

MIL-STD-2111 (EC)
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MILITARY STANDARD

TECHNICAL REPAIR STANDARDS -
ELECTRONIC (4G REPAIRABLE),
PREPARATION OF



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MIL-STD-2111(EC)

DEPARTMENT OF DEFENSE
WASHINGTON, DC 20360

Technical repair Standards (4G Repairable), Preparation Of

MIL-STD-2111(EC)

1. This Military Standard is approved for use by the Naval Electronic Systems Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Electronic Systems Command, Washington DC 20360 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426\ appearing at the end of this document or by letter.

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1. SCOPE

1.1 Scope. This standard covers Naval Electronic Systems Command requirements for the preparation technical repair standards (TRSA) TRS contains specific provisions for the inspection, repair, and test of repairable items for use in performing depot level maintenance by designated overhaul points (DOPs). The TRS may be used as a training document and in reprourement(s) of repairable items to aid in describing test and acceptance criteria.

2. REFERENCED DOCUMENTS

2.1 Issues of documents. The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of this standard to the extent specified herein.

SPECIFICATIONS

MILITARY

MIL-M-9868	Microfilming Of Engineering Documents, 35mm, Requirement For
MIL-M-15071	Manual, Technical, Equipments And Systems Content Requirements For
MIL-L-17192	Lubrication Design, Lubricants, And Lubrication Information For Electronic Equipment, General Specification (Navy)
MIL-M-38784	Manual, Technical, General Style And Format Requirements
MIL-C-45662	Calibration System Requirements

STANDARDS

FEDERAL

FED-STD-209	Clean Room And Work Station Requirements, Controlled Environment
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MILITARY

MIL-STD-280	Definitions Of Item Levels, Item Exchangeability, Models, And Related Terms
MIL-STD-962	Outline Of Forms And Instructions For The Preparation Of Military Standards And Military Handbooks
MIL-STD-1345	Data, Measurement, In Support Of Maintenance, Calibration And Repair Of Electronic Equipment
MIL-STD-1364	Standard General Purpose Electronic Test Equipment

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PUBLICATIONS

MILITARY

DoD 5220.22M

Industrial Security Manual For Safeguarding
Classified Information

(Copies of specifications, standards, and publications required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this standard to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

American National Standards Institute (ANSI)

ANSI Y14.15
ANSI Y32.16Electrical and Electronic Diagrams
Electrical and Electronic Reference Designations

(Application for copies should be addressed to the American National Standards Institute, 1430 Broadway, New York, NY 10018.)

Uniform Classification Committee

Uniform Freight Classification Rules

(Application for copies should be addressed to the Uniform Classification Committee, 202 Union Station, 516 West Jackson Boulevard, Chicago, Illinois 60606.)

3. DEFINITIONS

3.1 Depot level repair. The highest level of repair performed at designated maintenance activities to augment stocks of serviceable material. Depot level repair normally consists of inspection, test, repair, modification, alteration, modernization, conversion, overhaul, reclamation, or rebuild of parts, assemblies, subassemblies, components, equipment end items, and weapon systems; and the manufacture of critical non-available parts. Depot repair is normally accomplished at a designated Navy, other service(s), or contractor(s) activity.

3.2 Depot level repairable. Any item, component, or equipment that fails to conform to its minimum prescribed operating limits, that is, source, maintenance, and recoverability (SM&R) coded for depot level repair or condemnation.

3.3 Designated overhaul point (DOP). An activity (including an activity of another service or a contractor) designated by a hardware systems Command or Project Manager to perform the highest (depot) level of repair on a particular item or group of items. Provides technical assistance to intermediate maintenance organizations, using and other activities.

3.4 Equipment. One or more components capable of performing a complete function.

3.5 Final acceptance test(s). The examination and test of repairable item(s) after completion of overhaul or repair to ensure that the item(s) satisfies performance requirements.

3.6 Function. A group of circuits or other devices which operate together to accomplish a portion of an equipment or system objective (for example, transmit, receive, display, hoist, and control).

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3.7 General purpose electronic test equipment (GPETE). Electronic test equipment that contains the capability, without modification, to generate, modify, or measure a range of parameters of electronic functions required to test two or more items (repairable items), systems, or equipments of basically different design and listed in MIL-STD-1364.

3.8 Government inspection(s). Inspection(s) (including in-process inspections) that are conducted by the Government to ensure that deliverable items are being repaired in accordance with the requirements of the applicable contract and TRS. These inspections shall be conducted at the contractor's facility or his source facility at any time during the repair cycle of the items.

3.9 Item. A non-specific term used to denote any product, set, group, unit, assembly, subassembly, and part as defined in MIL-STD-280.

3.10 Overhaul. The process of reconditioning an item to conform to the performance of current technical specifications of the items with a life expectancy equivalent to similarly configured new equipment; by repair or replacement of parts and components that have failed, or are of marginal quality, due to wear, deterioration, or damage so as to preclude premature failure; cosmetic reconditioning; and installation of all approved engineering or field changes.

3.11 Quality. Used exclusively in this standard to refer to the completeness-of the technical repair standards (TRS) content for use at the DOP in terms of reliability, accuracy, retrievability, and operability.

3.12 Repair. The process of returning an unserviceable item to operational status by repair or replacement of parts or components that have failed or are of marginal quality due to wear, deterioration, or damage.

3.13 Repairable item. An item of durable nature which, when unserviceable, normally can be economically restored to a serviceable condition through repair procedures performed by a Government or commercial overhaul facility.

3.14 Restoration. The process of upgrading an item to conform to the current technical specifications for this item to ensure specified operational capability, and the restoration of the equipment's physical appearance to manufacturer's original condition. It includes the repair or replacement of parts and components that have failed, or are of marginal quality, due to wear, deterioration, or damage; full cosmetic reconditioning and mandatory installation of all approved engineering or field changes.

3.15 Special purpose electronic test equipment (SPETE). Electronic test equipment that is specifically designed to generate, modify, or measure a range of parameters of electronic functions of a specific or peculiar nature required to test a single item (repairable item), system, or equipment and not listed in MIL-STD-1364.

3.16 System. A system includes two or more equipments (sets) or components each having its own identity and nomenclature, arranged and interconnected to perform a specific operation.

3.17 Technical repair agent (TRA). An organizational unit or activity which is assigned the primary responsibility for the repair management of a group of items, including responsibility for technical control and quality control of the repair product.

3.18 Technical repair standards (TRS). The precise technical, operational, and material requirements to which the item must perform after repair conforming to established test procedures.

3.19 TRS change pages. A modification of data to an existing TRS.

3.20 TRS revision. A second or subsequent edition of a TRS which supersedes the preceding edition.

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3.21 TRS validation. The process by which the contractor ensures the technical accuracy, adequacy of the TRS, and that the TRS represents the latest configuration of the repairable item(s) covered by the TRS by actual test of the item.

3.22 TRS verification. The process by which the Government assures the accuracy of the TRSs by actual comparison the hardware (repairable item(s) covered by the TRS).

3.23 Ready for issue. Repairable item operating within all standards, in all modes of operation, that has government verification.

3.24 Non-ready for Issue. Repairable item requiring test, alteration, modification, conversion, or repair.

3.25 Hardware. End items, physical equipment, or repairable item.

3.26 Unique facility. One that has special configuration, operating, and test equipment to perform a specific mission.

3.27 Standard facility. One that utilizes general operating and test equipment capable of handling a variety of missions.

4. GENERAL REQUIREMENTS

4.1 Security.

4.1.1 Security classification. Unless otherwise specified herein, the TRS shall not contain classified information. When the TRS must contain classified information, the security classification shall be assigned by the procuring activity. Marking, handling, production, and packaging of all classified material shall be in accordance with the DoD 5220.22M Industrial Security Manual for Safeguarding Classified Information. DD Form 254 (Contract Security Classification Specification), which constitutes a part of the contract for all classified material, identifies and indicates the sensitive equipment features requiring security classification.

4.1.2 Security classification markings. Where classified information is included in the TRS, marking, handling, and production of all classified material shall be in accordance with the Security classification markings paragraph of MIL-M-38784. On foldout pages of classified TRSS, the security classification shall be so placed as to be visible when the printed page is folded or open.

4.2 TRS outline. A TRS outline shall be prepared for review and acceptance by the Government prior to the development of the manuscript. The TRS outline shall conform to the following:

- a. The TRS outline of the planned TRS coverage by section and paragraph shall be prepared in accordance with the content requirements of this standard. Each section and paragraph title or notation listed in Section 5 shall be followed by a short statement outlining the data to be presented. An index in tabular form, listing each illustration and table by number and title, shall be included. Each illustration by type (exploded view, schematic, line drawing), information content, and use shall be described. All nomenclature shall be consistent between text and illustrations.
- b. A brief summary of the purpose and contents of the proposed TRS shall be indicated within the TRS outline.
- c. The TRS outline shall identify the applicable item(s) by approved nomenclature, reference designator, National Stock Number (NSN), and Manufacturer(s) Federal Supply Code(s) (FSCMs) and part number(s), and shall identify the system(s) or equipment(s) of which the item(s) is a part.

- d. Applicable reference technical data (for example, Government approved product design drawings, performance specifications, quality assurance or test procedures, allowance parts lists (APLs), field changes, electronics information bulletins (EIBs), microfilm, and technical manuals), to be utilized in the TRS development shall be provided with the TRS outline. When applicable, MIL-STD-1345 contract data deliverables shall be referenced or included in the TRS outline and subsequent TRS.
- e. Repair item(s) input/output (I/O) parameters and tolerances (satisfactory performance requirements) shall be determined and listed in the TRS outline.
- f. A sample of each type of illustration shall be shown in the TRS outline.
- g. A detailed repair process flow chart graphically depicting the sequence of repair events (receiving, inspection, test, and packaging) to occur throughout the process specified in the TRS, shall be provided with the TRS outline (see FIGURE 1). Unique facility, repair process, and support equipment problem areas (including new concepts), and proposed solutions, shall be discussed in the TRS outline. The quantity and requirements of special repair aids, tools, fixtures, jigs, and test equipment, including SPETE, shall be identified and listed in the TRS outline.
- h. The quantity and requirements of test repair stations shall be identified and listed in TRS outline.
- i. Standard facility, repair process, and support equipment, including GPETE and standard measuring instruments (SMI) requirements shall be identified, and the necessary quantity and test repair stations shall be listed in the TRS outline.
- j. Coverage shall be on a comprehensive and systematic basis and shall provide the most effective and efficient method of performing all repair tasks.

4.2.1 TRS outline identification and date of issue. TRS outlines shall be numbered identically with the corresponding, planned TRS (see 5.5.1) with the exception that the words TRS OUTLINE: shall precede the number identification and the date of issue (contractor preparation and completion date) shall appear below the number identification. Example:

TRS OUTLINE: WRC-1-1A2A5-002
15 September 1974

The identification and date information shown in this example shall appear in the upper-outer corner of each page, including the cover or title page, of the outline.

4.2.2 TRS outline originals. The TRS outline(s) originals (masters) become the property of the procuring activity. The contractor shall deliver the approved outline masters to the procuring activity.

4.3 TRS manuscript. A TRS manuscript shall be prepared for review and approval by the Government prior to the preparation of the camera-ready reproducible copy. The review manuscript shall contain all data required for the final TRS, including all front matter, text, tables, and illustrations necessary to conform to the content and format requirements of this standard. Preparation of the TRS manuscript shall be in accordance with the Preliminary manual paragraphs of MIL-M-15071. The manuscript shall be technically accurate, adequate, and shall represent the configuration(s) of the repairable item(s) for which the TRS is prepared. Unless otherwise specified herein, the manuscript shall be validated (see 3.21).

4.4 TRS camera-ready reproducible. Copies of the TRS camera-ready reproducible and all TRS originals (text, artwork, and illustration masters) shall require review for final approval and acceptance prior to the printing and distribution of the TRS. The review for approval function shall be conducted in conjunction with or following the satisfactory accomplishment of TRS verification (see 3.22). Changes to the TRS determined during verification shall be incorporated in the TRS and the TRS reverified prior to formal approval. The TRS camera-ready reproducible (text, artwork, and illustration masters) are the property of the procuring activity. The contractor shall deliver the approved TRS camera-ready reproducible to the TRA as directed by the procuring activity.

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4.5 Criteria for the TRS change or revision determination. In considering a revision, the following detailed information would expedite a decision by the procuring activity and the TRA or its designated representative (see 5.4).

- a. Number of pages in the new revision and percentage of pages affected in existing TRS by all changes
- b. If the new revision merely adds pages to a section, or to the back of the TRS, affecting no pages in the existing TRS, it shall be so specified
- c. Time required to prepare the new revision or change
- d. Cost of preparing the new revision or change

5. DETAILED REQUIREMENTS

5.1 Level of writing, text, and illustration development. The level of writing and development of text for the TRS shall be in accordance with the requirements of this standard and the Style of writing paragraph of MIL-M-38784. The text of the TRS shall be specific, concise, and clearly worded to be readily understandable by repair personnel and inspectors who have had appropriate training and working experience with the repair and overhaul of similar or related equipment.

5.1.1 Accessibility and referencing of data. Cross-referencing techniques in text and illustrations shall provide rapid access to all repair requirements data so that the user can proceed through the required action without interruption. Referencing to other publications shall be kept to a minimum. Referencing shall be in accordance with the requirements of this standard and the References paragraph of MIL-M-15071.

5.1.2 Use of references in the TRS. The use of references in the TRS shall be limited to Government approved documents such as Military specifications and standards, technical manuals, uniform methods and standards, drawings, field change data, engineering change data, and such other approved material which will enhance clarity and support the repair requirements and processes delineated in the TRS (see Section 2).

5.1.3 Use of commercial documents as references. Commercial copyright and proprietary material shall not be incorporated without the written permission of the copyright and proprietary data owner and the procuring activity. Non-Government controlled documents, such as commercial specifications, catalog information, or manufacturer's manuals, may be referenced for general information procedures. In those instances where approval for incorporation of the data is required, the data shall be extracted and set forth verbatim in the TRS.

5.1.4 Illustrations and artwork requirements. Illustrations shall be provided to convey essential information and to support the instructions in the TRS. Text and illustrations shall complement each other to communicate the required information. The use of illustrations is expected in instances where they will improve clarity and reduce the volume of written descriptive matter. Photographs, charts, and graphs may be considered illustrations, and assigned figure numbers. If a particular photograph, chart, or graph is small, and will not require referencing except from adjacent text, it may be included within a paragraph of text without identification as a figure. Illustrations and artwork shall be prepared in accordance with the requirements of the Illustrations paragraph of MIL-M-15071. For example, fold-out diagrams and apron notes shall conform to the Apron notes paragraph of MIL-M-15071.

5.1.4.1 Illustration types. The following are examples of types of illustrations:

- a. Exploded views
- b. Sectional views
- c. Test set-up diagrams
- d. Assembly, disassembly, reassembly, and fabrication drawings
- e. Electrical and electronic schematic diagrams, block diagrams, fault logic, and timing circuit diagrams

- f. Hydraulic, pneumatic, and gas pressure diagrams
- g. Signal flow diagrams
- h. Wiring diagrams
- i. Item location illustrations
- J. Engineering drawings
- k. Gearing and linkage diagrams

5.1.4.2 Engineering drawings and technical manual illustrations. Engineering drawings and technical manual illustrations, which were not prepared primarily for TRS illustration purposes are acceptable as TRS illustrations if the copy print is legible, reproducible, and readable when reduced to TRS size, and when they conform to ANSI Y14.15 and ANSI Y32.16. Borders, title blocks, manufacturers notes, technical manual figure numbers and titles, and irrelevant material shall be removed or changed to incorporate all peripheral information that would be required in the TRS.

5.1.4.3 Photographs. Photographs shall be sharp, free of heavy shadows, distorted objects, cluttered foregrounds or backgrounds, and shall give good contrast from white, middle tones, and black.

5.1.5 Warnings, cautions, and notes. Warnings and cautions shall precede the text to which each applies, but notes may precede or follow applicable text depending on the material to be highlighted. Warnings, cautions, and notes shall be provided in the TRS in accordance with the Warning, caution, and notes paragraph of MIL-M-38784.

5.1.6 Safety and health hazards precaution data. Precautionary requirements shall be invoked in the TRS when hazardous chemicals and adverse safety or health factors occur, that cannot be eliminated, from the repair environment. The Safety summary paragraph of MIL-M-38784, shall also apply to the TRS.

5.2 Production and reproduction. The copy shall be a clear, readable reproduction. In addition, the copy shall be satisfactory for use in making 35 millimeter (rim) microfilm of each page in accordance with the Legibility paragraph of MIL-M-9868. The TRS shall be reproduced on one side of the paper only. Alternative methods will be considered for approval by the procuring activity if equivalent performance and durability are provided.

5.2.1 Typography. Except when it is more economical to the Government to supply a higher quality of typography, TRSs shall be typewritten. Letters, lines, and symbols shall be of a uniform contrast throughout the TRS. Blurred or smudged printing or drop-out characters or lines shall be cause for rejection. Typography for TRS changes and revisions shall conform to the original TRS.

5.2.1.1 General typing instructions. General typing instructions are as follows:

- a. Copy shall be typewritten, single spaced, single 158.750mm (6.2500 in) column width using a type face of 10-point or larger:
- b. Top, bottom, right, and left margins shall be 28.575mm (1.1250 in).

5.2.1.2 Legend. The TRS document number shall appear in the upper right corner of each page (see 4.2.1).

5.2.1.3 Title. The title shall be typed in capital letters on the first page of the text only, underlined located at the left margin two lines below the legend.

5.2.1.4 Paragraph numbering. Dewey decimal paragraph and subparagraph numbering shall be used (see the Paragraph identification paragraph of MIL-STD-962). Paragraph heading shall be presented as follows:

- a. 3. REQUIREMENTS (Section heading, stand alone (not run in with the text), all capital letters)

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- b. 3.1 Paragraphs. (Stand alone (not run in with the text), initial cap on first word only, underlined)
- c. 3.1.1 Subparagraphs. (Run in with text, initial cap on first word only, underlined)

5.2.1.5 Pagination. Pages shall be numbered as specified herein. The page number shall be centered, 12.700 mm (0.5000 in) from the bottom of the page.

- a. Cover and title page. The cover and title page shall be unnumbered (see FIGURE 2).
- b. The user activity comment sheet shall be unnumbered (see FIGURE 3).
- c. Front matter pages. Front matter pages (for example, pages for the table of contents, record of revisions or TRSCNS, list of illustrations, and list of tables) shall be assigned lower case Roman numerals, in sequence i, ii, iii, and so forth.
- d. All other pages (text) contained in the TRS, including any appendices, shall be numbered consecutively, using Arabic numerals.
- e. TRSS twelve or less pages (excluding the table of contents, record of revisions or TRSCNS, and the user activity comment pages) in length shall:
 1. Not have a list of illustrations, or list of tables.
 2. Always be revised, never have changes issued thereto.

5.2.1.6 Appendices. Appendices shall be placed at the end of the TRS, in the following format:

- a. Appendices shall be numbered, for example, Section X, XX, in multiples of ten for each succeeding appendix. Divisions and paragraphs within an appendix shall be numbered, such as 10.0, 10.1, 10.1.1. Page numbers for the appendices shall be consecutive and in sequential order with the page numbers used throughout the TRS text (see 5.2.1.5 d). Each page of the appendix shall be identified with the TRS number as in the main body of the TRS.
- b. An appendix shall have a statement of scope to indicate the limitations of the appendix and to ensure its proper application and use.

5.2.1.7 Cover and title page. The cover and title page forms (see FIGURE 2) may be produced locally by the contractor or they may be obtained from the procuring activity. Cover and title page stock satisfactory for intended use is acceptable; however, the colors for the cover and title pages shall be as follows:

- a. Unclassified: White
- b. Confidential: Green
- c. Secret: Yellow
- d. Top Secret: Pink

5.2.1.7.1 Back cover. The back cover stock shall be the same material and quality as the cover and title page. Copy for the back cover of a classified TRS shall show only the security classification, at the top and bottom, and in the same size and style as shown on the front cover and title page.

5.2.2 Paper stock. The TRSS shall be prepared on any good quality write paper stock 215.900 mm by 279.400mm (8.5000 by 11 in) which is suitable for the intended method of reproduction. Fold-out pages conforming to the requirements of this standard and the Paper stock for printed manuals paragraph of MIL-M-15071 shall be used.

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5.2.3 Assembling. TRSS shall be prepared in loose-leaf form for insertion in standard three-ring binders there by facilitating the insertion of replacement pages. Each document shall be collated and stapled at the upper left corner. The pages shall be punched or drilled as follows:

- | | | |
|----|-----------------------------|------------------------|
| a. | Number of holes: | 3 |
| b. | Hole size: | 6.350 mm (0.2500 in) |
| c. | Distance, left edge: | 11.113 mm (0.4375 in) |
| d. | Distance, center to center: | 107.950 mm (4.2500 in) |

5.2.3.1 Assembling bulky documents. TRS documents of 40 pages or more, or exceeding 15.875 mm (0.6250 in) thickness shall use corrosion resistant posts and screws or snap-ring metal prong fasteners.

5.2.3.2 Page sizes and punching or drilling Page sizes and punching or drilling for TRS changes or revisions shall be the same as for the original basic TRS.

5.3 Changes. Changes to TRSS shall be proposed by TRSCN and issued by TRSCN.

5.3.1 Technical repair standard change notice (TRSCN). The TRSCN document shall be used to propose, transmit, and record changes to a TRS the TRSCN form (see FIGURE 7) shall be used as a cover sheet and letter of transmittal, the changes associated with that TRSCN shall be attached and shall constitute an integral part of the TRSCN.

5.3.1.1 Proposed TRSCN. A proposed TRSCN shall be used to propose to the TRA the exact change in TRS paragraphs, figures, or other content that will be distributed to users if the TRSCN is approved by the TRA. Such modifications in content in this proposed form of the TRSCN shall be submitted in final change page format.

5.3.2 Change pages. Revised and reissued pages shall be complete reprints of pages suitable for incorporation by removal of old pages and insertion of new pages. All portions affected by the change shall be indicated by a vertical symbol in the right-hand margin adjacent to, and encompassing all changed portions (see 5.3.3).

5.3.3 Identification. Each changed page shall be identified by means of the TRS number and the applicable revision letter. The date of issue of the TRSCN shall be entered below the TRS number and shall agree with the date entered in the upper right-hand corner of the TRSCN form.

Example: Assume that the current revision of the TRS is A, the date of issue of such revision is 20 June 1972, and two TRSCNS have not been approved. If TRSCN-2 is issued on 5 June 1973, the pages changed by TRSCN-2 would carry the following identification on each page:

TRS-XXXX-A1A6-001a

5 June 1973

5.3.4 Page numbers. The changed pages furnished with an TRSCN shall be numbered with the same page numbers as the pages they replace. If it is necessary to replace one page with more than one, the additional pages shall carry the same number as the affected page plus a suffix letter in alphabetical order beginning with a. Thus, the numbers of changed pages to change page 5, for example, would be 5, 5a, 5b. If a page is deleted, that number shall be omitted in the current page sequence.

5.4 Revisions. A revision of a TRS is a reissue of a complete TRS and shall be prepared, issued, and identified in the same manner as the TRS that it supersedes, except that the identification number shall be followed by an appropriate revision letter. The letters shall be assigned in alphabetical order for each succeeding revision. Revision letter A shall be assigned to the first revision. Each revision shall incorporate all outstanding approved changes against the previous issue as well as approved changes proposed by the TRSCN that creates the need for revision. Revisions of TRSS shall include vertical symbols in the right-hand margins of the pages to indicate where changes have been made with respect to the prior issue.

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5.5 Approval. Once such a TRS has been approved, the TRS shall not be modified without further approval.

5.5.1 Document number. The procuring activity shall assign a document number for each TRS. The document number shall consist of three groups of digits which identify:

- a. The system or equipment to which the TRS applies (such as FRT-83)
- b. The reference designation of the repairable item to which the TRS applies (such as A1A6)
- c. A TRS serial Number

5.5.1.1 Document number(s) for repairable items. For TRSS which apply to repairable items not identifiable to a particular system or equipment, the first group shall consist of the four-digit designator from the Federal Item Identification Number (FIIN) such as 5820 for 4G items. The second group shall consist of the numbers which denote the repairable item reference designator. The third group of digits, or serial numbers, shall consist of consecutively assigned numbers, starting with 001. Examples of document numbers for TRSS are as follows:

<u>Equipment</u>	<u>Item</u>	<u>TRS serial number</u>
FRT-83	A1A6	001
5820	A1A6	002

A TRS number would actually appear as: 5820-A1A6-001. The first revision of this TRS would appear as: 5820-A1A6-CCIA.

5.5.1.1.1 Date of issue. The date of issue (contractor preparation and completion date) shall always appear below the TRS document (identification) number in the upper-outer corner of each page. For example:

- a. Initial issue of the basic (final) TRS:

FRT-83-A1A6-001
15 September 1973

- b. Subsequent reissue of TRS, (for example, revision A) all pages affected by the A revision shall carry the appropriate TRS document revision letter and the date of issue of the affected page(s):

FRT-83-A1A6-00IA
15 October 1974

5.6 Arrangement. The TRS shall contain the following data to provide complete instructions for the depot repair process and shall be arranged as follows:

- a. Front matter (see 5.6.1)
- b. Technical content (see 5.8)
- c. Appendices (see 5.9)
- d. User activity comment sheets (see 5.7)

5.6.1 Front matter. The front matter shall consist of the following, as applicable:

- a. Cover and title page
- b. Content assurance page(s)
- c. Record of revisions or TRSCNS (changes)
- d. Table of contents
- e. List of illustrations
- f. List of tables
- g. Safety summary

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5.6.1.1 Cover/title page. The cover and title page shall conform to the requirements of this standard (see 5.2.1.7 and shall be as shown in FIGURE 2).

5.6.1.2 Content assurance page(s). The content assurance page(s) shall conform to the requirements of this standard (see 5.2) shall be as shown in FIGURE 5, and shall follow the cover and title page. Completed content assurance page(s) with all required data shall be included in the TRS manuscript (see 4.3) in the TRS camera-ready reproducible (see 4.4), and in each subsequent revision of the TRS (see 5.4).

5.5.1.3 Record of revisions or TRSCNS (changes). The record of revisions or TRSCNS (changes) shall conform to the requirements of this standard (see 5.3 and 5.4), shall be as shown in FIGURE 6, and shall follow the content assurance page(s). All approved changes (TRSCNS) and revisions to the TRS shall be appropriately entered on this record (see 5.3).

5.6.1.4 Table of contents. The table of contents shall conform to the requirements of this standard (see 5.2), shall be as shown in FIGURE 8 (one page), and shall follow the record of revisions or TRSCNS (changes) page(s).

5.6.1.5 List of illustrations. The list of illustrations shall conform to the requirements of this standard (see 5.2) and the List of illustrations paragraph of MIL-M-38784 for a single column format. The list of illustrations shall follow the table of contents.

5.6.1.6 List of tables. The list of tables shall conform to the requirements of this standard (see 5.2) and List of tables paragraph of MIL-M-38784 for a single column format. The list of tables shall follow the list of illustrations.

5.6.1.7 Safety summary. When applicable, a safety summary in accordance with the Safety summary paragraph of MIL-M-38784 shall be provided. The safety summary shall follow the list of tables.

5.7 User activity comment sheets. The TRS shall contain three user activity comment sheets (FIGURES 3 and 4) in each separately produced or issued publication. These sheets, conforming to the requirements of this standard (see 5.2), shall be located immediately following the last page of the TRS.

5.8 Technical content. The TRS shall provide, on a systematic and comprehensive basis, the detailed instructions, procedures, and supporting illustrations for an effective and efficient method of performing the depot repair of the item(s) covered in the document. The technical contents (and appendices, see 5.9) shall follow the format matter (see 5.6.1) and shall be arranged in sections in accordance with the following:

- a. SECTION I, GENERAL INFORMATION
- b. SECTION II, FACILITIES, TEST EQUIPMENT, PERSONNEL AND TEST CONDITIONS
- c. SECTION III, INSPECTION METHODS
- d. SECTION IV, PERFORMANCE TEST PROCEDURE
- e. SECTION V, REPAIR PROCEDURE AND FINAL ACCEPTANCE TEST
- f. SECTION VI, PACKAGING AND HANDLING
- g. SECTION X, REPAIRABLE ITEM DATA
- h. SECTION XX, TEST SUPPORT EQUIPMENT DATA
- i. SECTION XXX, TEST DATA RECORD SHEETS
- j. SECTION(s) XXXX, Other appendices (sections)

5.8.1 Section requirements. A section shall consist of one or more main paragraphs, each divided into subparagraphs. Sections and major paragraphs shall each have a brief title describing content or action required.

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5.8.2 SECTION I, GENERAL INFORMATION. This section shall state the purpose, organization, and intended use of the TRS. This section shall include the information specified in 5.8.2.1 through 5.8.2.5.

5.8.2.1 Frontispiece illustration. A pictorial presentation (photograph is preferred) of the repairable item covered in the TRS shall be placed on the page preceding SECTION I (see FIGURE 9).

5.8.2.2 Scope. The scope shall:

- a. State a brief summary of the purpose, organization, and contents of the TRS including appendices. It shall include a statement that conformance with the TRS is required of designated commercial and Government depot maintenance activities authorized for repair of the repairable item(s) covered in the TRS.
- b. State the identification of the repairable item(s) covered by the TRS using approved nomenclature, reference designator, National Stock Number (NSN), and all applicable Manufacturer(s) Federal Supply Code(s) (FSCMS) and part number(s). It shall also identify the next assembly(s), equipment(s), and system(s) in which the repairable item(s) is used. These data shall be listed in tabular form.
- c. In cases where the TRS specifically pertains to a repairable end item(s) containing a repairable sub-item(s): State the identification of the sub-item(s) (see 5.8.2.2 b) and the applicable sub-item(s) TRS document number(s). In addition, briefly state the relationship of the subitem(s) to the repairable end item(s). Normally these data shall be provided in tabular form.

5.8.2.3 Item description. A tabular listing of the overall dimensions, approximate weight, and approximate volume of the repairable item(s) covered by the TRS shall be determined. Overall dimensions shall be the height, width, and depth in inches, approximate weight shall be the total weight in pounds and ounces, and approximate volume shall be the total volume in cubic feet and inches for the uncrated repairable item(s), with appropriate metric conversions.

5.8.2.4 Applicable documents. A tabular listing shall be developed of all publications, product engineering drawings and schematics, specifications and standards, engineering and field change(s) data, and other reference data (see 5.1.1) used in the preparation of the TRS and as determined appropriate for reference in the TRS text.

5.8.2.5 User TRS comments procedure. A brief instruction to the TRS user shall be developed specifying that comments or recommendations concerning the TRS are to be directed to the TRA utilizing the user activity comment sheets) (see 5.7).

5.8.3 SECTION II, FACILITIES, TEST EQUIPMENT, PERSONNEL AND TEST CONDITIONS. This section shall state information concerning the facilities, equipments, and repair personnel required by the depot maintenance activity to accomplish effective, efficient repair of the item(s) covered by the TRS. This section shall consist of the information described in 5.8.3.1 through 5.8.3.4.

5.8.3.1 Facilities. The facilities required (specify quantities) for the repair process shall be identified and described. The following information shall be normally listed in a tabular form:

- a. Work area, space, and storage requirements
- b. Shop machine, handling, and support equipment requirements (common and special)
- c. Electric power and ground requirements
- d. Hazard or safety and security requirements
- e. Electromagnetic interference and compatibility requirements
- f. Forced ventilation or air changes required from the facility
- g. Service requirements, for example, water, gas, hydraulic oil, and so forth (specify required pressures and flow rates)
- h. Other facility requirements as determined

5.8.3.2 Test equipment. A tabular listing shall be identified and shall describe all test equipment and repair aids required (specify quantities) in the examination, repair (including alignment, adjustment, and trouble-shooting), and performance or acceptance testing of the repairable item(s) covered by the TRS. These data shall be provided in the form shown in FIGURE 10, including the Test equipment requirements paragraphs therein:

- a. General purpose electronic test equipment (GPETE) shall be selected from standard or substitute standard GPETE as listed in MIL-STD-1364. (When it is determined that there is no standard or substitute standard GPETE suitable for performing the required tests, the situation shall be described, justified, and referred to the procuring activity and written approval shall be obtained authorizing the use of non-standard test equipment).
- b. Equipment which is no longer manufactured nor available to the Government shall not be listed.
- c. The accuracy of the recommended test equipment shall be less than 25 percent of the tolerance allowed for the measured parameter.
- d. Common hand tools normally used at depot maintenance facilities, for example, screwdrivers, wrenches, and pliers, shall not be listed in the tabular format.
- e. Unique or special maintenance and calibration requirements of the equipment(s) listed in this section of the TRS shall be specified. If no unique or special maintenance and calibration is required of any listed equipment, the TRS shall so specify (see MIL-C-45662).

5.8.3.2.1 Test equipment list. The following types of equipment shall be listed:

- a. General purpose electronic test equipment (GPETE)
- b. Special purpose electronic test equipment (SPETE)
- c. Automatic test equipment (ATE), and its peripheral equipment and software
- d. Dynamic type test equipment, for example, rate tables, tilt tables, centrifuges, vacuum, and atmospheric pressure equipment
- e. Weapon system or equipment product hardware (when prescribed as a test bed for repairable item(s) testing)
- f. Special test equipment or test set-up accessories, for example, adapters, extender cards, and connecting cables required to interface with the repairable item(s)
- g. Special test holding fixtures, jigs, gages, and special hand tools
- h. Standard measuring instruments (SMI) required for inspection or examination that are not normally available at depot maintenance facilities
- i. Other equipment requirements as determined

5.8.3.3 Personnel. An estimate of the number of personnel in the depot repair process to perform the examination, test, and repairs specified in the TRS shall be determined. Each training procedure or skill and its function shall be defined. In addition, an estimate of the number of manhours per work category needed shall be determined. This information shall be contained in a brief, narrative (text) form in a tabular listing.

5.8.3.4 Test conditions. All conventional and special depot work station environmental conditions required in the repair process shall be specified, for example, atmospheric pressure, temperature, relative humidity, and clean rooms, including class (see the Air cleanliness classes paragraph of FED-STD-209). This information may be appropriately detailed in table format.

5.8.4 SECTION III, INSPECTION METHODS. This section shall define the conventional and any special inspection methods, procedures, and responsibilities involved in the repair of the item(s) covered by the TRS. Normally, the inspection requirements specified in the TRS shall include those specified in 5.8.4.1 through 5.8.4.4.

5.8.4.1 Responsibility for inspection. This paragraph shall specify that the quality assurance element of the depot maintenance activity is responsible for the performance of all inspection requirements.

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5.8.4.2 Documentary inspection. This paragraph shall specify the requirements for inspection verification of all applicable publications, for example, standard documents, references, drawings, and schematics, for current relevancy to the item(s) under inspection.

5.8.4.3 Initial inspection. This paragraph shall specify all initial inspection requirements, for example, visual inspection for loose broken, or damaged parts, conductors, contacts, and terminals, verify repairable item(s) configuration and that all applicable engineering, production, and field changes have been properly incorporated. This paragraph shall also specify that all discrepancies and defects are to be noted and corrected before proceeding with further examinations and tests.

5.8.4.4 In-process and final inspection. This paragraph shall briefly specify (by category or type) all critical repair processing operations covered in the TRS requiring formal inspection discipline and verification, for example, in-process and post-repair, final acceptance test, and packing. This information shall be presented as a tabulated listing that cites the appropriate portion of the TRS test (by section or paragraph number) that delineates the required inspection procedure.

5.8.5 SECTION IV, PERFORMANCE TEST PROCEDURE. This section shall provide detailed mechanical or electrical, or both, Performance test procedures necessary to verify that the repairable item is operating within standards in all modes of operation. The test procedure(s) shall serve two primary purposes: a) To be used as an initial depot performance test of the repairable item prior to the accomplishment of the repair, and b) To be used as a (depot final acceptance test (see 5.8.6.5) after all required repairs have been accomplished and the repairable item is considered to be ready-for-issue (RFI). The object of the initial functional examination is to determine the status of the repairable item as received by the depot; to compare test results with data contained in incoming repairable item(s) discrepancy or failure reports; to identify repair item malfunctions and discrepancies; and to determine the extent of repairs required. This section shall be developed in accordance with the Test procedures paragraph of MIL-STD-1345 and shall contain, as a minimum the requirements specified in 5.8.5.1 and 5.8.5.2.

5.8.5.1 Performance test procedure requirements. Performance test procedure shall be similar to that presented in the Example of test procedures paragraph of appendix A of MIL-STD-1345. The test procedure shall specify:

- a. Safety precautions and instructions (see the Safety precautions paragraph of MIL-STD-1345)
- b. The title(s) of test or examinations to be performed
- c. Preliminary set-up data required to perform the test or examinations (see the Test set-up diagrams paragraph of MIL-STD-1345).
- d. Detailed step-by-step Procedures for accomplishing the tests or examinations (see the Test procedure types paragraph of MIL-STD-1345).
- e. Test equipment and tool listings (see the Test equipment and tooling listing paragraph of MIL-STD-1345). Only equipment in SECTION II, 5.8.3.2.1 that applies to performance testing, shall be listed.
- f. Other data as may be determined for the repairable item(s) type may be shown.

5.8.5.2 Test data record. (See the Test data record paragraph of MIL-STD-1345).

- a. The data required in the Procedure step, Performance requirement, TRS title, TRS NO., (TRS) REV, 4G ITEM - NOMENCLATURE, and 4G - ITEM PART NO. columns of the test data record (see FIGURE 12) shall be listed.
- b. The TRS shall indicate that the results of the test procedure (see 5.8.5.1) must be recorded on the test data record (see FIGURE 12), and the satisfactory operation of the RFI repairable item(s) must be verified by the depot quality assurance element personnel in the Test results accepted by: blocks.
- c. The TRS shall also indicate that the designated depot maintenance activity, responsible for the repairable item(s) repair, shall establish and maintain a file of the completed TRS test data records.
- d. Other instructions as may be determined for the repairable item(s) type shall be specified.

5.8.6 SECTION V, REPAIR PROCEDURE And FINAL ACCEPTANCE TEST. This section shall contain all procedures, processes, and methods data for the satisfactory accomplishment of all repair work. It shall also contain the instructions required for the accomplishment of the final acceptance test (see 5.8.5) of the repairable item(s) covered by the TRS. acceptance or rejection criteria for wear, deterioration, dimensions, electrical parameters, alignments, adjustments, and other standards of acceptance shall be specified. Additional information may be required to properly accomplish peculiar repair actions.

5.8.6.1 Removal, disassembly and inspection. Illustrations and step-by-step procedures for the removal, disassembly, and inspection of the repairable item(s) shall be developed. Disassembly instructions shall be limited to areas where the sequence of disassembly is not obvious or where special techniques are required for access to a part requiring repair. Where examinations, inspections, and tests must be performed prior to or during disassembly, the TRS shall so specify.

5.8.6.1.1 Disassembly illustrations. Illustrations shall be utilized to show the sequence of disassembly and shall contain part identification data by item number, noun name, quantity, and reference designation (see FIGURE 13 note pertaining to apron data requirement).

5.8.6.1.2 Planned material replacement list(s). When the requirement(s) exists for a particular repairable item(s) type, the TRS shall include in this section a planned material replacement list(s). The list(s) may be in table format and shall identify those parts which are specifically required to be replaced regardless of their condition. A list of materials and specific replacement action(s) shall be available at the depot repair activity in order to accomplish the planned material replacement actions in accordance with the TRS instructions. Examples of mandatory replacement items may be parts such as gaskets, seals, washers, vacuum tubes, air filters, and motor brushes.

5.8.6.1.3 Criteria for suitability of worn-in-parts versus new parts. Criteria to determine the suitability of worn or degraded critical parts for continued use shall be developed. The criteria shall explicitly state those measurable, wear or deterioration limits which, if exceeded, require replacement by new parts. These data shall be briefly presented, preferably in table format, and shall identify the parts involved, provide the measurable limits, and specify the required action(s).

5.8.6.2 Cleaning and inspection. When applicable to the repairable item(s) type covered in the TRS, the process and methods of cleaning and examination to be performed on each disassembled item shall be described. Cleaning and inspection instructions shall contain the following:

- a. The pre-cleaning examination requirements and the cleaning process to be used for each item requiring cleaning
- b. Step-by-step procedures for accomplishing the process
- c. Specific identification of cleaning materials to be used in the process by their commonly known name and specification number. These data may be provided in table format.
- d. Quantitative instructions for the variables associated with the cleaning process, for example, air pressure, moisture content, solvent temperature, soak time, ultrasonic frequency, drying time, and temperature
- e. Procedures for use of any special tools, jigs, or fixtures required during cleaning
- f. Post-cleaning examination, preservation, and handling instructions
- g. Cautions or warnings to be observed to protect personnel and equipment
- h. Other data as maybe determined appropriate for the repairable item(s) type

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5.8.6.3 Reassembly and inspection. Illustrations and all reassembly instructions and examination requirements for the reassembly of the repairable item(s) shall be developed. The use of any special tools, jigs, fixtures, or test equipment shall be specified. If reassembly is the reverse of disassembly (see 5.8.6.1), a statement to that effect will satisfy this requirement. The instructions or procedures shall indicate the following:

- a. The use of corrosion-preventive compounds, paints, or other materials and the use of gaskets or sealing compound materials shall be specified by nomenclature, trade name, and specification number.
- b. Identification of all points requiring lubrication, the kind of lubricants required, and the method of application. Lubricants to be used shall be those specified in the Lubricants paragraph of MIL-L-17192 or as approved by the procuring activity in accordance with the Lubricants paragraph of MIL-L-17192.
- c. The correct manner of installing all fasteners, safety wiring, cotter pins, and other locking devices
- d. The method of aligning, adjusting, and measuring tolerances (both electronic and mechanical), clearances, end-play back-lash and tolerances between any two gears Gearing and linkage alignment data
- f. Identification of critical examinations and tests required during reassembly
- g. Reference to tables and illustrations as applicable
- h. Other data as may be determined appropriate for the repairable item(s) type

5.8.6.4 Fault location and repair. Step-by-step procedures, special instructions, examination, and technical information (including supplementary illustrations and tabular lists) shall be determined to perform effective and efficient trouble-shooting and repair of the repairable item(s) covered in the TRS. The actions to be performed shall ensure that the repairable item(s) shall meet or exceed the specified performance requirements of the depot final acceptance test (see 5.8.6.5) and shall satisfy all quality assurance inspection requirements. This portion of the TRS shall, as a minimum, include the requirements of 5.8.6.4.1 through 5.8.6.4.4.

5.8.6.4.1 Fault location. Detailed step-by-step procedures for trouble-shooting and fault location to the faulty part, misalignment, or other trouble cause, shall be identified or developed in accordance with the Fault location procedures paragraph of MIL-STD-1345.

5.8.6.4.2 Repair and replacement. Detailed step-by-step procedures for corrective action(s), including the repair and replacement of defective, damaged, or deteriorated parts shall be identified or developed.

5.8.6.4.3 Alignments and adjustments. Detailed step-by-step procedures shall be identified or developed for all mechanical and electrical alignments and adjustment. Procedures shall include detail of methods used, and special tools and equipment required to achieve the setting and positioning of all a) electronic tuning adjustments and controls, and b) mechanical, gearing, and linkage alignments within the repairable item which, if maladjusted, would cause faulty operation. This information shall be developed in accordance with the Alignment procedures paragraph of MIL-STD-1345.

5.8.6.4.4 Supplementary technical data requirements. This section shall contain within the text (see 5.8.6.4.1, 5.8.6.4.2, 5.8.6.4.3) all supplementary technical information, illustrations, and tabulated lists to aid the repair personnel in performing the specified action(s). Such data shall include:

- a. Hazard or safety instructions (see the Safety precautions paragraph of MIL-STD-1345)
- b. Test equipment and repair aid(s) requirements (see the Test equipment and tool listing paragraph of MIL-STD-1345). Only that equipment listed under SECTION 11, 5.3.3.2 that applies to the type of procedure being developed (fault location, repair and replacement, alignment) need be specified.
- c. Test set-up diagrams (see the Test procedures set-up diagram paragraph of MIL-STD-1345 and FIGURE 11.)

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- d. Detailed step-by-step procedures for accomplishing the tests (see the Fault location procedures paragraph of MIL-STD-1345).
- e. Waveforms, truth tables, fault logic, and timing circuit diagrams
- f. Exploded views and gearing and linkage diagrams (see 5.8.6.1.1 and FIGURE 13)
- g. Parts lists and location {instructions and illustrations (see FIGURES 13, 14, 16, 17, and 18)}
- h. Printed-circuit board (PCB) foil layouts, as appropriate (see FIGURE 18)

NOTE : Printed-circuit boards shall be illustrated foil side up. When printed wiring appears 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 of front and rear view shall be provided. Internal elements of such items as electron tubes, coils, transformers, and transistors shall be illustrated schematically within the part outline and 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. Test point graphic symbols shall be located outside the board area, when not printed upon the board by manufacturer, with call-out leaders drawn from these symbols to the test-point locations. In like manner (when equivalent information is not printed on the board) the input and output terminals shall be labeled with the functions (signals and voltages) carried, and their point of origin or destination.

- i. Other special information, instructions, methods, processes, and materials peculiar to the repair operation that are not contained elsewhere in the TRS. In cases where applicable data are contained elsewhere in the TRS, such data shall not be repeated in this portion of the TRS but only referenced and their use specified.

NOTE: Obvious repair actions, that is, soldering and use of hand tools, shall not be included except where these actions involve hazards to personnel or equipment.

5.8.6.5 Final acceptance test. This section shall specify that:

- a. After accomplishment of all repair action(s), and the repairable item is considered ready for final examination, the item shall be inspected for proper identification, workmanship and quality, and subjected to the final acceptance test (FAT) to verify satisfactory performance.
- b. The FAT is to be accomplished in accordance with the established performance parameter requirements (see FIGURE 12) and test procedures (see 5.8.5 and 5.8.5.1) and make reference to the other pertinent data contained elsewhere in the TRS.
- c. The FAT is to be witnessed by the depot personnel responsible for final inspection and acceptance of the repairable item.
- d. The test results and all required data are to be recorded on the TRS test data record (see 5.8.5.2 b and FIGURE 12)
- e. Upon satisfactory completion of all FAT provisions, the TRS test data record is to be verified for completeness and accuracy, and duly dated, signed, and approved. by the applicable responsible depot personnel thereby certifying the satisfactory operation of the repairable item and its condition as ready-for-issue (RFI) to the fleet.
- f. The depot shall ensure the disposition of the completed TRS Test data record as follows:
 1. One copy of the record shall be packaged with the applicable repaired item for information to the fleet user of the item.
 2. One copy shall be mailed to the Navy Field Maintenance Agent (FMA) if an FMA has been designated for the applicable repairable item(s).

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3. One copy shall be mailed to the TRA or its designated representative.
4. The original is to be retained by the depot in a central file as a permanent record of the item(s) repair. The file is to be maintained in a current status (see 5.8.5.2).

5.8.7 SECTION VI, PACKAGING AND HANDLING. This section shall identify the packaging and handling requirements and determine any special preservation, storage and transportation techniques, equipment and methods needed for the packaging and handling of repairable item(s) covered in the TRS.

5.8.7.1 Packaging and handling requirements. This section shall describe the packaging and handling requirements (conventional or special or both) applicable to the repairable item(s) covered in the TRS. This section shall specify that the depot maintenance activity designated for repair of the item shall determine and maintain the instructions, documentation, or work details for the specified packaging and handling requirements.

5.8.7.1.1 Special handling procedures. This section shall describe the procedures required for the use of special crates, boxes, containers, transportation vehicles, and other facilities for repairable item(s) handling. If there are no requirements for special handling procedures or equipment, the TRS shall so specify.

5.8.7.1.2 Special packaging procedures. This section shall describe the procedures required for special packaging of the repairable item(s). If there are no requirements for special packaging procedures, the TRS shall so specify.

5.8.7.1.3 Classified repairable item(s) When the repairable item(s) covered in the TRS are classified items, this section shall specify the security requirements and controls necessary for proper handling, packaging, marking, storage, and shipping of the repairable item(s).

5.8.7.2 Special preservation, storage, and transportation requirements. This section shall identify the requirements for special preservation, storage, and transportation of the repairable item(s). For example, preservation for storage when the repair item(s) is not to be installed (fleet use) for an extended period of time and the methods used for preservation and storage of the repairable item(s) are critical. If there are no requirements for special Preservation, storage, and transportation, the TRS shall so specify.

5.8.7.3 Additional information and instruction related to packaging and handling. Additional information and instructions related to Section VI content matter shall be specified or developed, if required, for the repairable item(s) type covered in the TRS.

5.9 Appendices. The TRS shall contain appendices to provide pertinent supplementary and reference data required in the inspection, repair, trouble-shooting, test, final acceptance, packaging and handling of the repairable item(s) covered in the TRS. Each appendix shall contain a statement delineating its purpose and application.

5.9.1 SECTION X, REPAIRABLE ITEM DATA. This section shall consist of repairable item(s) servicing and trouble-shooting block diagram(s), schematic diagram(s), component location illustration(s), and parts list table(s).

5.9.1.1 Service and trouble-shooting block diagram. Servicing and trouble-shooting block diagram(s) shall conform to requirements of the Block diagram paragraph of MIL-STD-1345 and the Trouble-shooting diagrams paragraph of MIL-M-15071 for the repairable item(s) type covered by the TRS. Also see FIGURE 15.

5.9.1.2 Repairable item(s) schematic diagram(s). Repairable item(s) schematic diagram(s) shall conform to the requirements of the Schematic diagrams paragraph of MIL-STD-1345 and the Maintenance schematic diagram paragraph of MIL-M-15071 or the repairable item(s) type covered by the TRS.

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5.9.1.3 Repairable item(s) component location illustration(s). Repairable item(s) component location illustration(s) shall provide positive and rapid location of parts. Types of component location illustrations shall show exploded views (see FIGURE 13), engineering drawings (see FIGURE 18), photographs (see FIGURE 16), and sectional views.

5.9.1.4 Repairable item(s) parts list table(s). Repairable item(s) parts list table(s) shall conform to FIGURE 17.

5.9.2 SECTION XX, TEST SUPPORT EQUIPMENT. This section shall contain augmenting instructions, data, and illustrations required to fabricate, maintain, and calibrate (unique requirements) the special test and repair support equipment utilized in the TRS:

- a. Examples of special support equipment are special test fixtures and special purpose electronic test equipment, special mounting, holding and support jigs; special tools and gages; special mechanical and electrical interface or interconnection (mating) adapters, cables, and connectors, and so forth. also see FIGURES 19 and 20.
- b. If there are no requirements for special test support equipment data, the TRS shall so specify.

5.9.2.1 Test support equipment data requirements. The test support equipment data shall be developed in accordance with special purpose electronic test equipment (SPETE) information, non-standard general purpose electronic test equipment information, maintenance tools summary and the Test fixture information paragraphs of MIL-STD-1345.

5.9.3 SECTION XXX, TEST DATA RECORD sheets. This section shall contain the TRS test data record sheet(s) for the repairable item(s) covered by the TRS (see FIGURE 12).

5.9.4 SECTION(S) XXXX and on. Other appendices (sections). Other appendices (sections) shall be developed for the specific repairable item(s) type covered by the TRS.

5.10 Packaging and packing.

5.10.1 Packaging of deliverable data items. Packaging of deliverable data items shall protect against deterioration and physical damage during shipment from the supply source to the first receiving activity for immediate use.

5.10.2 Individual copies of deliverable data. Individual copies of TRS outlines (see 4.2), TRS manuscript (see 4.3), TRS camera-ready reproducible (see 4.4), change(s) (see 5.3), and revision(s) (see 5.4) shall be separated and packed to preclude the possibility of damage in transit. Stock copies of identical TRSs, changes or revisions, shall be packed and shipped in common containers. When a contract requires TRSS, revisions, or changes having different publication numbers the stock copies of each TRS, change, or revision shall be packaged as separate items (see 5.11).

5.10.3 Bulk shipment. TRSs when shipped for stock in bulk quantities shall not be individually wrapped (see 5.10.2). Containers shall comply with the Uniform Freight Classification Rules or their carrier regulations, as applicable to the mode of transportation.

5.10.4 Packing lists. A copy of the letter of transmittal or the packing list shall be placed inside the carton or container. When a shipment consists of several containers, the letter of transmittal or packing list shall be enclosed in the first container and shall identify the material that is packed in each container.

5.10.5 Original (master) copy and artwork. Original (master) copy and artwork shall be packaged flat and double packaged. Artwork shall not be folded or rolled. Interior packaging material shall be waterproof and shall be free of any chemical substance that would discolor or otherwise render the original (masters) copy useless. Large size inked-linen or vellum illustrations may be rolled or packed in mailing tubes.

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5.11 Marking. Bulk quantity shipments, interior packages, and exterior shipping containers shall be marked the following information for each item enclosed, except the shipment of an individual copy:

- a. Box (number) of (number) (to be listed on multiple container shipments)
- b. Publication identifying number
- c. quantity (in package)
- d. Contract number

When applicable, the words FOR STOCK shall be marked on the shipping containers destined for stock. The publication identifying number(s) shall be shown on the Shipping documents (see 5.10.2).

5. NOTES

5.1 Deliverable data items requirements. When this standard is used in a procurement which incorporates a DD form 1423 and invokes the provisions of 7-104.9(n) of the Defense Acquisition Regulating (DAR), the data requirements identified herein will be developed as specified by an approved Data Item Description (CID) (DD Form 1664) and delivered in accordance with the approved Contract Data Requirements List (CDRL) (DD Form 1423) incorporated into the contract. When the provisions of CAR 7-104.9(n) are not invoked, the data specified herein will be delivered by the contractor in accordance with the contract requirements. Deliverable data required by this standard are cited in the following paragraphs:

<u>Data requirement</u>	<u>Applicable DID</u>
Outline, Technical repair Standard	DI-M-2240
Technical Repair Standard	01-M-22404

(Copies of data item descriptions required by the contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

Preparing activity:
NAVY-EC
(Project MISC - ND29)

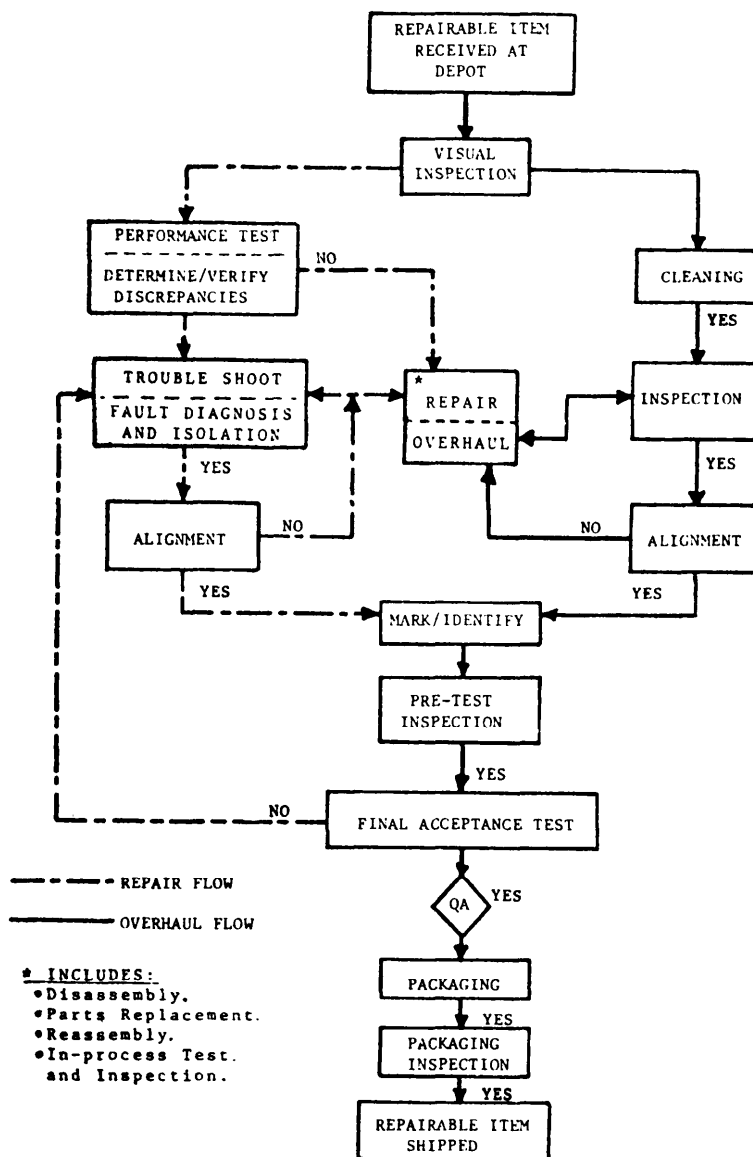


FIGURE 1. Example of a repair process flow chart.

FOR OFFICIAL USE ONLY

TRS NO: _____ REV: _____



NAVAL ELECTRONIC SYSTEMS COMMAND

TECHNICAL REPAIR STANDARD

TITLE: _____

REF. DESIG: _____

NSN: _____

APPROVED _____

DATE _____

APPROVED _____

DATE _____

NAVAL ELECTRONIC SYSTEMS COMMAND

TECHNICAL REPAIR AGENT (TRA)

SAN DIEGO, CALIF. 92138

FOR OFFICIAL USE ONLY

FIGURE 2. Sample cover and title page.

USER ACTIVITY TECHNICAL REPAIR STANDARD (TRS) COMMENT SHEET Date: _____

* TRS TITLE: _____
 * TRS NUMBER: _____ * REV: _____

Fold on dotted line on reverse side, staple, and mail to
 Naval Electronic Systems Engineering Center, San Diego, CA ATTN: TRA

PROBLEM QUESTION SUGGESTION COMMENT (CHECK ONE)

Discussion _____

RECOMMENDED CHANGE TO TRS

Page No.	Para. No.	Line No.	Fig. No.	Table No.	Recommended Change(s) and Reason(s)

Use Blank Continuation Sheets as Required

NAME _____
 RANK RATE TITLE _____
 MAILING ADDRESS _____

Page 1 of _____

NOTE : Both sides of this form shall be reproduced locally to size of TRS as required.
 * To be filled in by Contractor/Supplier before printing.

FIGURE 3. Sample of a user activity comment sheet (comment side).

MIL-STD-2111 (EC)

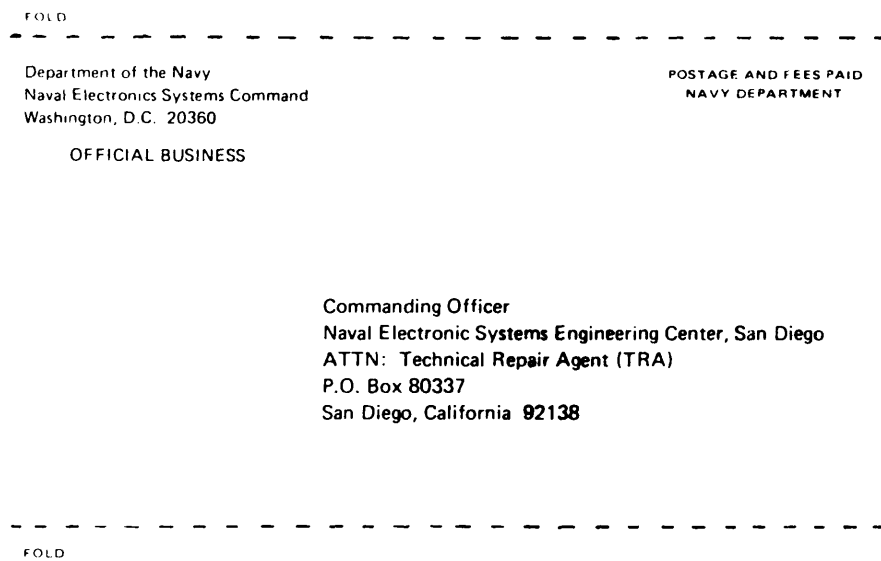


FIGURE 4. Sample of a user activity comment sheet (address side).

TRS VALIDATION/VERIFICATION PERFORMANCE ASSURANCE				
TRS TITLE: _____				
TRS NO: _____ REV.: _____				
PERFORMANCE ASSURANCE TYPE (Check as Applicable):				
VALIDATION: <input type="checkbox"/>			VERIFICATION: <input type="checkbox"/>	
CONTRACTOR/SUPPLIER: (Name/Address)			GOVERNMENT ACTIVITY: (Name/Address)	
CONTRACT NO(s) AND ORDER(s) IF APPLICABLE:				
SECTION	PARAGRAPH	OTHER	DATE PERFORMANCE ASSURANCE COMPL.	REMARKS
NAME & AUTHORITY OF CONTRACTOR'S/SUPPLIER'S REPRESENTATIVE:				
_____ SIGNATURE				
NAME & AUTHORITY OF GOVERNMENT AGENT:				
_____ SIGNATURE				

NOTE: This form may be reproduced locally.

FIGURE 5. Example of a content assurance page.

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RECORD OF REVISIONS AND/OR TRSCN'S (CHANGES]

TRS REV LETTER	TRSCN NUMBER(S)	TRSCN ISSUE DATE(S)	TITLE OR BRIEF DESCRIPTION	RECORDED BY	DATE

FIGURE 6. Example of a record of revisions or TRSCN'S (changes).

MIL-STD-2111 (EC)

TECHNICAL REPAIR STANDARD CHANGE NOTICE				
ORIGINATOR NAME AND ADDRESS	<input type="checkbox"/> PROPOSED	DATE PREPARED	TRS. NO.	
	<input type="checkbox"/> APPROVED	CODE IDENTIFICATION	TRSCN NO.	
ITEM(S) PART NUMBER(S)	ITEM FSN/NSN	RELATED ECP NO.	CONTRACT NO.	
ITEM NOMENCLATURE		EFFECTIVITY		
<p>THIS NOTICE INFORMS RECIPIENTS THAT THE STANDARD IDENTIFIED BY THE NUMBER SHOWN HAS BEEN CHANGED. THE PAGES CHANGED BY THIS TRSCN BEING THOSE FURNISHED HERewith AND CARRYING THE SAME DATE AS THIS TRSCN. THE PAGES, AS DATED AND LISTED BELOW IN THE SUMMARY OF CHANGED PAGES, COMBINED WITH NON-LISTED PAGES OF THE ORIGINAL ISSUE OF THE LATEST APPROVED REVISION, CONSTITUTE THE CURRENT VERSION OF THIS STANDARD.</p>				
TRSCN NO.	PAGES CHANGED (INDICATE DELETIONS)	*S	*A	DATE
	PAGES CHANGED AND TRANSMITTED HERewith :			
	SUMMARY OF CHANGED PAGES:			
* "S" indicates supersedes earlier page, "A" indicates added page.				
TECHNICAL APPROVAL:			DATE	
TRA APPROVAL:			DATE	

FIGURE 7. Sample of a technical repair standard change notice (TRSCN) form.

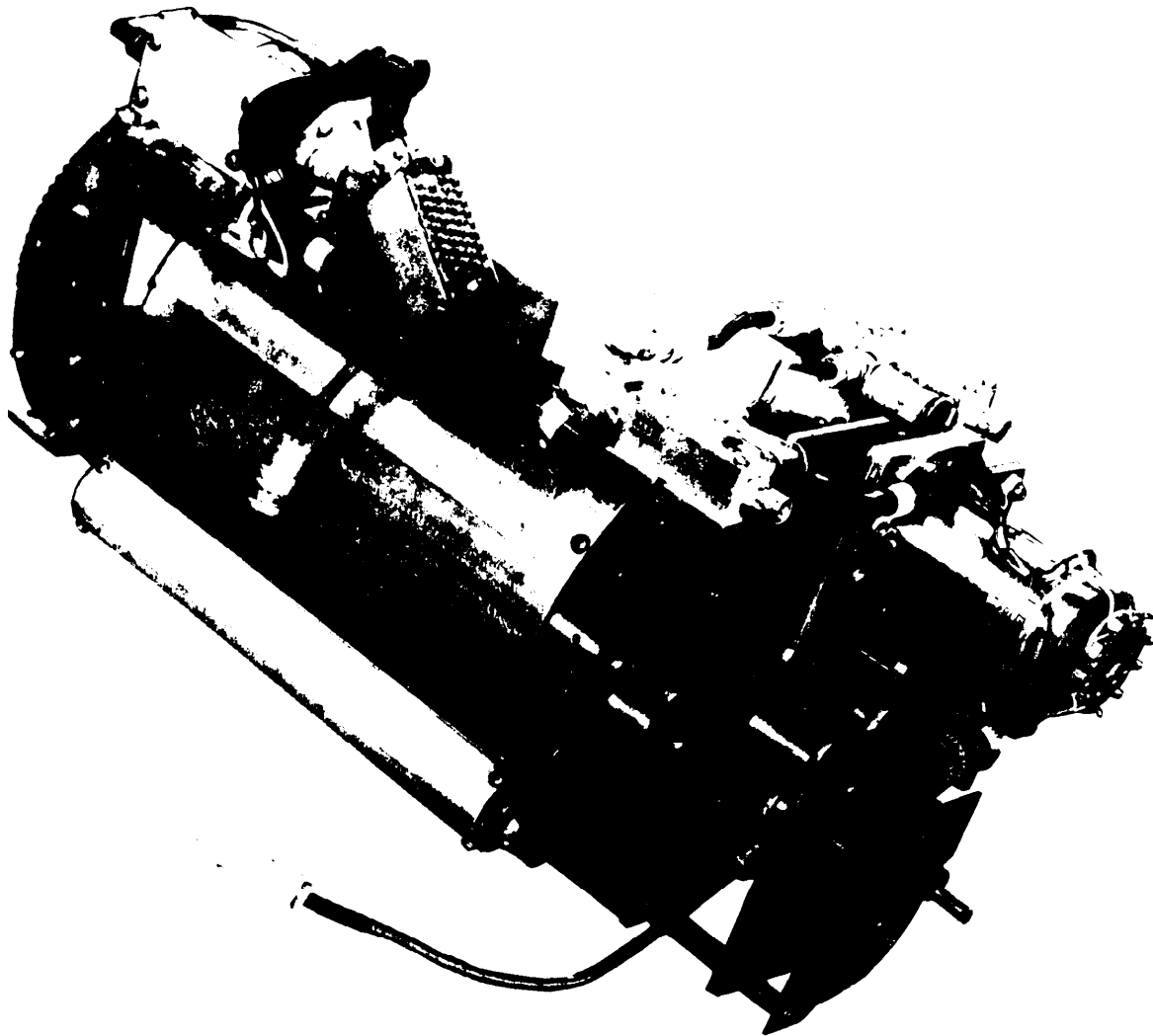
TABLE OF CONTENTS

SECTION	TITLE	PAGE
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	4.2.3 Preliminary Test Setup	4-2
	4.3 Test Procedure	4-5
	4.3.1 Transmitter and Receiver Gain Test	4-5
	4.3.2 Transmit Gain Test	4-5
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(ETCETERA - See 3.9.3)

NOTE: The example above is hypothetical; the actual Table of Contents for a TRS is to be based upon the specific TRS content requirements for the repairable item(s) covered by the TRS.

FIGURE 8. Example of a TRS table of contents.



NOTE: Sample photograph illustration only. Contrast and sharpness do not conform to minimum specification requirements

FIGURE 9. Example of a repairable item frontispiece illustration (photograph).

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TEST EQUIPMENT REQUIREMENTS

(Para. #) Minimum use specifications are the principal parameters required for performance of the required tests, and are included to assist in the selection of alternate equipment, which may be used at the discretion of the using activity. Satisfactory performance of alternate items shall be verified prior to use. All applicable equipment must bear evidence of current calibration in accordance with MIL-C-45662.

(Para. #) The instruments utilized in this procedure were selected from those known to be available at Department of Defense facilities, and the listing by make or model number carries no implication of preference, recommendation, or approval by the Department of Defense for use by other agencies. It is recognized that equivalent equipment produced by other manufacturers may be capable of equally satisfactory performance in the procedure. Alternate equipment, where necessary, shall be selected in accordance with MIL-STD-1364. Refer to table 2-2 for recommended test equipment.

Table 2. Test Equipment

MFR AND MODEL NUMBER	DESCRIPTION	MINIMUM USE SPECIFICATIONS
TS2133iWRC 1	Test fixture	Test A2A6
HP 606b or Equivalent	Signal Generator	229 MHz at 10mV out
HP 5245L or Equivalent	Frequency Counter	1 kHz to 35 MHz
AN/USM 281 or Equivalent	Oscilloscope	Scope trace between 2336 Vdc with ripple
Hampson 260 or Equivalent	Multimeter	As Required
Fluke 8120 or Equivalent	Digital Voltmeter	+28 Vdc
HP 141T or Equivalent	Display and Main Frame	CRT display of information processed by HP 8443A, 8552B and 8553B
HP 8443A or Equivalent	Tracking Generator	100kHz to 110 MHz -20dBm to +10dBm
HP 8552B or Equivalent	RF Section	10 dB/dw log, 2 dB/dw log, and linear displays
HP 8553B or Equivalent	Spectrum Analyzer/RF Section	1kHz to 235MHz 3 to 90mV
HP 1121A or Equivalent	~ MHz Probe	1M3k ohm, 3 pF Input AC, Impedance
NAVSECNORDIV TS 2133/WRC/A1 or Equivalent	MHz Repair Aid	Interface with A2A6A1
NAVSECNORDIV TS 2133/WRC/A2 or Equivalent	100 kHz SYN Repair Aid	Interface with A2A6A2
NAVSECNORDIV TS 2133/WRC/A3 or Equivalent	1 & 10 kHz Repw Aid	Interface with A2A6A3
NAVSECNORDIV TS 2133/WRC/A5 or Equivalent	500 Hz SYN Repair Aid	Interface with A2A6A5

FIGURE 10. Sample of a test equipment requirements table.

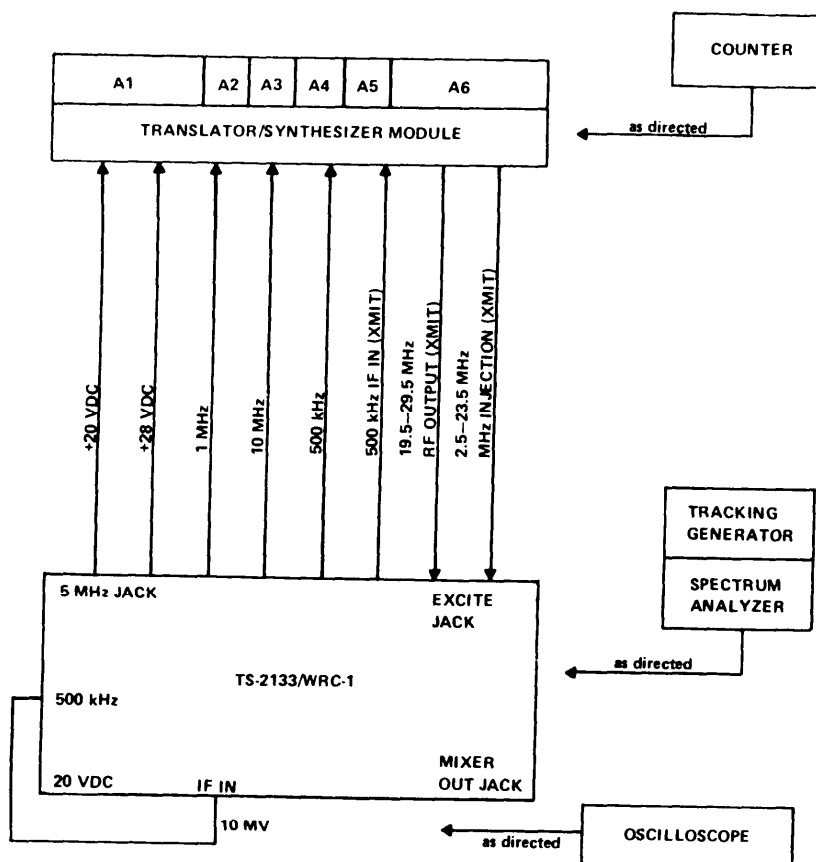


FIGURE 11. Sample of a performance test set-up.

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TRS TEST DATA RECORD

DOP ACTIVITY NAME: _____

TRS TITLE. RF Amplifier Electronic AssemblyTRS NO WRC 1 A2A4-002 REV" _____

<u>4G ITEM - NOMENCLATURE</u>	<u>4G ITEM - PART NO.</u>	<u>4G ITEM SER. NO.</u>
<u>RF Amplifier Electronic Assembly</u>	<u>666230-019</u>	

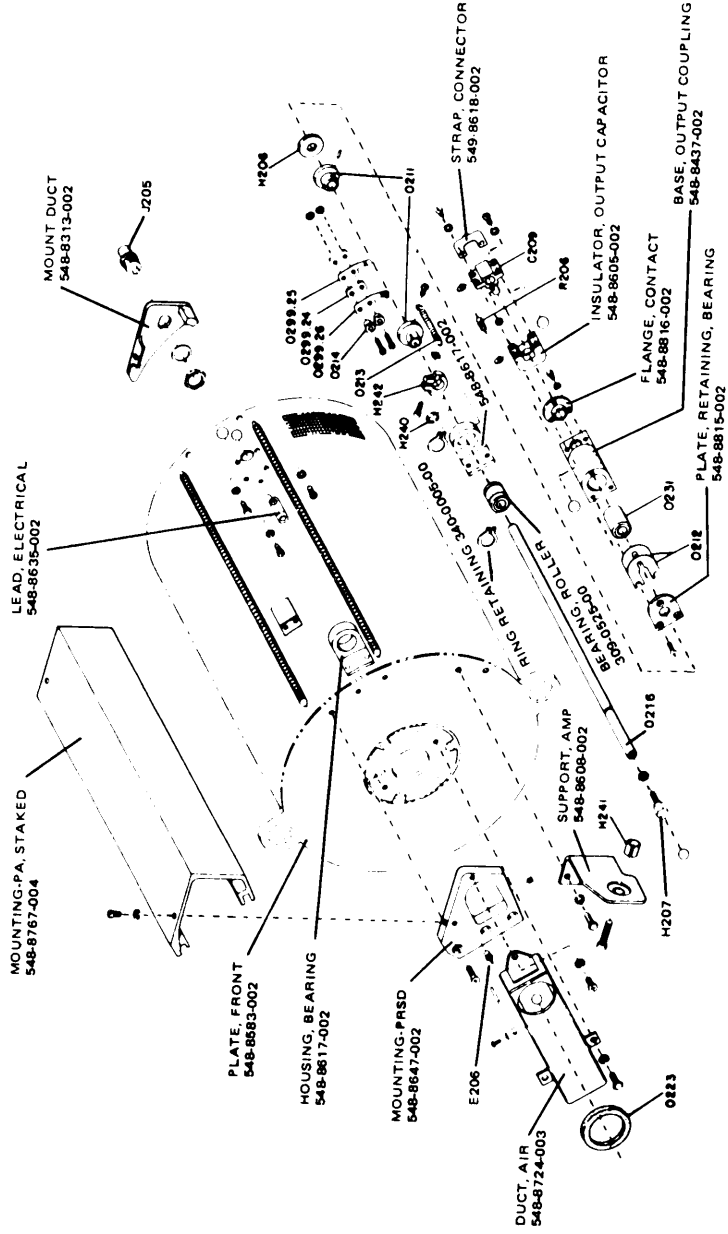
TEST VERIFICATION CHECK LIST

Proc'r. Step	EQUIPMENT		Test - Insp'n. Date	TEST	
	Performance Requirement	Actual Performance (Record Test Results)		Conductor (Initial)	Insp'r (Initial)
4.3.1f	1 to -11 dB				
4.3.1g	3 dB, max. variation				
4.3.1h	+ 1 dB, max. variation				
4.3.1i	+ 3 dB, max. variation				
4.3.1j	1 to 11 dB (2-20 Mhz)				
	-3to -15dB (21-29 MHz)				
4.3.2e	-1 to-n dB				
4.3.2f	-50 dB below reference				
4.3.2g	14to-25VDC				
4.3.3h	NLT+18dB				
4.3.3k(1)	NLT+18dB				

<u>DOP.</u>	<u>TEST RESULTS ACCEPTED BY:</u>	
Test Supervisor:	<u>DOP:</u>	Customer: (optional)
	Quality Assurance officz?:	Agency:
Approved	Approved:	Witnessed/Concurred by:
Date	Date:	Date:

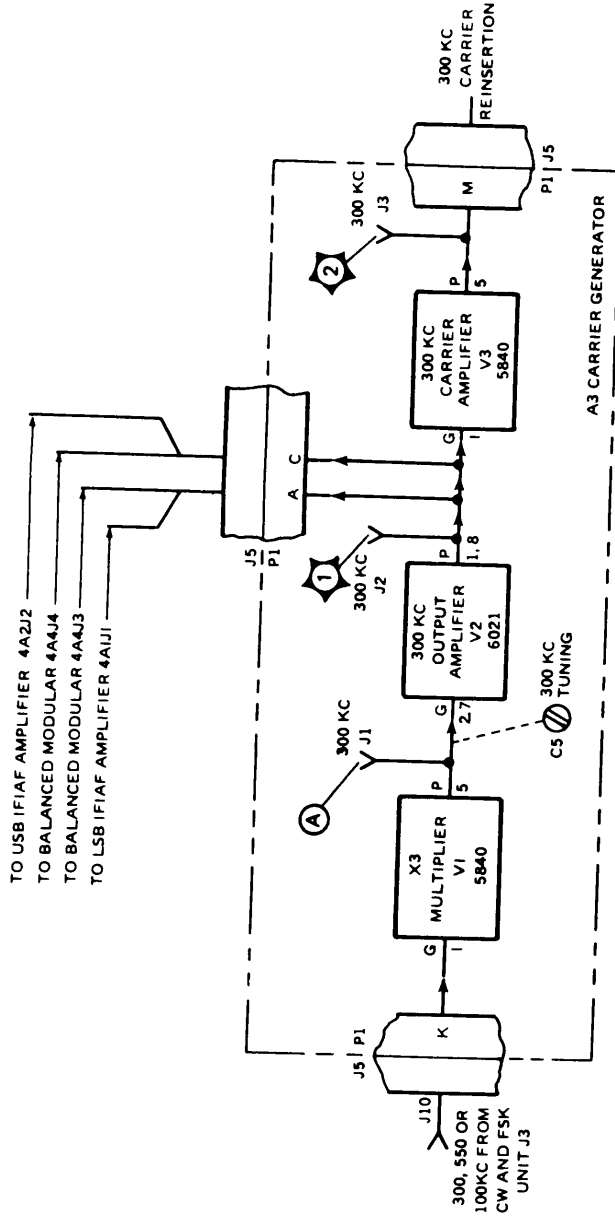
NOTE: Use additional sheets as required. Approval/Acceptance signature block to appear at bottom of last sheet only.

FIGURE 12. Sample of a test data record.



NOTE: Sample arrangement only. Supplementary data may appear on apron, e.g., Parts Identification, Listing, etc.

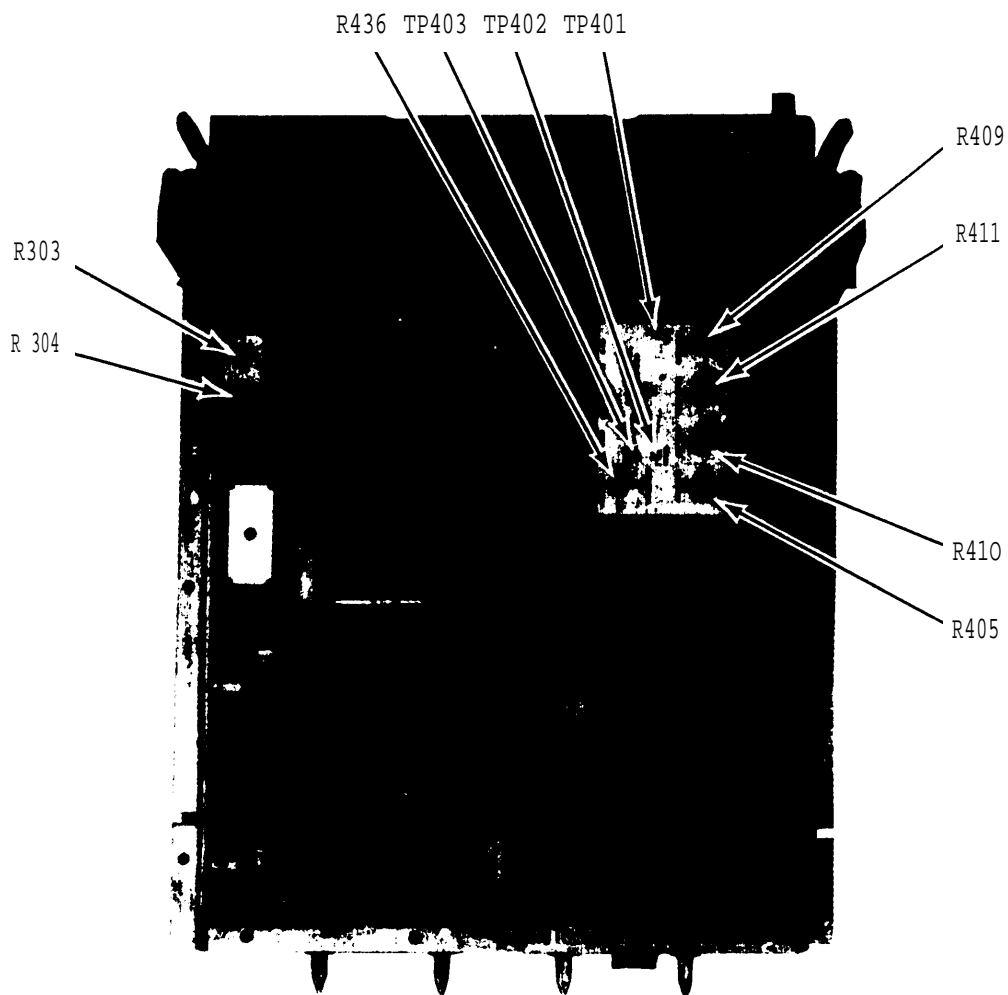
FIGURE 13. Sample of a repairable item, exploded view.



3 U

NOTE: Sample arrangement only. Size and legibility do not conform to minimum standard requirements. Supplementary data normally appears on an apron.

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NOTE: Sample photograph illustration only. Contrast and sharpness do not conform to minimum specification requirements (see 3.4.2.3).

FIGURE 16. Sample of component location illustration (photograph).

Table 10-1. Repairable Item Parts List

REF DESIG	NAME AND DESCRIPTION	FIG. NO.
A2A6	TRANSLATOR SYNTHESIZER SUBASSEMBLY, Mfr 06845, PN 2058940-0501	5-1
A2A6C1	CAPACITOR, MIL Type CS13F470K	5-1
A2A6C2	SAME AS A2A6C1	
A2A6J4	CONNECTOR, Receptacle, Electrical, 2.08 x 0.42 x 0.62 in., 17 Contacts, Mfr 71468, PN DBMF17W2S2C31	5-1
A2A6J5	CONNECTOR, Receptacle, Electrical, 2.08 x 0.42 x 0.62 in., 13 Contacts, Mfr 71468, PN DBMF13W3S2C31	5-1
A2A6J6	CONNECTOR, Receptacle, Electrical, 2.08 x 0.42 x 0.62 in., 9 Contacts, Mfr 71468, PN DBMF9W4S2C31	5-1
A2A6P1	CONNECTOR, Plug, Electrical, 2.72 x 0.42 x 0.62 in., 25 Contacts, Mfr 71468, PN DCM25W3P	5-1
A2A6P2	CONNECTOR, Plug, Electrical, 1.54 x 0.42 x 0.62 in., 3 Contacts, Mfr 71468, PN DAM3W3P	5-1
A2A6P3	SAME AS A2A6P2	
A2A6P7	CONNECTOR, Plug, Electrical, Red, 0.14 Dia x 0.34 in., Mfr 98291, PN SKT-14	5-1
A2A6P8	CONNECTOR, Plug, Electrical, Green, 0.14 dia x 0.34 in., Mfr 98291, PN SKT-14	5-1
A2A6P9	CONNECTOR, Plug, Electrical, Orange, 0.14 dia x 0.34 in., Mfr 98291, PN SKT-14	5-1
A2A6P10	CONNECTOR, Plug, Electrical, Gray, 0.14 dia x 0.34 in., Mfr 98291, PN SKT-14	5-1
A2A6P11	CONNECTOR, Plug, Electrical, Rt Angle, 0.63 x 0.53 in., Mfr 06845, PN 559998-273	5-1
A2A6P12	SAME AS A2A6P11	
A2A6P13	CONNECTOR, Plug, Electrical, Mfr 06845, PN 559998-299	5-1
A2A6P14	SAME AS A2A6P11	
A2A6P15	SAME AS A2A6P7	

NOTE: Use continuation pages as required.

FIGURE 17. Sample of a repairable item parts list table.

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WRC 1 A2A6 005

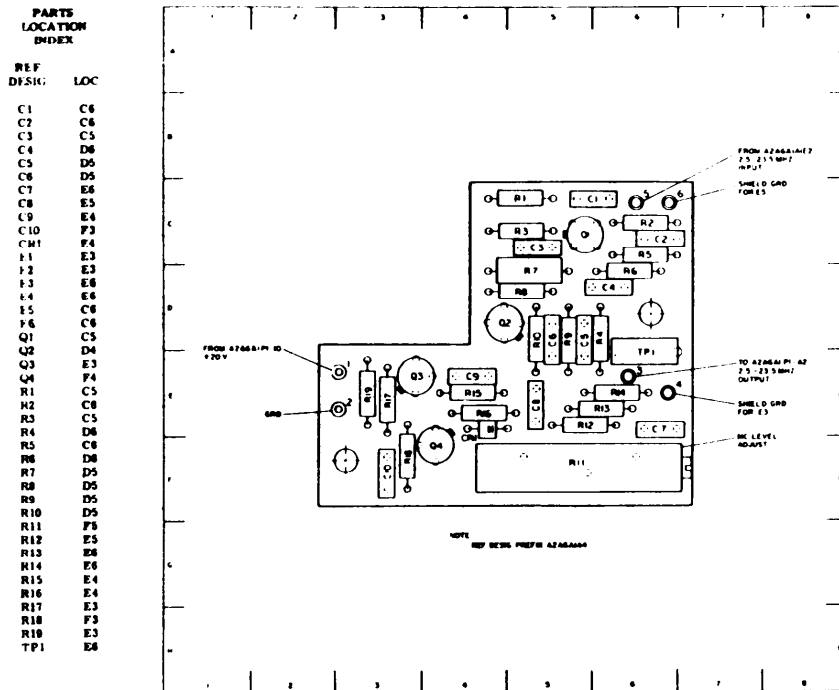
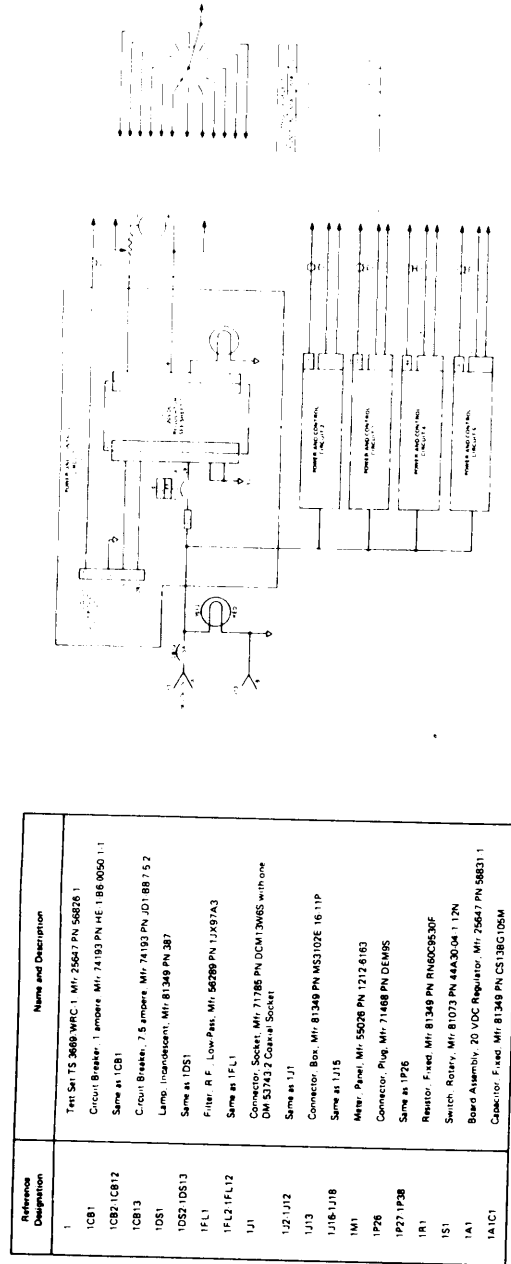


Figure 10-16. Component Location Diagram, AZA6A1A4

NOTE: Sample arrangement only. Size and legibility do not conform to minimum specification requirements. Supplementary data appears on an apron.

FIGURE 18. Sample of a component location illustration (engineering drawing).



NOTE: Sample arrangement only. Size and legibility do not conform to minimum standard requirements. Supplementary data, including Parts List, normally appears on an apron.

FIGURE 19. Sample of a special test fixture schematic diagram and parts list.

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WRC- 1-3667-001

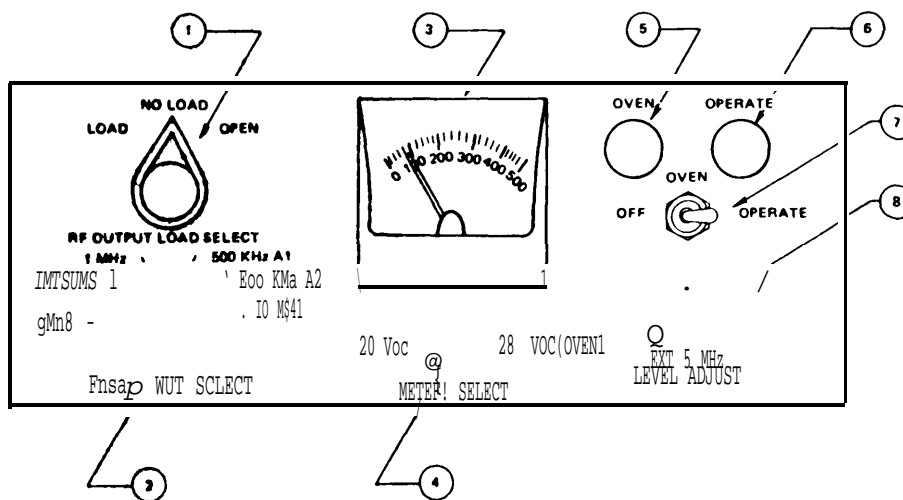


Figure 4.1. Radio Test Set TS-3687/WRC-1 Front Panel Layout

NOTE 20. Sample arrangement only, Size and legibility do not conform to minimum standard requirements, Supplementary data normally appears on an apron.

FIGURE 20. Sample of a special test fixture panel layout drawing.

INSTRUCTIONS: In a continuing effort to make our standardization documents better, the DoD provides this form for use in submitting comments and suggestions for improvements. All users of military standardization documents are invited to provide suggestions. This form may be detached, folded along the lines indicated, taped along the loose edge (*DO NOT STAPLE*), and mailed. In block 5, be as specific as possible about particular problem areas such as wording which required interpretation, was too rigid, restrictive, loose, ambiguous, or was incompatible, and give proposed wording changes which would alleviate the problems. Enter in block 6 any remarks not related to a specific paragraph of the document. If block 7 is filled out, an acknowledgement will be mailed to you within 30 days to let you know that your comments were received and are being considered.

NOTE: This form may not be used to request copies of documents, nor to request waivers, deviations, or clarification of specification 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.

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b. ADDRESS <i>(Street, City, State, ZIP Code)</i>	
5. PROBLEM AREAS	
a. Paragraph Number and Wording:	
b. Recommended Wording:	
c. Reason/Rationale for Recommendation:	
6. REMARKS	
7a. NAME OF SUBMITTER <i>(Last, First, MI) – Optional</i>	b. WORK TELEPHONE NUMBER <i>(Include Area Code) – Optional</i>
c. MAILING ADDRESS <i>(Street, City, State, ZIP Code) – Optional</i>	8. DATE OF SUBMISSION <i>(YYMMDD)</i>

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