers only shall be used with leader lines on the illustration. A part shall be called out by the leader line touching the part and extending clear of the assembly for placement of the callout.

5.4.1 Assignment of callouts. Callouts on an illustration shall be Arabic numerals in sequence, starting with number one. These callout numbers shall be placed in a clockwise numerical sequence around the illustration beginning at the 11 o'clock position. Parts grouped together by a bracket to show relationship within an assembly or subassembly shall have callout numbers in the clockwise manner starting with the callout for the assembly or subassembly, then going inside the bracket to identify each item of the assembly. An assembly which is shown on the illustration but broken down on a subsequent figure shall be referenced to the subsequent figure and shall not be identified by a callout (see figure 3). If a figure has more than one sheet, the callouts should start with one on the first sheet and continue at 11 o'clock on the next sheet with the next highest number (see figure 5).

5.4.2 Cross reference list. A cross reference list is a tabular identification of illustrated parts. The contractor shall furnish a typed cross reference list on a separate sheet for each figure. The cross reference list shall provide the following information: (1) the figure key callout from the illustration, (2) the complete noun name for the item as shown in the provisioning data, and (3) the provisioning line item sequence number (PLISN).

5.4.3 Identical parts. Identical parts within a figure will be identified by the same callout. However, on a multi-subassembly illustration, identical parts within a bracket will have a different callout. For example, a screw used in an assembly shall have a different callout than the same screw used in a subassembly on the same figure (see figure 10).

5.4.4 Applying callouts with leader lines. Leader lines shall be straight without crossing other leader lines and (if necessary) may contain only one bend. Callouts and leader lines shall be placed in a logical arrangement to prevent long leader

## MIL-STD-3002(MC)

lines and crowding of the illustration. Leader lines should not run parallel to flow and axis lines or at an angle which may cause confusion with the object lines on the illustration. Leader lines should be of a good consistency and size but should not overpower the artwork. When a leader line must cross an object line(s), a "white shadow" should appear along the uppermost edge of the leader line to ensure that the correct item is called out. Special care should be taken to ensure that the leader line(s) and their "white shadows" do not obscure important details. Leader lines should be the same size throughout the illustration package.

5.4.5 Callout size and typeface. Typeface used for callouts shall be of mechanical type and shall not be freehand. Typeface of helvetica medium or equal should be used. Callouts should be 7 point in size.

5.5. Identifying illustrations. The figure title and number should appear on each page of each figure outside the image area for preliminary and final illustrations.

5.5.1 Figure number. Each illustration should be identified by a figure number of Arabic numerals, assigned in consecutive sequence within a single publication. Figures should be sequenced in a fashion following the order of the provisioning parts list (PPL). For example, figure 1 should be the end item with no callouts. Figure 2 should be the end item exploded with items called out that are first in the PPL and are not broken out later as an assembly. Figure 3 should be the first assembly broken down in the PPL. Figure 4 and all other figures as needed should follow the order of the PPL. The assemblies in each figure should be broken down completely before going on to the next figure.

5.6 Reproduction of illustrations. Illustrations shall be reproduced in accordance with high quality commercial standards. Workmanship and materials shall contribute to copy prints which accurately and clearly reproduce the original illustrations.

5.7 Sample illustrations. At the request of the procuring activity, the contractor shall furnish artwork samples representative of the contractor's preparation techniques (a package of sample documentation). Artwork shall have each item identified by figure key callout cross referenced to the applicable line item as identified in the PPL. A cross reference

## MIL-STD-3002(MC)

listing shall accompany each illustration that contains callouts. The artwork shall consist of a breakdown of the equipment under contract. The sample illustrations will be reviewed with the technical documentation.

5.8 Preliminary illustrations. The contractor shall furnish, in accordance with the provisioning performance schedule required by the Integrated Logistics Support Plan (ILSP), two copies of each illustration prepared for the end item assemblies and components under contract. Assemblies and components shall be illustrated to the degree required to identify the parts of such assemblies and components listed in the PPL. Each figure shall include a cross reference list when callouts are required.

5.9 Final illustrations. Upon receipt of the preliminary illustration approval from the procuring activity, the contractor shall proceed with the preparation of the final illustrations. The final illustration package shall consist of three 8-1/2 x 11 inch camera-ready copies of the finalized original illustrations with a maximum image area of 7 x 8-1/2 inches, and three copies of the cross reference lists of all the finals. Final illustrations shall be submitted in accordance with the provisioning performance schedule required by the contract.

## 6. NOTES

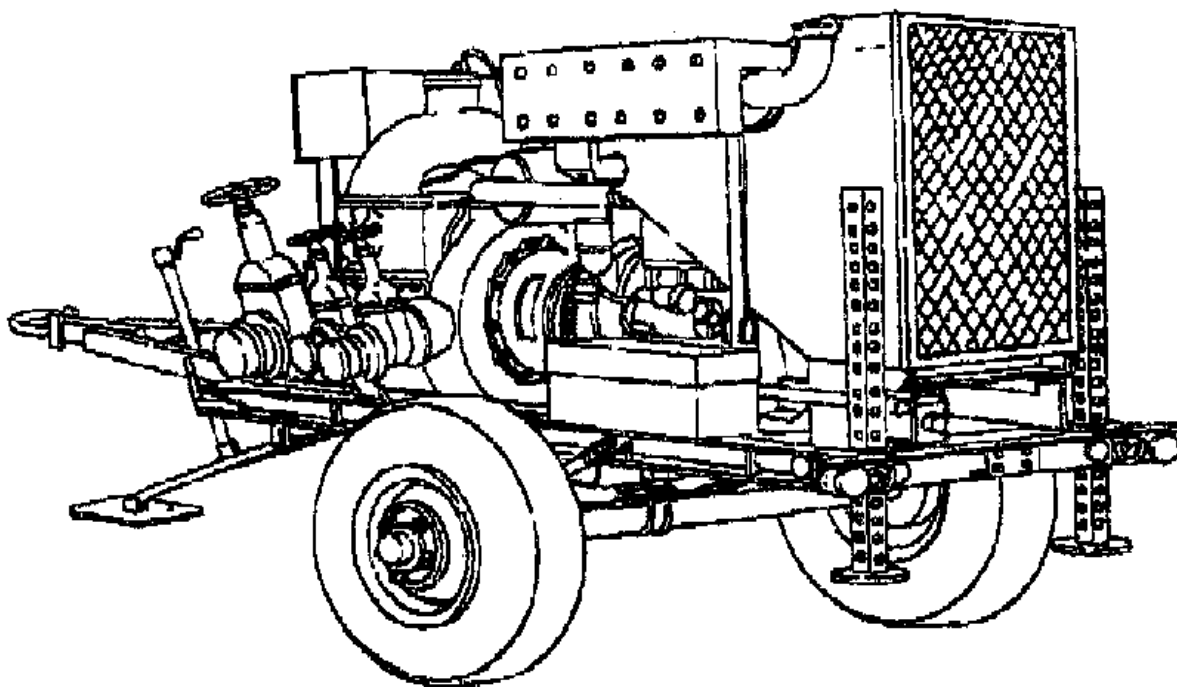
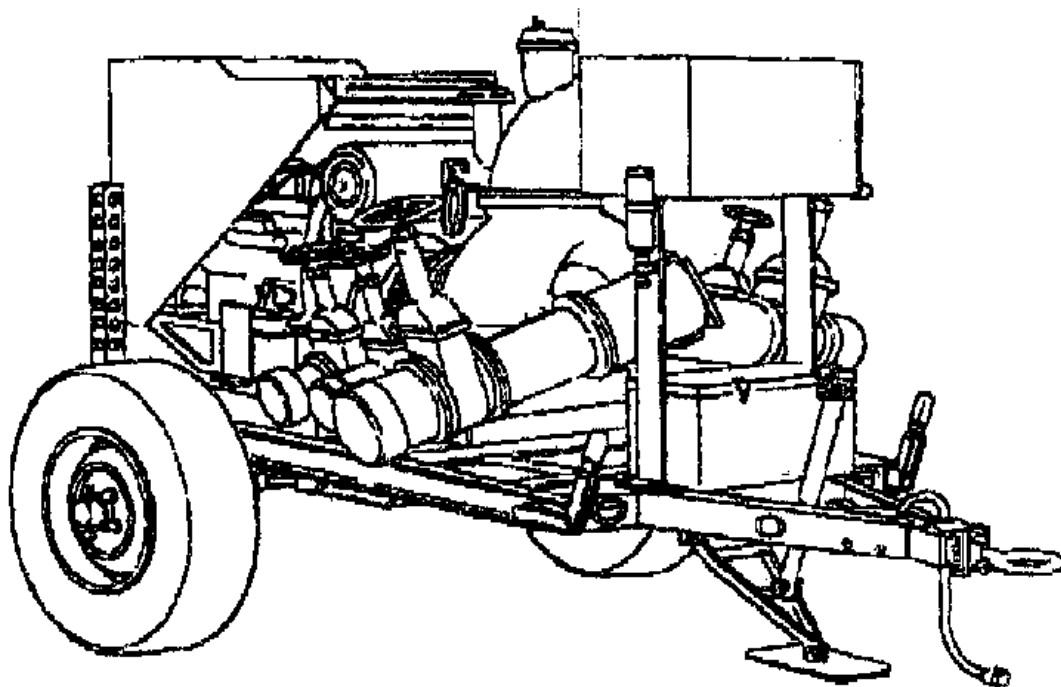
(This section contains information of a general or explanatory nature which may be helpful, but is not mandatory.)

6.1 Intended use. The illustrations furnished under this standard are intended for use in the preparation of illustrated technical repair parts publications and components lists, and for other identification purposes.

6.2 Subject term (keyword) listing.

- Cutaway views
- Drawings
- Phantom view
- Photographs
- Technical manuals

MIL-STD-3002(MC)



MIL-STD-3002(MC)

FIGURE 1. End item line illustration.

MIL-STD-3002(MC)

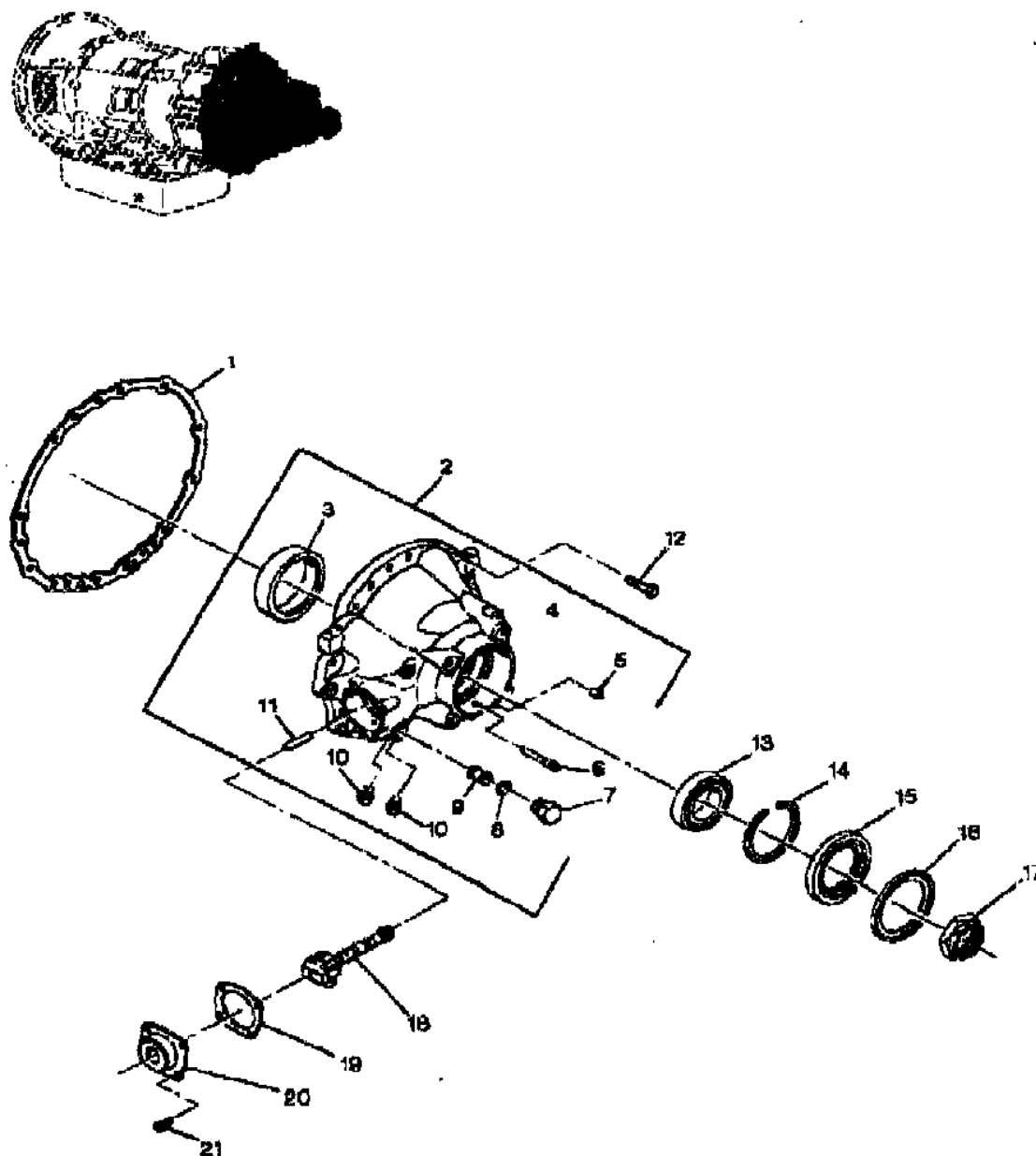
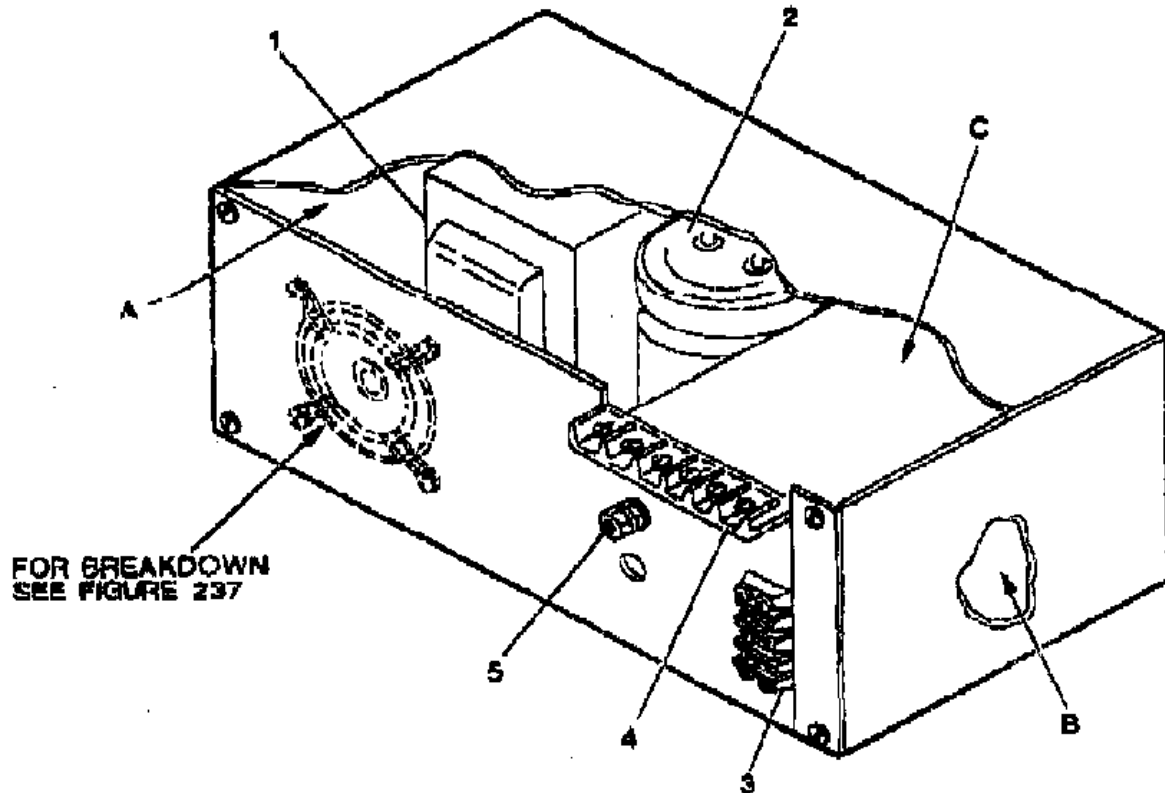


FIGURE 2. Exploded view, line illustration.

MIL-STD-3002(MC)



<u>KEY</u>	<u>ITEM</u>	<u>ITEM NO.</u>
001	TRANSFORMER, VOLTAGE	428
002	CAPACITOR	427
003	TERMINAL, ELECTRICAL	426
004	CONNECTOR, TERMINAL LUG	429
006	NUT, GROUNDING	430

FIGURE 3. Cutaway view and legend.



MIL-STD-3002(MC)

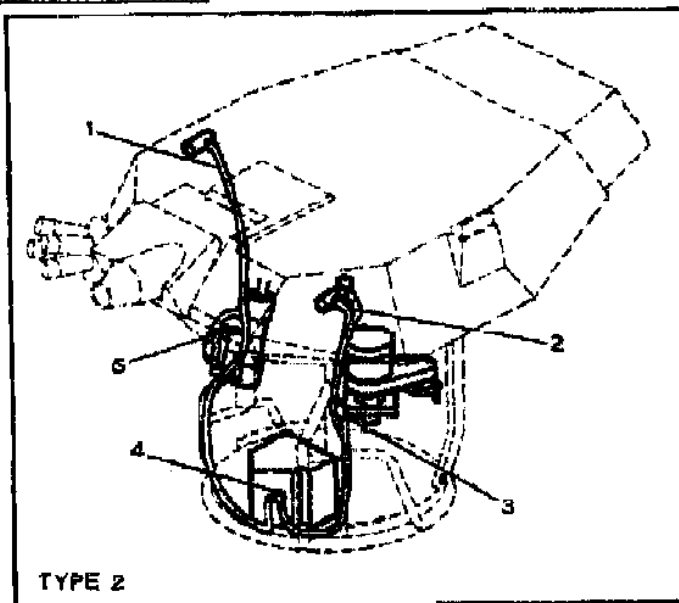
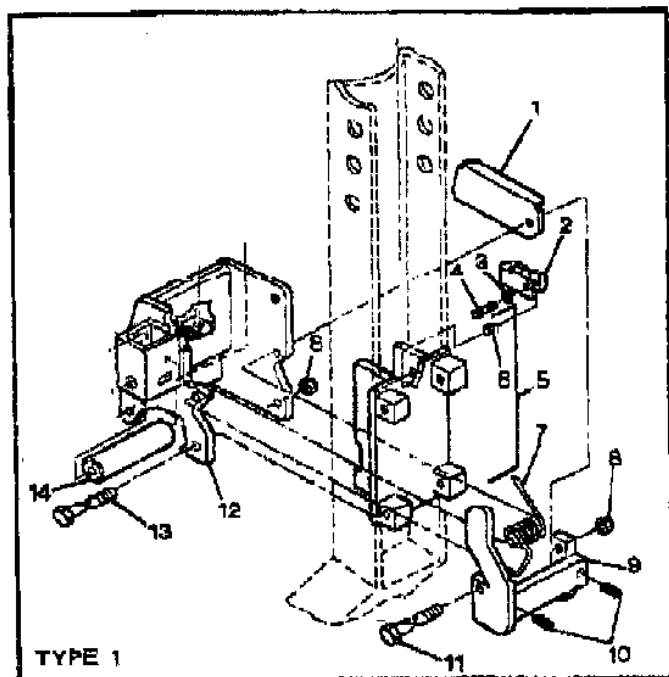


FIGURE 4. Types of phantom views.

MIL-STD-3002(MC)

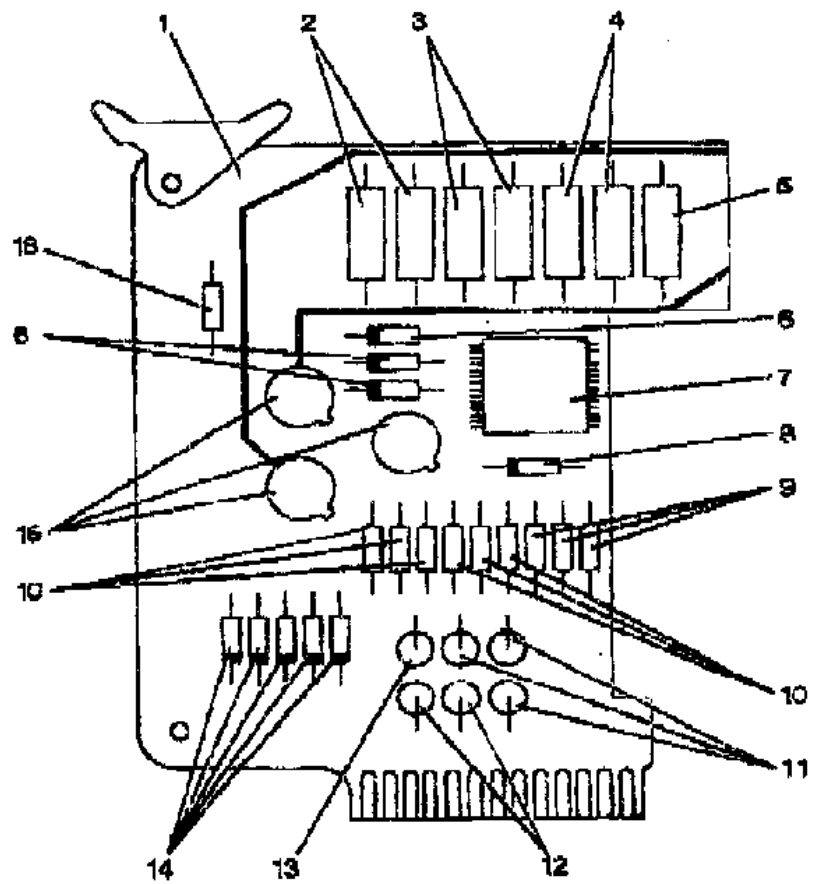
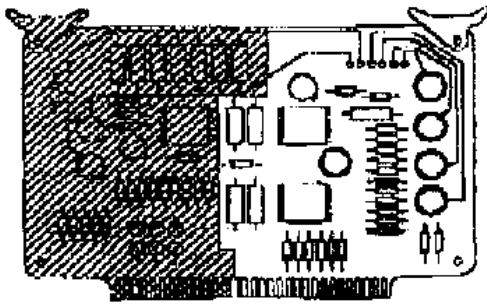


FIGURE 5. Printed circuit card (1 of 2).

MIL-STD-3002(MC)

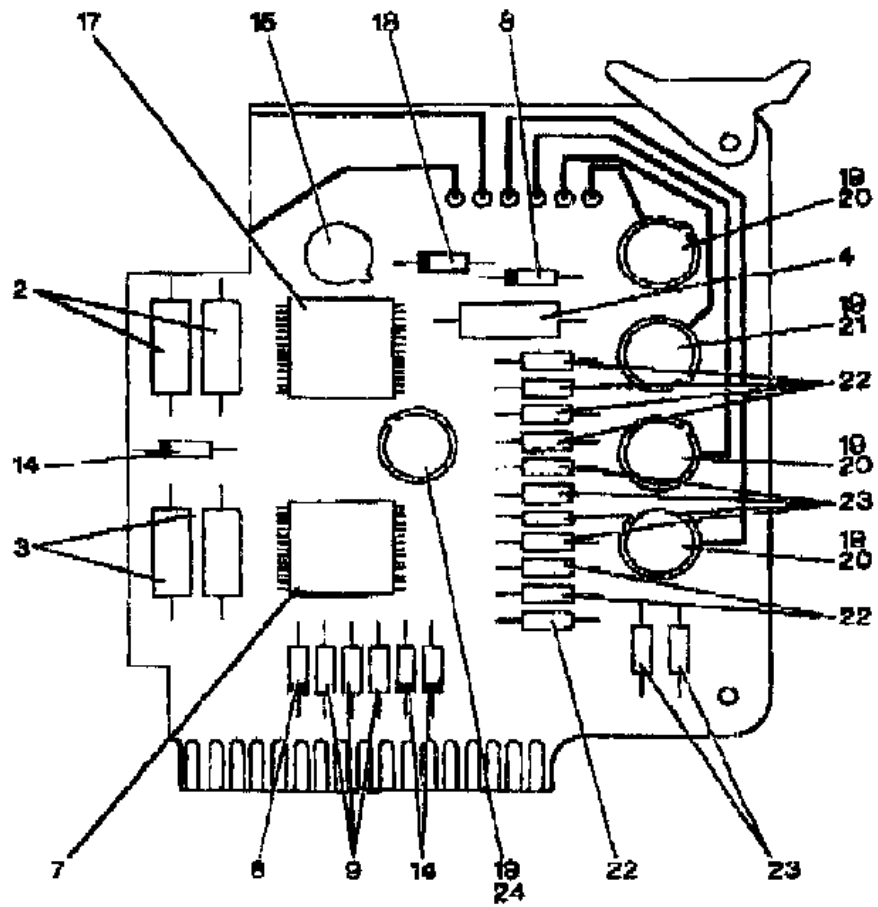
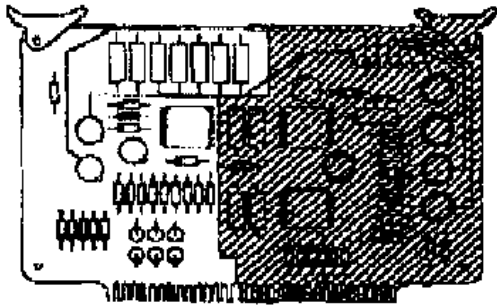


FIGURE 5. Printed circuit card (2 of 2)

MIL-STD-3002(MC)

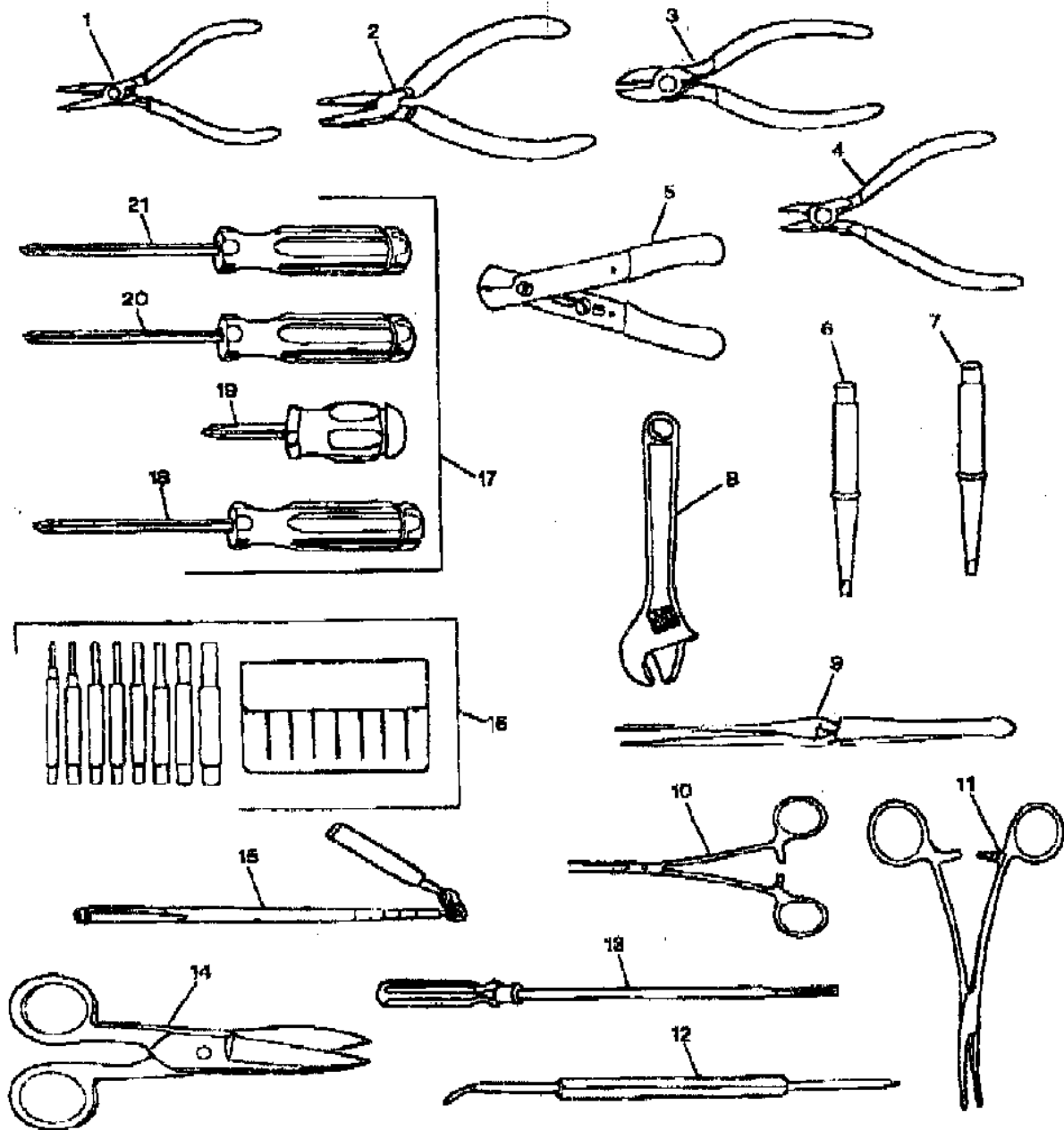


FIGURE 6. Collection type.

MIL-STD-3002 (MC)

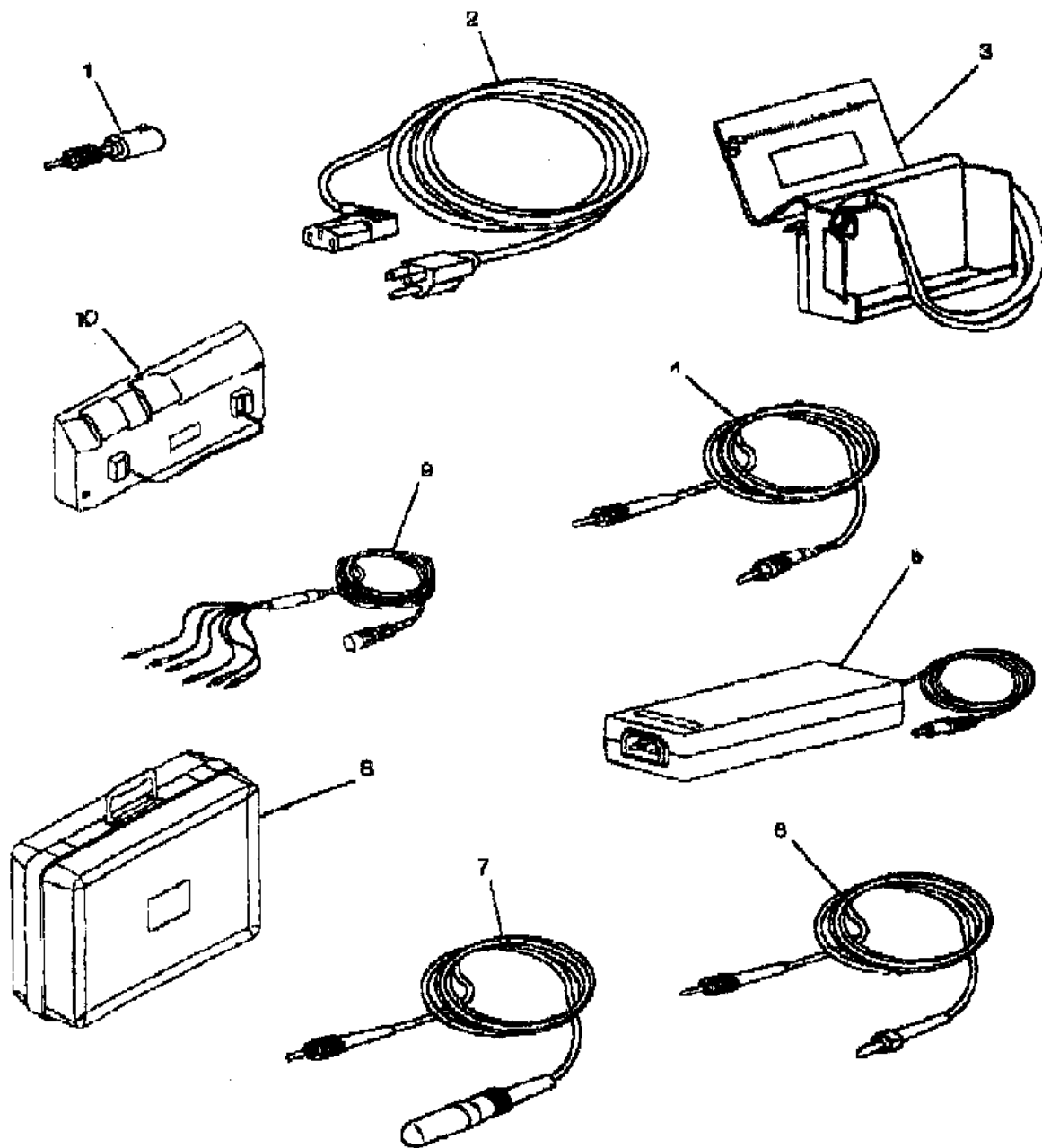


FIGURE 7. Component set.

MIL-STD-3002(MC)

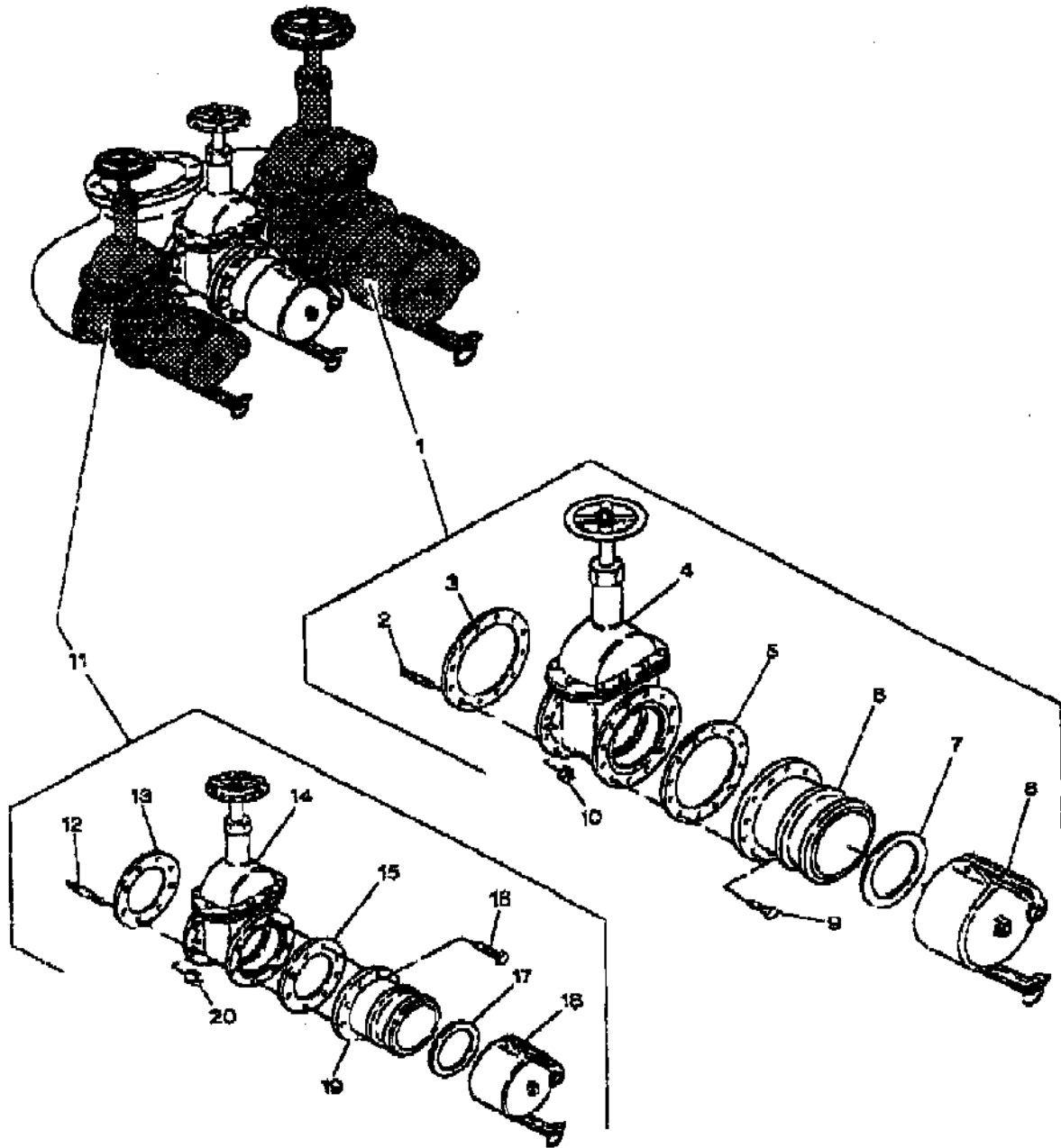


FIGURE 8. Combination of types of illustrations.

MIL-STD-3002(MC)

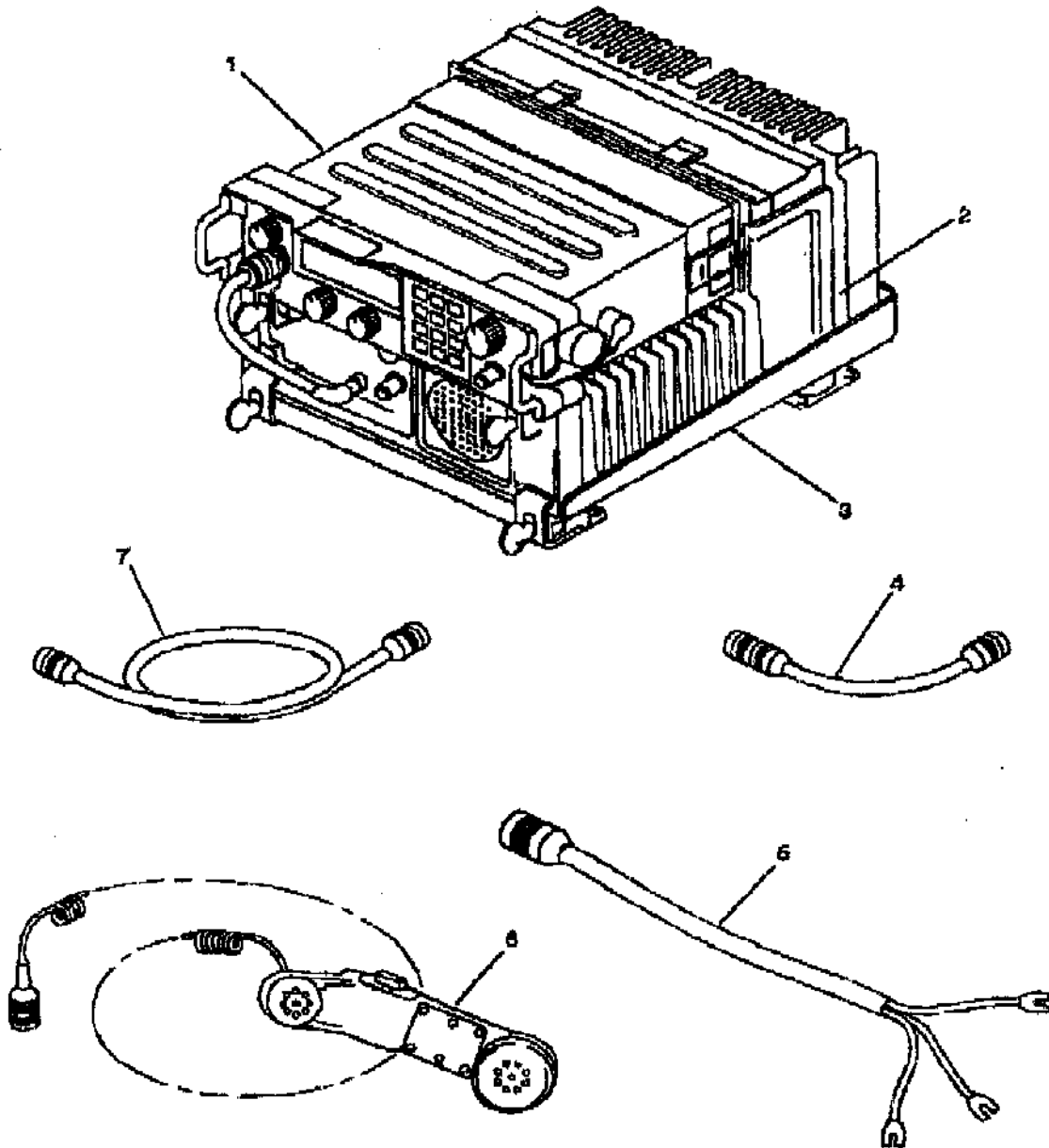
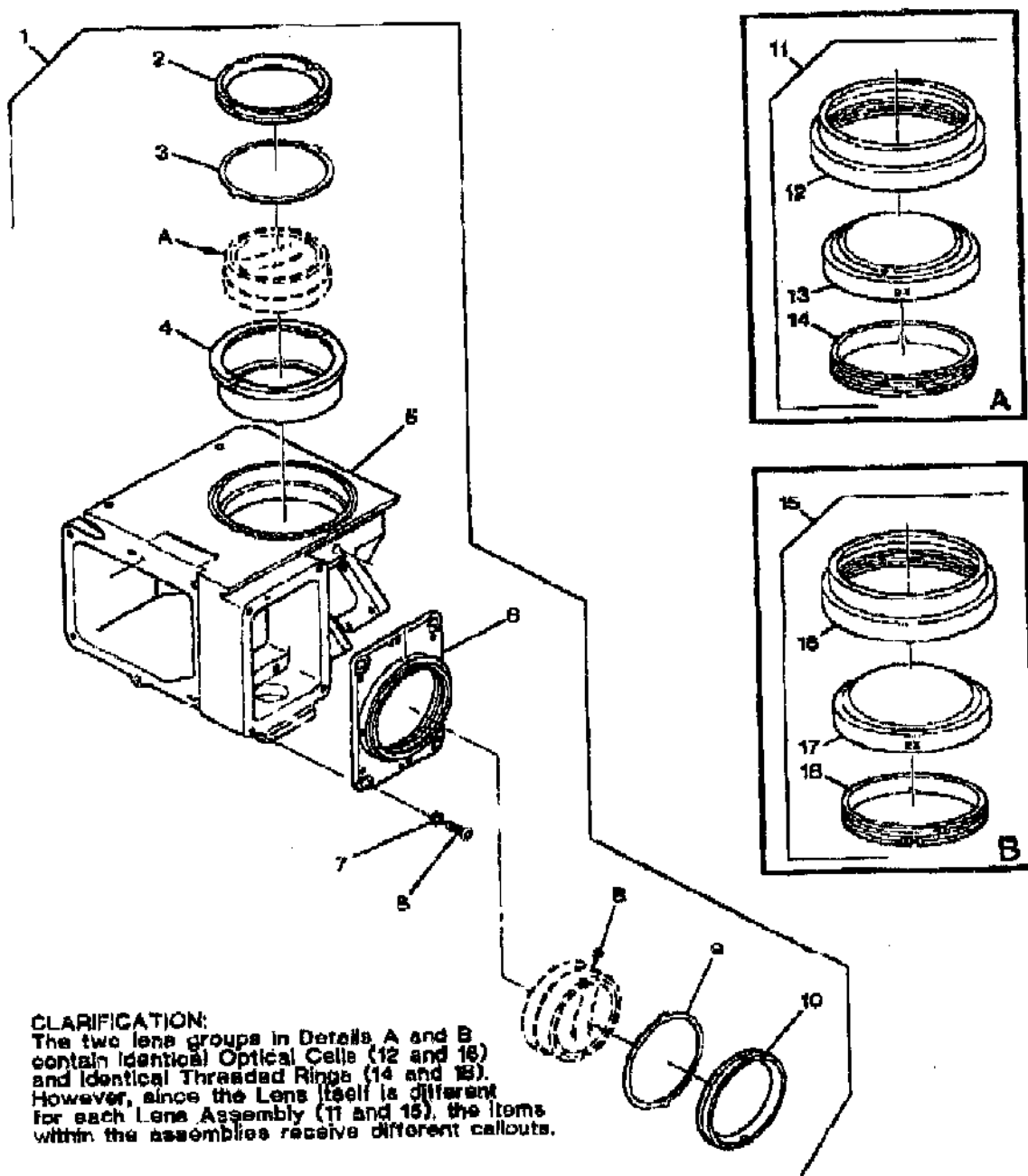


FIGURE 9. Components of an end item.

MIL-STD-3002(MC)

FIGURE 10. Line illustration details and borders.



## MIL-STD-3002(MC)

## INDEX

	PARAGRAPH	PAGE
Abbreviations .....	3.1	1
Acronyms .....	3.1	1
Arrows .....	5.4	6
Arrow applying .....	5.4.4	6
Arrow defined .....	3.2	1
Assembled view (end item) .....	4.2.1.3	3
Assembled view defined .....	3.3	1
Borders .....	4.1	2
Callouts .....	5.4	6
Callouts, assignment of .....	5.4.1	6
Callouts defined .....	3.4	1
Callouts, nonexploded view, electrical .....	4.2.1.7	4
Callouts, exploded views, mechanical .....	5.4.1	6
Callouts, identical parts .....	5.4.3	6
Captions on illustrations .....	4.1	2
Cartoons .....	4.1	2
Collection type illustration .....	4.2.1.8	4
Color illustrations .....	4.1	2
Combination line drawing and half tone .....	4.1	2
Combinations of types of illustrations .....	4.2.1.9	5
Components of an end item .....	4.2.1.11	5
Copy prints defined .....	3.5	2
Credit lines .....	4.1	2
Cross-reference list .....	5.4.2	6
Cutaway view .....	4.2.1.5	4
Exploded view .....	4.2.1.4	4
Exploded view, callouts .....	5.4.1	6
Exploded view defined .....	3.6	2
Figure number .....	5.5.1	7
Figure titles on illustrations .....	4.1	2
Final illustrations .....	5.9	8
Flow lines .....	5.3	5
Flow lines defined .....	3.7	2
Identifying illustrations .....	5.5	7
Illustrating, method of .....	4.2.1	3
Illustration, figure number .....	5.5.1	7
Illustration sizes .....	4.2.1.2	3
Illustrations, final .....	5.9	8
Illustrations, identifying .....	5.5	7
Illustrations, planning .....	4.2	3

## MIL-STD-3002(MC)

	PARAGRAPH	PAGE
Illustrations, sample .....	5.7	7
Illustrations, preliminary .....	5.8	8
Illustrations, reproduction of .....	5.6	7
Intended use .....	6.1	8
Lead illustration defined .....	3.8	2
Leader lines .....	5.4.4	6
Leader lines defined .....	3.9	2
Legend, use of .....	4.2.1.10	5
Legend defined .....	3.10	2
Line illustrations .....	4.2.1.1	3
Line illustrations defined .....	3.11	2
Line weights .....	5.2	5
Method of illustrating .....	4.2.1	3
Names, distributors' .....	4.1	2
Names, manufacturers' .....	4.1	2
Phantom view .....	4.2.1.6	4
Planning the illustrations .....	4.2	3
Preliminary illustrations .....	5.8	8
Repair parts list illustrations .....	4.2.1.10	5
Reproduction of illustrations .....	5.6	7
Restrictions .....	4.1	2
Sample illustrations .....	5.7	7
Scope .....	1.1	1
Size of lettering .....	5.4.5	7
Sizing of illustrations .....	4.2.1.2	3
Subject term (keyword) listing .....	6.2	8
Symbols, distributors' and manufacturers' ....	4.1	2
Three-dimensional drawings .....	4.2.1	3
Tools, collection of .....	4.2.1.8	4
Trademark and trade names .....	4.1	2

MIL-STD-3002(MC)

CONCLUDING MATERIAL

Preparing Activity:  
Navy - MC  
(Project TMSS-N250)

# STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

## INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

### I RECOMMEND A CHANGE:

1. DOCUMENT NUMBER  
MIL-STD-3002(MC)

2. DOCUMENT DATE (YYMMDD)  
980805

### 3. DOCUMENT TITLE PREPARATION OF ILLUSTRATIONS FOR STOCK LIST PUBLICATIONS)

### 4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)

### 5. REASON FOR RECOMMENDATION

### 6. SUBMITTER

a. NAME (Last, First, Middle Initial)

b. ORGANIZATION

c. ADDRESS (Include Zip Code)

d. TELEPHONE (Include Area Code)  
(1) Commercial  
(2) AUTOVON  
(if applicable)

7. DATE SUBMITTED  
(YYMMDD)

### 8. PREPARING ACTIVITY

NAME COMMANDER  
MARCORSYSCOM, PSE-D

b. TELEPHONE (Include Area Code)  
(1) Commercial (2) AUTOVON  
(703) 784-4584 278-4584

c. ADDRESS (Include Zip Code)  
2033 BARNETT AVE, SUITE 315  
QUANTICO, VA 22134-5010

**IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:**  
DEFENSE QUALITY AND STANDARDIZATION OFFICE  
5203 Leesburg Pike, Suite 1403, Falls Church, VA 22401-3466  
Telephone (703) 756-2340 AUTOVON 289-2340