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## MILITARY SPECIFICATION

### MANUALS, TECHNICAL: OPERATION AND MAINTENANCE INSTRUCTIONS FOR TRAINING DEVICES

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

1. SCOPE. This document sets forth the detailed scope and contents requirements for the preparation of technical manuals for training devices,

1.1 Paragraphs with limited applicability. This document contains paragraphs which are not applicable to all services. Such paragraphs are prefixed to indicate the services to which they pertain: (A) for Army, (N) for Navy and Marine Corps, and (F) for Air Force.

1.2 Table and figures. All tables and figures used in this document are for example only.

## 2. APPLICABLE DOCUMENTS

### 2.1 Government documents.

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Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Naval Training Systems Center, Code 4323, 12350 Research Parkway, Orlando, FL 32826-3224, 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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AMSC N4914

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2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation.

## SPECIFICATIONS

## MILITARY

MIL-M-7298	Manuals, Commercial Off-the-shelf
MIL-M-38784	Manuals, Technical: General Style and Format Requirements
MIL-M-38807	Manuals, Technical, Illustrated Parts Breakdown, Preparation of
MIL-M-63004	Manuals, Technical, Preparation of Lubrication Orders
MIL-M-63036	Manuals, Technical, Preparation of Operation
MIL-M-63038	Manual, Technical, Unit or Aviation Unit, Direct Support or Aviation Intermediate and General Support; Requirements for
MIL-M-63042	Manuals, Technical: Procedures for Destruction of Equipment to Prevent Enemy Use
MIL-M-85337	Manual, Technical: Quality Assurance Programs; requirements for
MIL-P-38790	Printing Production of Technical Manuals: General Requirements for

## STANDARDS

## MILITARY

DOD-STD-100	Engineering Drawing Practices
MIL-STD-12	Abbreviations for Use on Drawings, Specifications, Standards, and in Technical Documents

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MIL-STD-335(TM) - Manual, Technical: Repair Parts and Special Tools List

MIL-STD-1379 Military Training Program

2.1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues shall be those cited in the solicitation.

## DEPARTMENT OF THE ARMY

AR 750-1 Army Materiel Maintenance Concepts and Policies

AR 750-43 Test, Measurement, Diagnostic Equipment (TMDE)

DA PAM 700-21 The Army test, Measurement, and Diagnostic Equipment Register Index and Instructions: Part 1; Nomenclature Index, National Stock Number Index

DA PAM 700-21-1 - The Army Test, Measurement, and Diagnostic Equipment Register Index and Instruction: Part 2; Functional Index; TMDE Summary of General Purpose Equipment

DA PAM 738-750 - The Army Maintenance Management System (TAMMS).

## DEPARTMENT OF THE AIR FORCE

AFR 51-6 Flying Training Certification Program

T.O. 00-25-234 - General Shop Practice Requirements for the Repair, Maintenance, and Test of Electronic Equipment

## DEPARTMENT OF DEFENSE

DLSC H4-1 Commercial and Government Entity (CAGE), United States and Canada, Name to Code

DLSC H4-2 Commercial and Government Entity (CAGE), United States and Canada, Code to Name

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DLSC H6-1

Section C, Part 1 of Federal Item  
Identification Guides for Supply Cataloging,  
Abbreviations, and Symbols

(Unless otherwise indicated, copies of Federal and Military Specifications, Standards, and Handbooks are available from the Naval Publications and Forms Center, (Attention: NPODS), Building 4D, 700 Robbins Ave., Philadelphia, PA 19111-5094.)

2.2 Non-Government publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted shall be those listed in the issue of the DODISS specified in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of documents cited in the solicitation.

ANSI X3.5	Flow Chart Symbols for Information Processing
ANSI Y14.15	Electrical and Electronic Diagrams
ANSI Y32.2	Graphic Symbols for Electrical and Electronic Diagrams
ANSI Y32.10	Graphic Symbols for Fluid Power Diagrams
ANSI Y32.14	Graphic Symbols for Logic Diagrams
ANSI Y32.16	Reference Designations for Electrical and Electronic Parts and Equipment

(Application for copies should be addressed to the United States of America National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for related associated detail specifications, specification sheets or military standards), the text of this document shall take precedence. Nothing in this document, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

### 3. REQUIREMENTS

3.1 General requirement. The general style and format shall be in accordance with this document and MIL-M-38784. Printing requirements shall be in accordance with the MIL-P-38790.

3.1.1 Army technical manuals. (A) When directed by the contracting activity (see 6.9), technical manuals for Army training devices shall be prepared in accordance with Appendix A.

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3.1.2 Device utilization handbook. (N) When directed by the contracting activity, Device Utilization Handbook shall be prepared in accordance with Appendix B. The general requirements of this specification and MIL-M-38784 also apply to Appendix B.

3.1.3 Security classification markings. Security classification markings for technical manuals shall be in accordance with MIL-M-38784.

3.1.4 Contractor logistic support. (F) For those systems converting to Contractor Logistic Support (CLS), technical manuals shall be prepared in accordance with MIL-M-7298, MIL-M-38784 and appropriate technical manuals.

3.1.5 General content. Technical manuals shall be (1) designed and written to facilitate their use in maintenance, operation, repair, and logistic support; and (2) written to cover the Government's maintenance concept for the training device.

3.1.6 General arrangement. Technical manuals shall be arranged in volumes; shall be numbered by adding a dash and consecutive Arabic numbers after the assigned publication number, e.g. , P-XXXX-1, P-XXXX-2, etc. The technical manuals may further be divided into parts, e.g., Volume I, Part 1; Volume II, Part 2 with covers and table of contents for each volume and part. Each new section of the technical manual shall begin on a right-hand page.

3.1.7 Conflict between documents. When a conflict exists between the contract and this document, the contract shall take precedence. When a conflict exists between the requirements of this document and its referenced documents, this document shall take precedence.

3.1.8 Commercial-Off-The-Shelf (COTS) manuals. COTS manuals shall provide operation, maintenance and repair parts data for COTS equipment. COTS manuals shall conform to the requirements of MIL-M-7298. If the manual requires supplemental data, the contractor shall prepare the needed information in accordance with MIL-M-7298 and meet the requirements of the cited specifications. Equipment for which the use of COTS manuals is permitted shall be covered as "black boxes" in the basic technical manual with all input, output and interface data depicted on all appropriate diagrams. Each individual COTS manual shall reflect the exact configuration of the delivered hardware identified by serial and model number(s). All applicable revisions shall have been incorporated into the manuals prior to delivery to the Government.

3.1.8.1 Copyrights/rights in data. Copyrights/rights in data release information regarding COTS manuals shall be in accordance with MIL-M-7298.

3.1.9 Level of writing. The level of writing shall be in accordance with MIL-M-38784 and to that of a technician having previous maintenance experience with similar or related equipment.

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3.1.9.1 (N) Unless otherwise directed by the contracting activity, the contractor shall provide documentation for Trainer Unique Equipment (TUE) that would permit maintenance to be performed to the Intermediate (piece-part) level of repair. TUE is defined as equipment that is contractor developed specifically for the training device and is not commercially available off-the-shelf.

3.2 Reference to other publications. Reference to other publications shall be made as provided for in MIL-M-38784. Reference shall not be made to a portion of another publication which requires still further reference to a third publication.

3.3 Types of technical manuals. This specification covers the following types of technical manuals:

- a. Operation and Maintenance Manual (see 3.3.1).
- b. Systems Operation and Maintenance Manual (see 3.3.2).
- c. Systems Interface Manual (see 3.3.3).
- d. Manuals, Technical: Requirements for Army Training Devices (Appendix A).
- e. Handbook: Device Utilization for Navy Training Devices (Appendix B).

3.3.1 Operation and maintenance manual. (N,F) The operation and maintenance manual shall contain the following sections:

- a. Front Matter (see 3.3.1.1).
- b. Section I - Description and Leading Particulars (see 3.3.1.2).
- c. Section II - Installation (see 3.3.1.3).
- d. Section III - Operation (see 3.3.1.4).
- e. Section IV - Theory of Operation (see 3.3.1.5).
- f. Section V - Maintenance (see 3.3.1.6),
- g. Section VI - Maintenance Diagrams (see 3.3.1.7).
- h. Section VII - Illustrated Parts Breakdown/Repair Parts and Special Tools List/Parts Catalog (see 3.3.1.8).
- i. Appendix(es) (see 3.3.1.9).
- j. Glossary (see 3.3.1.10).

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k. Index (see 3.3.1.11).

3.3.1.1 Front matter. Front matter shall be in accordance with MIL-M-38784.

3.3.1.1.1 Foreword. (N) The foreword, in addition to complying with MIL-M-38784, shall:

- a. Contain safety statements describing precautionary items applicable to the training device.
- b. Identify the operational system represented by the training device.
- c. Explain that coverage in the technical manual(s) is limited to TUE items or functions and that reference must be made to the applicable COTS or tactical technical manuals for additional information.
- d. List, in tabular form, all related contractor developed and COTS manuals by number and title which affect the operation and maintenance procedures of the training device.

3.3.1.1.2 Introduction. (F) The introduction shall, in addition to complying with MIL-M-38784, also list, in tabular form, all related publications. This list shall identify the technical manuals by number and title, which affect the operation, maintenance, and inspection procedures of the training device. The introduction shall explain that coverage in the technical manual includes organizational and intermediate level maintenance of the training device items and functions, and that reference may be made to equipment publications for additional information. Unless special techniques or materials are required, the introduction shall include a reference to T.O. 00-25-234 for instructions concerning procedures and specific materials to be utilized in soldering electronic equipment. Descriptive and leading particular information shall be placed in section I of the technical manual.

3.3.1.2 Section I - Description and leading particulars. The content of this section shall be such that command-level, supervisory personnel, and other users having an interest in the training device can easily and rapidly determine the purpose, physical and functional characteristics, and the operational capabilities of the training device.

3.3.1.2.1 Frontispiece. A frontispiece for the technical manual (usually a left-hand full page or a foldout, never back up) identified as page 1-0, figure 1-1 shall be prepared as a composite illustration of the separately housed units, sets, or subsystems of the complete training device, giving proper nomenclature of the components indexed and captioned in accordance with the requirements of MIL-M-38784.

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3.3.1.2.2 Administrative requirements. (A) Administrative requirements shall be provided as specified:

- a. Maintenance forms and records. (A) Maintenance forms, records, and reports which are to be used by maintenance personnel at all maintenance levels are listed in and prescribed by DA PAM 738-750.
- b. Destruction of Army materiel to prevent enemy use. (A) Destruction of Army materiel to prevent enemy use shall be in accordance with MIL-M-63042.
- c. Administrative storage. (A) Administrative storage requirements shall be included in the unit maintenance manual. These requirements shall be furnished by the contracting activity and shall reflect the requirements of AR 750-1.

3.3.1.2.3 Reporting of errors. Reports of errors, omissions, and recommendations for improving manuals shall be submitted on the appropriate form and forwarded to the command issuing the manual. A reply will be furnished.

3.3.1.2.4 Description. A description, in nontechnical, easily understood terms, shall be provided to include the following:

- a. The purpose of the training device.
- b. Scope of operation.
- c. How, in general, the training device accomplishes its mission.

3.3.1.2.5 Leading particulars. (N) A list, in tabular form, of the main features of the training device shall be provided. This list shall include but not be limited to the following:

- a. Training device capabilities and limitations.
- b. Physical characteristics of the training device overall dimensions, i.e., length, width, height, net weight, and cubic space of major assembly units; capacities of tanks, reservoirs, flow meters, and pumps; maximum and minimum operating pressures, temperatures, and flow of pneumatic or hydraulic systems.
- c. Electrical characteristics of the training device such as total power factor and overall voltage, current, and frequency requirements of major assemblies; maximum allowable deviation (plus or minus tolerances) from normal of the above electrical characteristics.

Note: Comparative data contained in COTS manuals need not be supplied.



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3.3.1.2.6 Equipment tables. Equipment (including accessories such as cables, linkages, tools, and test equipment) supplied with the training device shall be itemized as shown in table I. Tools and test equipment required but not supplied with the training device shall be itemized as shown in table II.

3.3.1.2.7 Selection of special tools and test equipment to be listed in equipment tables. Special tools and test equipment listed in the table headed "Equipment Required But Not Supplied" shall be the minimum required to maintain the training device.

3.3.1.2.7.1 Special tools and test equipment. The use of special tools and test equipment required for maintenance, with instructions for assembly or interconnection with the training device, shall be described in detail. When necessary, illustrations shall be provided to clarify use or identification of particular tools.

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TABLE I. Sample table of equipment supplied.

Quantity	Short Form Nomenclature	Gov't Type Designation Model No./Part No.
1	Trainee Station	101-858D311500-1
1	Instructor Station	102-858D43000
1	Computation System	103-858D311500-1
1	Power Distribution Cabinet	104-858D411000-1
1	I/O Cabinet	105-858D411100-1
1	Alarm/Annunciator Panel	106-858D310100-1
1	Cockpit/Fuselage	107-858D420000-1
1	Countermeasure	MX-7910/ALM-70
1	Test Set	TS1490-12
2	Card Extender	100D611410-1

TABLE II. Sample table of equipment required but not supplied.

Quantity	Short Form Nomenclature	Gov't Type Designation Model No./Part No.
1	Multimeter, Digital (DMM)	8050A-01, Fluke
1	Oscilloscope	2236 Tektronix
1	Variable Transformer	Variac
1	Pressure Gauge	73040100, CDC
1	Head Alignment Kit	9233500, CDC

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3.3.1.2.7.2 (N,F) Equipment shall be selected from the list of tools and test equipment approved by the Government by means of Aerospace Ground Equipment (AGE) listings, Special Support Equipment (SSE) listings, Ground Support Equipment (GSE) listings, the Federal Supply Catalog, provisioning conferences, Engineering Change Proposals (ECPs), Trainer Change Proposals (TCPs), Training Equipment Change Directives (TECDs) and procurement documents. When the contractor cannot obtain an approved list, the manual shall show the contractor's recommendations. However, these recommendations shall be changed promptly to conform to the official Government list as soon as such information is provided to the contractor.

3.3.1.2.7.3 (A) Test, Measurement, and Diagnostic Equipment (TMDE) shall be selected from the DA TMDE Register, DA PAM 700-21, the DA Preferred Items List (PIL), DA PAM 700-21-1 or as indicated in AR 750-43, the DA TMDE Program.

3.3.1.2.8 Illustrations of units and assemblies. A unit, assembly, or subassembly description shall be illustrated by a line drawing followed by a brief description of the equipment. This shall include rack maps of printed circuit card racks or assemblies as applicable. The view shall be such that, when considered with the text, it shall contribute the most information to a reader interested at the moment only in a particular unit, assembly, or subassembly. Components shall be indexed as specified in MIL-M-38784.

3.3.1.3 Section II - Installation. This section shall provide overall training device requirements required at the device site, installation instructions, installation test procedures, and post-installation test procedures. The procedures and associated data tables contained in this section will enable maintenance personnel to configure, test, and relocate the training device.

3.3.1.3.1 Preparation for use. Instructions shall be given for providing facilities for the training device prior to installation.

3.3.1.3.1.1 Facilities. (A,N) Detailed information such as power requirements, inputs and outputs, humidity, electrostatic discharge, space requirements, minimum opening required for entry of the entire training device or its unassembled units shall be provided. Weights and dimensions of units, and special requirements such as ventilation, illumination, air conditioning, levelness of the floor, and weight distribution of the training device at its final location shall also be provided.

3.3.1.3.1.2 (F) The requirements of 3.3.1.3.1.1 shall apply unless otherwise specified and shall contain all data required in the event that the training device is moved.

3.3.1.3.2 Unpacking and repacking for reshipment. (A,N) Complete and simple instructions shall be provided for personnel to unpack and repack the training device, including specific instructions for the salvage of special material required for repacking. Instructions shall be illustrated if necessary for clarification.

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3.3.1.3.2.1 (F) The requirements of 3.3.1.3.2 shall apply unless otherwise specified and shall contain all data required in the event that the training device is moved.

3.3.1.3.3 Installation information. (A,N) Instructions shall be provided for planning the installation of the training device and shall include the following:

- a. A floor plan diagram showing location of desirable positions for each assembly.
- b. Precautions in the positioning of assemblies to prevent interaction.
- c. Installation considerations, such as short ground leads, effective bonding, and shielding requirements.
- d. Information for attaching plugs to receptacles, wires to terminal boards, and for making connections to other related equipment, such as interphones.
- e. Data on any critical cord lengths, cable, assemblies, and linkages.
- f. A trainer interconnecting cable list, in tabular form, listing all the external cables installed between the equipments in the training device (see table III).

TABLE III. Trainer interconnecting cable list.

Cable Ref Desig	From Unit	To Unit	Part Number
W1	12A4TB2	Unit 19	824-2-500001
W2	12A5P16	5J1	824-2-500002
W3	12A5P3	6J1	824-2-500003
W4	12A5P9	7J1	824-2-500004
W5	12AP10	8J1	824-2-500005
W6	12A5P15	10J1	824-2-500006
W7	12A5P4	11J1	824-2-500007
W8	12A5P7	1A9P1	824-2-500008
W9	12A5P6	1A9P2	824-2-500009
W10	12A5P13	2A9P1	824-2-5000010

3.3.1.3.3.1 (F) The requirements of 3.3.1.3.3 shall apply unless otherwise specified and shall contain all data required in the event that the training device is moved.

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3.3.1.3.4 Installation test Procedures. Instructions shall be provided for making performance tests after installation of the training device to ensure that it is properly set up, calibrated, adjusted, and in proper operating condition before it is turned over to the operating personnel. These instructions shall specify in detail all tests and parameters required to ensure that the operational performance of the training device is equal to that which qualified it for acceptance by the Government. Reference may be made to applicable portions of the Acceptance Test Procedures Report or equivalent when provided as a separate item of the contract . A publication number shall be assigned to this report. Reference shall be made to the use of special tools and test equipment (see 3.3.1.2.7.1).

3.3.1.3.5 Post installation tests. Precautionary measures and post installation tests shall be described where such omission might lead to faulty operation, equipment damage, or injury to personnel.

3.3.1.4 Section III - Operation. This section shall include all the procedures necessary to enable operating personnel to efficiently and effectively use the equipment in accomplishing its designated task. These operating instructions shall be in sufficient detail to allow operators, not trained on this equipment, to independently and safely operate the equipment.

3.3.1.4.1 Controls and indicators. Tabular listing of all TUE operating controls and indicators in the training device shall be provided. Each table shall be accompanied by an illustration of the related panel or unit. When the size of the illustration precludes direct reading of the designation of the control or indicator, leader lines with index numbers in clockwise rotation shall be used. The tables shall include the following columns (see figure 1):

- a. Item number. Sequential list of index numbers shown on illustration.
- b. Controls or indicators exactly as shown on the equipment. Controls to be used only by qualified maintenance personnel shall be so identified.
- c. Reference designations.
- d. Description of the purpose or function of the control or indicator.
- e. Normal status or operating position.

3.3.1.4.2 Preparation for operation. Procedures shall be provided for preparing the training device for operation. These procedures shall include instructions for a preliminary inspection. Precautionary measures and any preoperational tests that are required to preclude faulty operation, equipment damage, or injury to personnel shall be described. All procedures required prior to training device turn-on shall be included.

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3.3.1.4.2.1 Preliminary inspections. Preliminary inspection procedures shall be provided for a walkaround inspection of the training device to ensure that major components are intact and ready to be turned on. Daily preventive maintenance procedures shall be used as applicable. Instructions shall be provided, as applicable, for inspecting hoses, drive belts, electrical wiring, indicators, etc. Switches and controls which require positioning before energizing the equipment shall be described in a tabulation under the headings "Name", "Location", and "Position or Setting." Any required preoperational adjustments shall be described.

3.3.1.4.3 Operating procedures. Operating procedures shall be provided as follows:

3.3.1.4.3.1 Device turn-on. This procedure shall include all steps necessary to turn-on the training device and perform any daily readiness tests. At the conclusion of this procedure, the training device will be in the full operating condition.

3.3.1.4.3.2 Modes of operation. Procedures shall be provided for each mode of operation; e.g. , manual, automatic, local, remote, search, track, etc. The use of each mode shall be described. Computer program loading procedures shall be included when essential to initializing operation of the equipment.

3.3.1.4.3.3 Device shut down. This procedure shall include all steps necessary to shut down the training device. This shall include both daily and long term shut down conditions.

3.3.1.4.4 Emergency operation. Emergency stop and restart procedures shall be included. Instructions shall also be provided for substitute methods of operation where there is a failure of circuits or improper functioning of units.

3.3.1.5 Section IV - Theory of operation. This section shall contain the theory of operation necessary to provide the technician with an understanding of the interrelationships of the functional systems of the overall training device. This data shall include the operating theory of the support systems integrated into the training device such as commercial computers, visual systems, motion systems, Government-furnished equipment (GFE), etc. Reference shall be made to COTS manuals as necessary.

3.3.1.5.1 Introduction. An introduction paragraph shall explain the scope of this section and the relationship of theory to fault isolation.

3.3.1.5.2 Unusual terms and abbreviations. Unusual terms and abbreviations , such as acronyms, mnemonics, etc., used in text and diagrams of the technical manual shall be defined in the glossary (see 3.3.1.10)

3.3.1.5.3 Basic Principles and major systems. The basic principles of operation of the training device and its major systems shall be concisely described. As required, appropriate simplified schematic and block diagrams

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and other simple drawings shall be included. Appropriate reference shall be made to the functional block and schematic diagrams located in section VI of the technical manual.

3.3.1.5.4 Mathematical equations. When necessary for maintenance purposes, mathematical equations which are computed by the training device shall be described. This description shall precede other text describing the theory of operation if this arrangement provides for easier understanding. Summaries of digital computer algebra terminology and fundamental logic operations shall be included.

3.3.1.5.5 Circuits and systems used throughout training device. The theory of operation of the systems, subsystems, circuits, units, assemblies, or subassemblies which are frequently used throughout the training device shall be explained in this section so that these explanations may be referred to by paragraph number and not repeated in other areas of the text.

3.3.1.5.6 System analysis. The theory of operation of each functional system and subsystem shall be technically discussed and referenced to the associated functional block diagrams, logic diagrams, and simplified block and schematic diagrams. The theory shall be to the level required by a maintenance technician to provide the understanding necessary for fault isolation to the level of repair specified by the maintenance concept for the training device. Coverage shall include general functioning and interface of operational and COTS equipment in the training device, with references to the operational or COTS manuals for detailed theory of operation.

3.3.1.5.7 Simplified block and schematic diagrams. Simplified block and schematic diagrams shall be used to the maximum extent in order to assist the maintenance technician to understand the theory of operation of the complete training device. See figure 2 for a sample of a simplified schematic diagram.

3.3.1.6 Section V - Maintenance. This section shall consist of text, diagrams, and tables as required for maintenance of the complete training device as defined by the maintenance concept. The text shall include all necessary warnings, cautions, and notes as specified in MIL-M-38784, to prevent injury to personnel or damage to equipment. Wherever necessary, and wherever such references would aid in maintenance, references shall be made to illustrations, diagrams, COTS manuals, GFE documents, etc.

3.3.1.6.1 Maintainer requirements. (N) This section shall familiarize the maintainer with the maintenance procedures/techniques required to support the training device.

3.3.1.6.1.1 Maintenance tasks. (N) These tasks shall be developed to include all skills required to maintain the training device to the maintenance concept.

- a. Major tasks. (N) A job task analysis shall be performed. Those job tasks identified shall be translated into major tasks and

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sequenced in the order of performance. Major tasks shall consist of a statement of the task to be performed, skills/knowledge required to perform the tasks, and any special conditions under which the task is to be performed.

- b. Elements and job steps. (N) Elements and job steps shall be identified for each major task, as appropriate. They shall be expressed in terms of, and keyed to, the major tasks they support. They shall become more specific as they are broken down from the major level, to the element level, to the job step level. Accomplishment of job steps shall lead to the achievement of elements which leads to the completion of the major task.
- c. Tasks performed by maintainer sheets. (N) Tasks Performed by Maintainer (see table IV) shall be completed for the job of maintainer. Each major task shall be recorded with its elements and job steps. The planned time allotted to perform the task shall be identified under the "Unit Hours" column. The planned time allotted for each element shall be recorded under the "Sub-hours" column.
- d. Task numbering. (N) Tasks shall be numbered in a logical sequence with each element and job steps numerically related to their specific major task. The job steps shall be numerically related to the element.

3.3.1.6.1.2 Maintenance qualifications matrices. (N) This section shall establish a system for properly recording and consolidating maintainer qualification information into a usable format. Table V illustrates a matrix of the minimum information required by the maintainer to achieve and maintain their qualification as a training device technician. Tasks shall be formatted in a logical sequence. Modifications or changes may be required to tailor the matrix to a specific project.

- a. Types of matrices. (N) The Maintenance Qualifications Matrix shall be organized into the following three matrices:
  - (1) Operation. (N) This matrix shall contain all tasks, objectives which relate to operation of the equipment or any equipment supplemental to the system.
  - (2) Computer and peripheral maintenance. (N) This matrix shall contain all tasks, objectives related to maintenance of the computer, its peripheral equipment, and any interface equipment between the computer and its peripheral equipment or between the computer and any nonperipheral components of the system.



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TABLE IV. Sample of tasks performed by maintainer.

	SUB- HOURS	UNIT HOURS
Major Task 1.0 _____		8.0
Element 1.1 _____	4.0	
J.S. _____		
J.S. _____		
J.S. _____		
J.S. _____		
Element 1.2 _____	4.0	
J.S. _____		
J.S. _____		
J.S. _____		
J.S. _____		
Major Task 2.0 _____		8.0
Element 2.1 _____	4.0	
J.S. _____		
J.S. _____		
J.S. _____		
J.S. _____		
Element 2.2 _____	4.0	
J.S. _____		
J.S. _____		
J.S. _____		
J.S. _____		

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TABLE V. Sample of maintenance qualification matrix.

MAINTENANCE QUALIFICATIONS STANDARDS								
Tasks	Task Number	Section						COTS Manuals
		I	II	III	IV	V	VI	

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- (3) System maintenance. (N) This matrix shall contain all tasks, objectives related to maintenance of any system components not covered under the operation and computer and peripheral maintenance matrices listed above.
- b. Major elements. (N) The major elements of the Maintenance Qualification Matrix are defined as follows:
  - (1) The tasks are those identified on the Tasks Performed by Maintainers sheets. The tasks shall be presented in the same sequence and numbered as listed on the Tasks Performed by Maintainers sheets. All elements and job steps related to the first major task shall be recorded before proceeding to the second major task.
  - (2) Section I through Section VII refers to those sections of the Operation and Maintenance manual which provide information on performance of the major task, element, or job step, as appropriate. The columns, i.e. section I through VII and the COTS manuals, shall include all paragraph(s), page(s), figure(s), diagram(s), and list(s) related to the specific task required for the maintainer to achieve the required qualification.
  - (3) A written explanation of the matrices shall be provided to ensure that each major task, elements and job steps are referenced in the matrix, can be cross referenced to all sections of the technical documentation, and are sequenced in the order performed.

3.3.1.6.2 Maintenance levels. This section shall describe in detail the maintenance responsibilities allocated to organizational, intermediate, and depot maintenance levels in accordance with the maintenance concept.

3.3.1.6.3 Depot maintenance. (F) Depot maintenance requirements shall be provided to the Air Force as separate manuals in accordance with MIL-M-38789.

3.3.1.6.4 Scheduled (preventive) maintenance. This section shall contain scheduled preventive maintenance procedures to be accomplished on TUE, COTS, and operational equipment in the training device. For procurements in which maintenance requirement cards (MRC) or work cards (WC) are included as a contract item, a paragraph shall be provided to explain that the MRC or WC contain the planned scheduled maintenance procedures for the particular training device. Reference to the MRC or WC shall be by Government publication number. For procurements in which MRC or WC are not a contract item, the detailed requirements for scheduled preventive maintenance text shall be provided as specified in 3.3.1.6.4.3 through 3.3.1.6.4.7.

3.3.1.6.4.1 Introduction. The introduction shall explain the purpose, scope, and arrangement of the scheduled preventive maintenance data. When a

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preventive maintenance procedure is critical to the operation of the equipment and the schedule for servicing is absolute (not just recommended), this information shall be conspicuously written as a caution.

3.3.1.6.4.2 Preventive maintenance requirement intervals. The periodicity of each requirement shall be identified as follows:

- a. Daily Preoperational.
- b. Daily Postoperational.
- c. Daily.
- d. Daily between missions/exercises.
- e. Periodic, followed by the requirement periodicity.
- f. Special, followed by the requirement periodicity.

3.3.1.6.4.3 Preventive maintenance procedure. These procedures shall include information required to examine, clean, and lubricate the equipment and shall contain:

- a. References to preventive maintenance instructions contained in COTS or operational equipment manuals.
- b. Safety precautions.
- c. Tools, parts, materials, and test equipment required.
- d. Cleaning solvents. Solvents shall be identified by Government specification numbers and National stock numbers.
- e. Instructions for properly maintaining all safety devices and interlocks, with warnings and cautions.
- f. Instructions for lubrication; also types and quantities of lubricants to be applied. Lubricants shall be identified by Government specification numbers and National stock numbers.
- g. Procedures for obtaining access to subassemblies of subcomponents.
- h. Inspection procedures for parts which deteriorate due to cycles of usage, age and/or other conditions.
- i. Illustrations to identify lubrication points and other pertinent data.
- j. Illustrations to support the text.

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- k. Other information pertinent to these procedures.

3.3.1.6.4.4 Scheduled Performance checks. These operational test shall contain step-by-step procedures necessary to verify that the equipment is operating within standards for all modes of operation and to detect malfunctions prior to failure. The text shall contain the following:

- a. Safety procedures.
- b. A list of tools and test equipment identified by type, manufacturer, and model number.
- c. The title of the test to be performed.
- d. Preliminary setup data required to perform the tests.
- e. Detailed procedures for accomplishing the tests. Procedures requiring lengthy and identical setup data may be presented in detail in one procedure and referenced in succeeding procedures.
- f. Values or conditions, with tolerances indicative of normal operation.
- g. Reference to corrective maintenance procedures to be used if the tests are not within tolerances.
- h. Illustrations to support the text.

3.3.1.6.4.5 Lubrication chart. (F) Lubrication methods shall be incorporated as a chart. See figure 3 for an example of a lubrication chart.

3.3.1.6.4.6 Lubrication orders. (A) Lubrication orders shall be prepared in accordance with MIL-M-63004.

3.3.1.6.4.7 Periodic validation. (F) Instructions shall be provided for conducting performance tests on a recurring basis to ensure that aircrew training device(s) (ATD) performance matches acceptance standards. These instructions shall specify in detail all tests and parameters required to ensure that operational performance of the training device is commensurate with that which qualified it for acceptance by the Government. Maximum use shall be made of the information given in the engineering acceptance test procedures (ATP) document. Reference shall be made to the use of special tools, test equipment, and software programs. Figures 4 and 5 are samples of the required data. The Air Force, per AFR 51-6, requires development of data sufficient to assure a means for simulator certification. Tests shall include but not be limited to those for:

- a. Operator and instructor stations.
- b. Simulated aircraft systems and controls.

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- c. Power plant.
- d. Aerodynamics.
- e. Visual systems.
- f. Motion systems.
- g. Control loading.

3.3.1.6.5 Corrective (unscheduled) maintenance. Complete procedures shall be provided for the following categories of corrective maintenance:

- a. Troubleshooting. (see 3.3.1.6.5.1)
- b. Disassembly and reassembly. (see 3.3.1.6.5.2)
- c. Inspection. (see 3.3.1.6.5.3)
- d. Testing. (see 3.3.1.6.5.4)
- e. Repair/replacement and adjustment/realignment. (see 3.3.1.6.5.5)
- f. Regualification testing. (see 3.3.1.6.5.6)
- g. Alignment. (see 3.3.1.6.5.7)

3.3.1.6.5.1 Troubleshooting. information shall be developed to contain all data necessary to locate a malfunction in the training device. This information shall be provided to guide a technician in the logical sequence of isolating a fault to a unit, assembly, subassembly, module, or piece part depending on the maintenance concept for the level of repair being performed. Troubleshooting procedures shall be directly related to and support the maintenance diagrams of section VI. Diagnostic test programs shall be developed for digital devices where this method is determined to be the most practical method of troubleshooting logic circuitry. A description of the use of the following items, as applicable, as aids in troubleshooting the overall training device shall be included:

- a. Diagnostic programs.
- b. Built-In-Test Equipment (BITE).
- c. Fault logic diagrams.
- d. Assembly test procedures.

3.3.1.6.5.2 Disassembly and reassembly. Detailed procedural steps required to detach a unit, assembly, subassembly or component for replacement,

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test, inspection, or repair shall be provided together with precautions to be observed, except when the methods or procedures are obvious. Exploded views (line drawings) shall be used to supplement maintenance procedures where it is necessary to show in detail the parts of an assembly which cannot be clearly shown in assembly drawings. When these exploded views are also used for parts identification (see 3.3.1.7.10), the nomenclature shall be followed by the reference designation enclosed in parentheses, see figure 6.

3.3.1.6.5.3 Inspection. Instructions to inspect the disassembled equipment for damage or wear shall be provided. This information shall be in tabular or chart form where practicable, with emphasis upon allowable service limits and tolerances. Inspection information shall provide adequate standards for determining when parts may safely be continued in service and when they should be replaced.

3.3.1.6.5.4 Testing. Detailed testing procedures required for fault isolation to the lowest replaceable unit (LRU) for all repairable assemblies and subassemblies shall be included. Instructions for use of required assembly testers or bench test equipment shall be given for each fault isolation procedure. An illustration of the bench test setup or assembly tester cabling between components being tested and the required test equipment shall be included for each assembly. Procedures shall include resultant voltages, resistances, or waveforms, when applicable. Procedures for throwaway assemblies and depot repair items shall be limited to those required for assembly go/no-go tests.

3.3.1.6.5.5 Repair/replacement and adjustment\realignment. Procedures for repair/replacement of a faulty piece part shall be included. Procedures shall include any special cleaning or lubricating instructions. Procedures for any required adjustments/ realignment of the assembly following a repair action shall also be provided.

3.3.1.6.5.6 Regualification testing. Procedures for regualification testing of a repaired unit, assembly, or subassembly shall be provided.

3.3.1.6.5.7 Alignment. Corrective adjustment procedures and support information necessary to restore electrical and mechanical alignment of the various equipments, including all values and tolerances shall be provided. The alignment procedures shall be cross-references to respective fault isolation procedures and diagrams. The alignment procedures shall be presented in step-by-step sequence. Calibration requirements shall be defined and discussed.

3.3.1.7 Section VI - Maintenance diagrams. This section shall contain all the diagrams required to maintain the training device to the level specified by the maintenance concept. Preparation of the diagrams shall be in accordance with DOD-STD-100, ANSI Y14.15, ANSI Y32.2, ANSI Y32.10, ANSI Y32.14, ANSI Y32.16 and ANSI X3.5. These diagrams/drawings shall be reduced to "B" size (11 x 17 inches) and be provided as a separately bound volume of the technical manual.

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3.3.1.7.1 Introduction. An introductory paragraph shall explain the scope of this section. A reference to the definition of terms and abbreviations in the Glossary shall be provided. A data list, developed in accordance with Chapter 600 of DOD-STD-100, shall be included in this volume. For multiple sheet drawings, the contractor shall ensure that continuity is maintained from sheet to sheet. This shall be accomplished by providing continuation keys using the alphanumeric system of zoning. Drawings should be divided into equally spaced horizontal zones designated A, B, C, etc. , from the bottom to the top along the outside left and right borders. Drawings shall be divided into equally spaced vertical zones designated 1, 2, 3, etc. , from right to left along the outside top and bottom borders. Continuation sheets shall use consecutive zone designators, e.g. , sheet one uses A, B, C, D, E and 1, 2, 3, 4, 5. Sheet two would use F, G, H, I, J and 6, 7, 8, 9, 10, etc. When referencing to zones on other sheets, the following information shall be provided: (a) signal name (mnemonic), (b) sheet number, and (c) alphanumeric zone number. When using zone designators, the number should be listed first to avoid possible confusion with reference designators, for example "3C" should be used instead of "C3".

3.3.1.7.2 Intercabling diagram. (A,N) External intercabling diagrams for the training device shall be provided. All cables installed between equipments shall be included and identified by cable number. Figure 7 is a sample of an intercabling diagram showing cabling between units of a training device. If a junction box or disconnect panel is supplied, an additional wiring diagram(s) showing the internal wiring of the box or panel and its relationship to the external wiring shall be furnished, but functions of the circuits need not be indicated. Cable terminations are normally multi-pin connectors, terminal lugs, coaxial connectors, etc.

3.3.1,7.2.1 Cable wire lists. (N) Cable wire lists (figure 8) shall be provided for all cables identified on the cabling diagrams. The wire lists shall consist of tabular data representing the internal connections of the cables that run between the equipment. The principle information provided by cable wire lists shall be as follows:

- a. Cable number (W-100, W-101, etc.).
- b. Point-to-point connector terminations, both ends (W100P1-A to W100P2-A).
- c. Reference designators of interconnecting units.
- d. Number of active wires.
- e. Spare wires - conductors designated as spares shall be identified as such in the function column.
- f. Function (voltage, mnemonics, signal, etc.).



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3.3.1.7.3 Overall functional block diagrams. Overall functional block diagrams (figure 9) shall be provided to display the operational sequence and signal flow of the entire training device. Major functions of the equipment shall be correlated in a logical manner to show inputs, outputs, power distribution, etc. Hardware packaging shall be subordinated to the functional arrangement. Blocks on the diagram shall include references to the appropriate functional schematic diagrams continuing the detailed circuitry.

3.3.1.7.3.1 Intermediate level block diagrams. When the complexity of the training device dictates, intermediate block diagrams shall be provided for each system or subsystem.

3.3.1.7.4 Functional schematic diagrams. Overall and intermediate functional schematic diagrams for each system and each subsystem, as required to support fault isolation to the level defined in the maintenance concept, shall be provided, and shall be coordinated with the block diagrams specified in 3.3.1.7.3 and 3.3.1.7.3.1. Mnemonics, flag notes, reference designations, and pin identification data shall be included to facilitate signal tracing. Only that circuitry of an assembly/chassis that relates to the function being shown need be depicted. All inputs and outputs shall be labeled and shall be cross-referenced to origin or destination. COTS equipment and GFE shall be treated as "black boxes" with all inputs/outputs and interface data depicted. Test points shall be identified and data required for fault isolation such as waveforms and voltage levels shall be presented adjacent to the appropriate test points. Figure 10 is an example of a functional schematic diagram.

3.3.1.7.5 Unit or chassis schematic. A schematic of each individual chassis, printed circuit board or fundamental unit, regardless of the maintenance concept, shall be provided (see figure 11). Circuit components shall be grouped into functional elements; e.g., amplifiers, gates, buffers, flip-flops, etc. The location of the functional elements and functional element groups on the page shall cause the direction of the signal flow to be obvious and, when practical, from left to right while feedback signal flow shall be from right to left. Voltage levels and waveforms necessary to assist in rapid and complete fault isolation shall be provided.

3.3.1.7.5.1 Waveform analysis. Where waveform analysis is necessary to determine normal or abnormal operation, graphic reproductions of normal waveforms shall be provided on the functional and unit schematic diagrams to support the text. Critical parameters, such as signal amplitude, pulse width, durations, slope, repetition rates, and polarities, shall be shown.

3.3.1.7.5.2 Timing circuit diagrams. For circuitry requiring synchronization, timing circuit diagrams shall be provided depicting all significant timing relationships and the origins of all timing signals analog or digital (figure 12).

3.3.1.7.6 Detailed logic diagrams. Where digital circuitry is involved, detailed logic diagrams depicting all logic functions shall be supplied (see figure 13).

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3.3.1.7.7 Wiring lists or diagrams. Wiring lists or diagrams shall be provided for the complete training device to show the point of origin, all tie points, and the termination of each lead. Each point shall be identified by unit number, rack number, reference designator, terminal board or cable number, terminal or cable connection and function in accordance with the numbering system used throughout the training device. Figure 14 is a sample of a wire list.

3.3.1.7.7.1 Wiring lists. (F) Wiring lists in lieu of wiring diagrams shall not be accepted except as authorized by the contracting activity. If authorized, incorporation shall be by reference to applicable engineering document number and nomenclature only.

3.3.1.7.8 Power distribution diagrams. Power distribution diagrams shall depict the distribution of primary alternating current (at) power, secondary ac power, direct current (dc) power, and grounding systems (see figure 15). The following shall apply for the preparation of power distribution diagrams:

- a. Show total distribution from power sources to the various assemblies, subassemblies, and modules.
- b. Show and identify all power line devices such as fuses, circuit breakers, switches, interlocks, and relay contacts.
- c. Show and identify all connections including plugs, jacks, and terminal boards.
- d. Identify any emergency power sources where applicable.
- e. Show all grounds, commons, neutrals, and return lines.
- f. Show and identify all metering circuits and indicators.
- g. Include voltage and tolerances as required.
- h. Wherever practical, power paths shall be displayed from left to right and from top to bottom.
- i. The functional names of all "main line" switches and circuit breakers shall be conspicuously marked.
- j. Show all relay or contactor coils in series with the main power distribution path.

3.3.1.7.9 Fault logic diagrams. Fault logic diagrams shall be based on fault indications observed during troubleshooting. The diagrams shall comprise a branching series of questions pertaining to fault isolation (see figure 16). Each question shall pertain to a further observation or measurement and shall result in a "yes" or "no" answer, thereby progressively

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narrowing the possible functional area of the fault. Tolerance values shall be provided in those instances where a definitive "yes" or "no" is not obtained. This progression and elimination shall isolate the functional area of the equipment containing the fault and then refer the user to that portion of the manual containing the information needed to complete the fault isolation and repair. Each diagram shall include or make reference to information establishing the initial conditions required for the fault isolation procedure.

3.3.1.7.10 Parts location diagrams. (N) Where a nonillustrated parts list refers to parts not shown in the technical manual or elsewhere (i.e., mechanical parts and parts not stamped with a part number or reference designation), line drawings shall be furnished showing callouts of the interior of the major assemblies identifying all such parts. These illustrations shall show and identify such parts by reference designation as well as part name. Common mechanical assemblies used throughout the training device shall be identified by one representative illustration. A note on such an illustration shall state what these common assemblies are. Parts not used on one of these assemblies shall be so indicated (e.g., MP3 not used on Unit 2A3).

3.3.1.8 Section VII - Illustrated parts breakdown/repair parts and special tools list/parts catalog. This section shall contain the requirements specified in 3.3.1.8.1 through 3.3.1.8.3.6.

3.3.1.8.1 Illustrated parts breakdown. (F) Unless otherwise specified by the contracting activity, illustrated parts breakdown shall be prepared as a separate manual in accordance with MIL-M-38807.

3.3.1.8.2 Repair parts and special tools list. (A) Repair parts and special tools list shall be prepared in accordance with MIL-STD-335(TM).

3.3.1.8.3 Parts catalog. (N) The parts catalog shall catalog and identify all repair parts in the training device. This section shall contain the following:

- a. Introduction (see 3.3.1.8.3.1).
- b. List of manufacturers (see 3.3.1.8.3.2).
- c. List of major assemblies (see 3.3.1.8.3.3).
- d. Major assembly parts list (see 3.3.1.8.3.4).
- e. Numerical parts list (see 3.3.1.8.3.5).
- f. Reference designation list (see 3.3.1.8.3.6).

3.3.1.8.3.1 Introduction. (N) An introduction section shall explain the use of the parts catalog, use of abbreviations, codes, symbols, and other

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specific notations concerning the parts listed. Figure 17 is an example for use as a guide in preparation of the "Introduction" to the parts catalog.

3.3.1.8.3.2 List of manufacturers. (N) The Commercial and Government Entity Code (CAGEC) numbers, names, and addresses of the manufacturers shall be listed numerically by code number as listed in DLSC H4-1 and DLSC H4-2 (see figure 18).

3.3.1.8.3.3 List of major assemblies. (N) All major assemblies which comprise the training device shall be listed in item number order. The item number for each major assembly shall be obtained from column 1 of the major assembly parts list (MAPL) (see 3.3.1.8.3.4). The list of major assemblies shall include information shown in figure 19.

3.3.1.8.3.4 Major assembly parts list. (N) The major assembly parts list (MAPL), see figure 20, shall be prepared as follows:

- a. Major assemblies. (N) This list shall be prepared in major assembly and subassembly sequence with the major assembly nomenclature identified on each page of the list.
- b. Assemblies. (N) The main groups shall be broken down into assemblies, subassemblies, and parts. Each item shall be designated with an indenture number to indicate the relationship to its next higher assembly (see 3.3.1.8.3.4g).
- c. MAPL. (N) The MAPL shall list in "Top Down Breakdown Order" all installations, assemblies, and parts including assemblies which can be disassembled or replaced as stated in the maintenance concept. Identical assemblies used two or more times in an end equipment shall be broken down at the first appearance. All other appearances of this assembly shall be annotated; e.g. , "See Item No.\_\_\_\_\_ for breakdown", in column 4. Potted, encapsulated, riveted, or welded units, not susceptible to maintenance, shall not be broken down.
  - (1) Unmodified Government-Furnished Property (GFP). (N) Unmodified GFP provided for incorporation in the training device or forming an integral part of the training device shall be listed as a complete item under the appropriate assembly with the applicable technical publication numbers as shown in figure 21.
  - (2) Unmodified Contractor Acquired Operational Equipment (CAOE). (N) Unmodified CAOE obtained from operational equipment supplies, which form an integral part of the training device, shall be listed as a complete item under the appropriate assembly with the applicable technical publication numbers as shown in figure 22.

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- (3) Modified GFP or CAO E. (N) When GFP or CAO E is modified, the modification breakdown shall be listed. Any items permanently removed from the GFP or CAO E shall be listed and annotated as "Deleted" in column 4 of the MAPL following the modification breakdown. Columns 1, 2, 3, 4, 5, 6, and 7 of the MAPL shall be completed for each item deleted (see figures 23 and 24).
- d. Parts/Material. (N) Items of common hardware such as common nuts, bolts, screws, washers, and fittings, except those of special design, shall not be listed in the MAPL. Bulk items such as electrical wire and cable, gasket material, and metal stock, except those of special design, shall not be listed in the MAPL. All electrical or electronic parts and all maintenance significant mechanical parts shall be included in accordance with the maintenance concept. Hardware and bulk items which are of special design or modified or fabricated solely for use with the training device shall be listed in the applicable assembly breakdown.
- e. Column 1, item number. (N) This column shall contain consecutive item numbers for each item listed. For revisions to the MAPL, new items shall be added using item numbers with an alpha letter suffix to retain continuity. Item numbers for deleted items shall remain with the notation "Deleted" in column 4. If first appearance is deleted, all detailed information must be transferred to the second appearance which now will become the master reference for this item. All other later appearances must refer to the new first appearance item.
- f. Column 2, reference designations or figure and index number. (N) This column shall contain reference designation assigned by the contractor as required by ANSI Y32.16. The unit system for assignment of reference symbols shall be used. If a reference designation is not assigned to the item, the appropriate figure and index number shall be listed.
- g. Column 3, indenture number. (N) An indenture number shall be used to indicate the relationship of assemblies as follows:

<u>Item No.</u>	<u>Indent.</u>	<u>Description</u>
1	1	End article (complete training device)
2	2	First major component (unit)
3	3	All parts attached to the first major component (unit) but not part of a subassembly thereof
4	3	First assembly

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<u>Item No.</u>	<u>Indent.</u>	<u>Description</u>
5	4	First subassembly
6	5	Parts or subassemblies for first subassembly
7	4	Second subassembly
8	5	Parts for second subassembly
9	3	Second assembly
10	6	Parts for subassemblies of subassemblies

- h. Column 4, part name and description. (N) The noun name, modifier, and basic characteristics of each item is required. When an item is identical to one previously listed in the MAPL, the description detail shall be replaced by the noun name and the phrase "Same as Item No. \_\_\_\_ ." The referenced number shall be that of the item's first appearance in the MAPL. If abbreviations are used, they shall conform to Cataloging Handbook, DLSC H6-1, or to MIL-STD-12. In the event a conflict occurs between these two documents, the former shall take precedence.
- i. Column 5, manufacturer's code. (N) The Commercial and Government Entity Code (CAGEC) numbers, as listed in DLSC H4-1 and H4-2, shall be listed at the items first appearance in the MAPL.
- j. Column 6, part number. (N) The part number shall be inserted in column 6 of the MAPL in accordance with the requirements specified in 3.3.1.8.3.4j(1) through 3.3.1.8.3.4j(3).
- (1) (N) The prime contractor's drawing number or part number if different from the drawing number, shall be listed on only those items which are manufactured or modified by the prime contractor. This shall include drawings for modification to vendor items, GFP, or contractor acquired operational equipment. Prime contractor drawing numbers or part numbers shall not be assigned to unmodified commercial or Government-type parts.
- (2) (N) Parts purchased commercially and used without modification by the prime contractor shall be listed. The manufacturer's brand, make, style, model, type, or other designation shall be used in column 6 of the MAPL. Parts purchased from commercial sources with nonspecific numbers (i.e., type J, Model 5, or the like) shall use available type and model number in column 6 of the MAPL.

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(3) (N) The prime contractor shall be responsible for providing the original manufacturer's part number or drawing number for components that have been modified/alterd and assigned contractor part numbers. Part listings shall include both numbers. For programmable integrated circuits, the original manufacturer's part number along with programming bit pattern information shall be supplied.

k. Column 7, quantity per assembly. (N) This column shall contain the number of units required per assembly, per subassembly, and per sub-subassembly as applicable.

3.3.1.8.3.5 Numerical parts list. (N) The numerical parts list (figure 25) shall be prepared in accordance with 3.3.1.8.3.5a through 3.3.1.8.3.5k. All part numbers for each part shall be listed in alphanumeric sequence. Since part numbers are composed of both alphabetic and numeric characters, sequence values assuming left-hand justification shall be assigned as follows:

- a. First - Blank.
- b. Second - Dash.
- c. Third - Alphabetic character.
- d. Fourth - Numeric character.

NOTE - The following listing part numbers illustrates this method of sequencing:

A-16316  
 ARIQ7  
 BZRD  
 CR390  
 C100  
 00IR  
 01133  
 012  
 22814  
 23-11  
 61-61  
 61F4  
 9-3  
 900-3.

- e. Part number. (N) Enter the same part number as in column 6 of the MAPL.
- f. Source, Maintenance and Recoverability (SM&R) Code. (N) Enter the designated SM&R codes for the training device.

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- g. Manufacturer's code. (N) The manufacturer's code shall be as specified in 3.3.1.8.3.4i.
- h. Item number. (N) Enter the item number of the item's first appearance in column 1 of the MAPL.
- i. National Stock Numbers (NSN). (N) Enter the National Stock Numbers (NSN) for the part. When NSN's are not available, leave this column blank.
- j. Quantity per trainer. (N) Enter the total quantity for each item used throughout the training device. Use of the abbreviation "as required" (A/R) shall be kept to a minimum.
- k. Usable on code. (N) This column shall contain the serial number(s) of the training device to indicate which configuration (type, model, series, etc.) the assemblies and parts apply. When a part applies to all configurations, no serial numbers are required in this column.

3.3.1.8.3.6 Reference designation list. (N) The reference designation list shall contain the information indicated in figure 26.

3.3.1.9 Appendix(es). Appendix(es) shall be prepared in accordance with MIL-M-38784.

3.3.1.9.1 Appendix A. References. (A) Reference information contained in this appendix shall be prepared in accordance with MIL-M-38784.

3.3.1.9.2 Appendix B. Maintenance Allocation Chart (MAC). (A) The information and format for the maintenance allocation chart shall be in accordance with Appendix A of this document.

3.3.1.9.3 Appendix C. Repair Parts and Special Tools List (RPSTL). (A) When specified by the contracting activity, this appendix shall be prepared in accordance with MIL-STD-335(TM).

3.3.1.10 Glossary. A glossary shall be prepared in accordance with MIL-M-38784.

3.3.1.11 Index. An index is required when the manual exceeds 100 paragraphs. The index shall be prepared in accordance with MIL-M-38784.

3.3.2 Systems Operation and Maintenance Manual. (N) The Systems Operational and Maintenance manual shall be prepared to cover large complex training devices. This manual shall be volumized on a system(s) basis; volumization shall include a trainer volume and separate volumes for each major functional system. The manual shall be volumized as follows:



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- a. Trainer volume - see 3.3.2.1.
- b. System volume(s) - see 3.3.2.2.
- c. Maintenance drawing volume - see 3.3.2.3.
- d. Parts catalog volume - see 3.3.2.4.

3.3.2.1 Trainer volume. (N) The trainer volume shall address the overall training device and shall be prepared in accordance with 3.3.2.1.1 through 3.3.2.1.7.

3.3.2.1.1 Front matter. (N) The front matter shall be prepared in accordance with 3.3.1.1.

3.3.2.1.2 Section I - Description and leading particulars. (N) This section shall be prepared in accordance with 3.3.1.2.

3.3.2.1.3 Section II - Installation. (N) This section shall be prepared in accordance with 3.3.1.3.

3.3.2.1.4 Section III - Operation. (N) This section shall be prepared in accordance with 3.3.1.4.

3.3.2.1.5 Section IV - Training device theory of operation. (N) This section shall be prepared in accordance with 3.3.1.5.

3.3.2.1.6 Section V - Training device maintenance. (N) This section shall be prepared in accordance with 3.3.1.6.

3.3.2.1.7 Section VI - Maintenance diagrams. (N) This section shall contain a listing of all diagrams/drawings included in the maintenance drawing volume, with columns for the abbreviated drawing number, complete drawing number, number of sheets per drawing, and revision level.

3.3.2.2 System volume(s). (N) A system volume(s) shall be prepared for each major functional system (e.g. , computer, motion or visual) in the training device. Each system volume(s) shall be prepared in accordance with 3.3.2.2.1 through 3.3.2.2.3.

3.3.2.2.1 Front matter. (N) The front matter shall be prepared in accordance with 3.3.1.1.

3.3.2.2.2 Section I - System theory of operation. (N) This section shall be prepared in accordance with 3.3.1.5.

3.3.2.2.3 Section II - System maintenance. (N) This section shall be prepared in accordance with 3.3.1.6.

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3.3.2.3 Maintenance drawing volume. This section shall be prepared in accordance with 3.3.1.7.

3.3.2.4 Parts catalog volume. (N) A parts catalog volume shall be prepared in accordance with 3.3.1.8.3.

3.3.3 Systems Interface Manual. (N) When the majority of the equipment in the training device is COTS equipment and/or GFE, a systems interface manual shall be prepared to cover the interface relationships between the COTS equipment and/or GFE and the Trainer Unique Equipment (TUE). The systems interface manual shall be prepared in accordance with 3.3.3.1 through 3.3.3.8.

3.3.3.1 Front matter. (N) The front matter shall be prepared in accordance with 3.3.1.1.

3.3.3.2 Section I - Description and leading particulars. (N) This section shall be prepared in accordance with 3.3.1.2.

3.3.3.3 Section II - Installation. (N) This section shall be prepared in accordance with 3.3.1.3.

3.3.3.4 Section III - Operation. (N) This section shall be prepared in accordance with 3.3.1.4 and shall support the interface relationships of the complete training device.

3.3.3.5 Section IV - Theory of operation. (N) This section shall provide the theory of operation for the interface relationship of the complete training device.

3.3.3.6 Section V - Maintenance. (N) This section shall be prepared in accordance with 3.3.1.6.

3.3.3.7 Section VI - Maintenance diagrams. (N) All interface maintenance diagrams/drawings shall be prepared in accordance with 3.3.1.7. Diagrams/drawings contained in COTS and/or GFE manuals need only to be referenced as required.

3.3.3.8 Section VII - Parts catalog. (N) This section shall be prepared in accordance with 3.3.1.8.3.

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in this document where such inspections are

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deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5 of this document. The inspection set forth in this document shall become a part of the contractor's overall inspections system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.2 Validation, in-process review and verification. The contractor shall perform validation, in-process review and verification in accordance with MIL-M-85337.

## 5. PACKAGING

5.1 Packaging. Packaging, packing, and marking for shipment shall be in accordance with MIL-M-38784.

## 6. NOTES

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

6.1 Intended use. This document covers the preparation of technical manuals for training devices.

6.2 Acquisition requirements. Acquisition documents must specify if the items listed below are required:

- a. Title, number and date of specification.
- b. Army technical manual (A) (see 3.1.1).
- c. Facilities (A) (see 3.3.1.3.1.1) - (F) (see 3.3.1.3.1.2).
- d. Unpacking and repacking for reshipment (A, N) (see 3.3.1.3.2) - (F) (see 3.3.1.3.2.1).
- e. Installation information (A) (see 3.3.1.3.3) - (F) (see 3.3.1.3.3.1).
- f. Depot maintenance (F) (see 3.3.1.6.3).
- g. Scheduled (preventive) maintenance (see 3.3.1.6.4).

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- h. Wiring lists (F) (see 3.3.1.7.7.1).
- i. Illustrated parts breakdown (F) (see 3.3.1.8.1).
- j. Appendix C, Repair Parts and Special Tools List (RPSTL) (A) (see 3.3.1.9.3).
- k. Issues of DODISS.

### 6.3 Definitions.

6.3.1 Training device. Three-dimensional aids such as models, miniatures, or chateaus, including such complex mechanical or electronic three-dimensional aids as synthetic trainers, radar target simulators, mechanized evaluators, and simulated weapons and operational systems.

6.3.2 Class I trainers. (F) Distinctive end items of training equipment developed, designed, engineered, fabricated, or assembled by either contractors or Air Force organizations to meet specific training objectives.

6.3.3 Class III training aids. (F) Items that facilitate teaching by visual or auditory means. They are used to communicate information, concepts, or ideas to the student and to demonstrate or portray the functional characteristics of end items without actually using the operational item.

6.3.4 Training equipment. (F) Any item or combination of items, including system equipment, specially designed equipment or a combination thereof, used for instruction purposes, including aerospace vehicles used for ground training.

6.3.5 Set. (F) A grouping of items having the same basic name for use in connection with or for performance of closely related operation; or a number of groups, units, or a combination thereof, not all having the same basic name, which are required for the performance of an operational function. A set may exclude certain operating units supplied separately or already present at the point of usage. In some cases, a set may be a single major unit capable of performing an operational function.

6.3.6 Special test equipment. Test equipment designed and developed specifically for support of the system, subsystem, or equipment.

6.3.7 Special tools. Tools not listed in the Federal Supply Catalog, or tools designed and developed specifically for support of the system, subsystem, or equipment.

6.3.8 Standard test equipment. Test equipment which does not fall within the definition of special test equipment. This would include such items as

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multimeters, digital voltmeters, oscilloscopes, torque wrench, tensionmeter, micrometers, etc. Any commonly used item requiring periodic calibration would be in this category rather than in the standard tool category.

6.3.9 Standard tool. Any readily available and commonly used tool included in the approved lists outlined in 3.3.1.2.7.1 and not otherwise falling within the definition of special tools.

6.4 Assistance in technical manual preparation. Contractors are encouraged to request assistance from the contracting activity in the application of this document. Such requests should be made in time to meet required contract schedules.

6.4.1 Contractor assistance. Subcontractors, when preparing material furnished in accordance with this document, are also encouraged to request assistance as noted in 6.4, via the prime contractor.

Custodians:

Army - TM

Navy - TD

Air Force - 16

Preparing Activity:

Navy - TD

Review Activities:

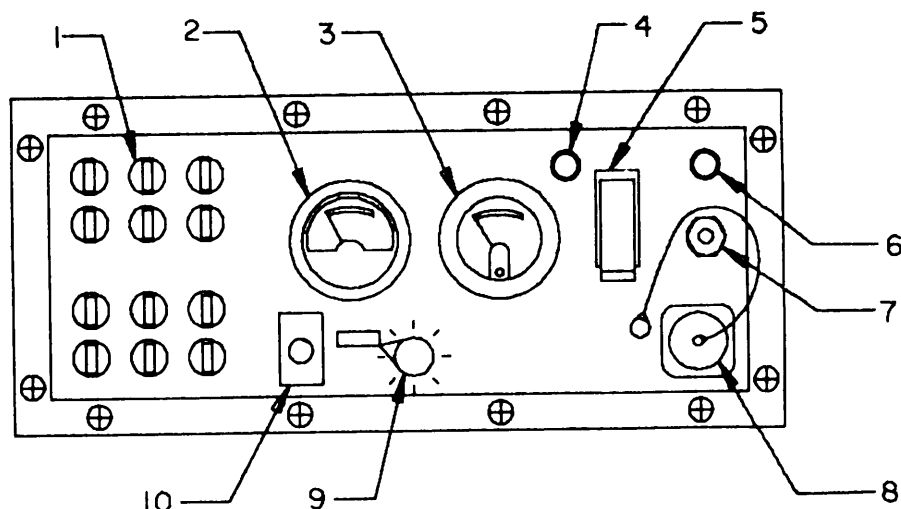
Army - AT, MI, AR

(Project TMSS - 0282)

Navy - AS, CG, OS, SH, MC

Air Force - 10, 01, 99

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ITEM NO.	CONTROL OR INDICATOR	REF DESIG	DESCRIPTION	NORMAL STATUS OR OPERATING POSITION												
1	FUSES	2F1 THRU 2F12	TWELVE COMBINATION FUSE HOLDER. BLOWN FUSE-INDICATORS. WHEN A FUSE BLOWS, ASSOCIATED NEON INDICATOR LIGHTS.	BLOWN FUSE-INDICATORS NOT LIT												
2	DC VOLTMETER	2M1	DC VOLTMETER WITH TWO SCALES: 0 TO 50V AND 0 TO 500V MEASURES DC VOLTAGE GENERATED BY POWER SUPPLIES CONTAINED IN UNIT 2. VOLTAGES TO BE MEASURED ARE SELECTED BY METER SELECT SWITCHES 253.	AS SELECTED BY METER SELECT SWITCH												
3	AC VOLTMETER	2M2	AC VOLTMETER WITH 0 TO 150VAC SCALE. MEASURES INPUT AC VOLTAGE TO UNIT 2.	117VAC												
4	INTERLOCK LAMP	2DS2	WHEN LIT, INDICATES UNIT 2 INTERLOCKS ARE BYPASSED.	OUT												
WARNING																
HIGH VOLTAGE IS PRESENT WHEN CABINET DOORS ARE OPEN AND INTLOCK OV RD SWITCH IS ON.																
5	INTLK OV RD SWITCH*	2S2	USED TO BYPASS INTERLOCKS WHEN CABINET IS OPEN AND IT IS DESIRED TO APPLY 60HZ POWER TO UNIT 2.	COVER IS IN DOWN POSITION												
6	POWER ON LAMP	2DS1	WHEN LIT, INDICATED 60HZ POWER IS AVAILABLE IN UNIT 2.	LIT												
7	POWER ON-OFF SWITCH	2S1	CONTROLS APPLICATION OF 60HZ POWER TO UNIT 2 WHEN POWER ON SWITCH 4A487 IS ON.	ON												
8	PHONE JACK	2J2	ENABLES HEADSET CONNECTION SOUND-POWERED PHONE SYSTEM. USED FOR MAINTENANCE.	COVER IN PLACE												
9	METER SELECT SWITCH	253	SELECTS VOLTAGE FOR MEASUREMENT BY DC VOLTMETER 2M1. POSITIONS AND VOLTAGES ARE AS FOLLOWS:	ANY POSITION												
			<table><tr><th>POSITION (SOURCE)</th><th>VOLTAGE</th></tr><tr><td>2A6A1</td><td>300V</td></tr><tr><td>2A6A2</td><td>64V</td></tr><tr><td>2A7</td><td>26.5V</td></tr><tr><td>2A7</td><td>28V</td></tr><tr><td>2A7A1</td><td>28V</td></tr></table>	POSITION (SOURCE)	VOLTAGE	2A6A1	300V	2A6A2	64V	2A7	26.5V	2A7	28V	2A7A1	28V	
POSITION (SOURCE)	VOLTAGE															
2A6A1	300V															
2A6A2	64V															
2A7	26.5V															
2A7	28V															
2A7A1	28V															
10	*32X2232X2 SWITCH	286	SELECTED EITHER +64V FOR METER SELECT SWITCH.	EITHER POSITION												

FIGURE 1 CONTROLS AND INDICATORS

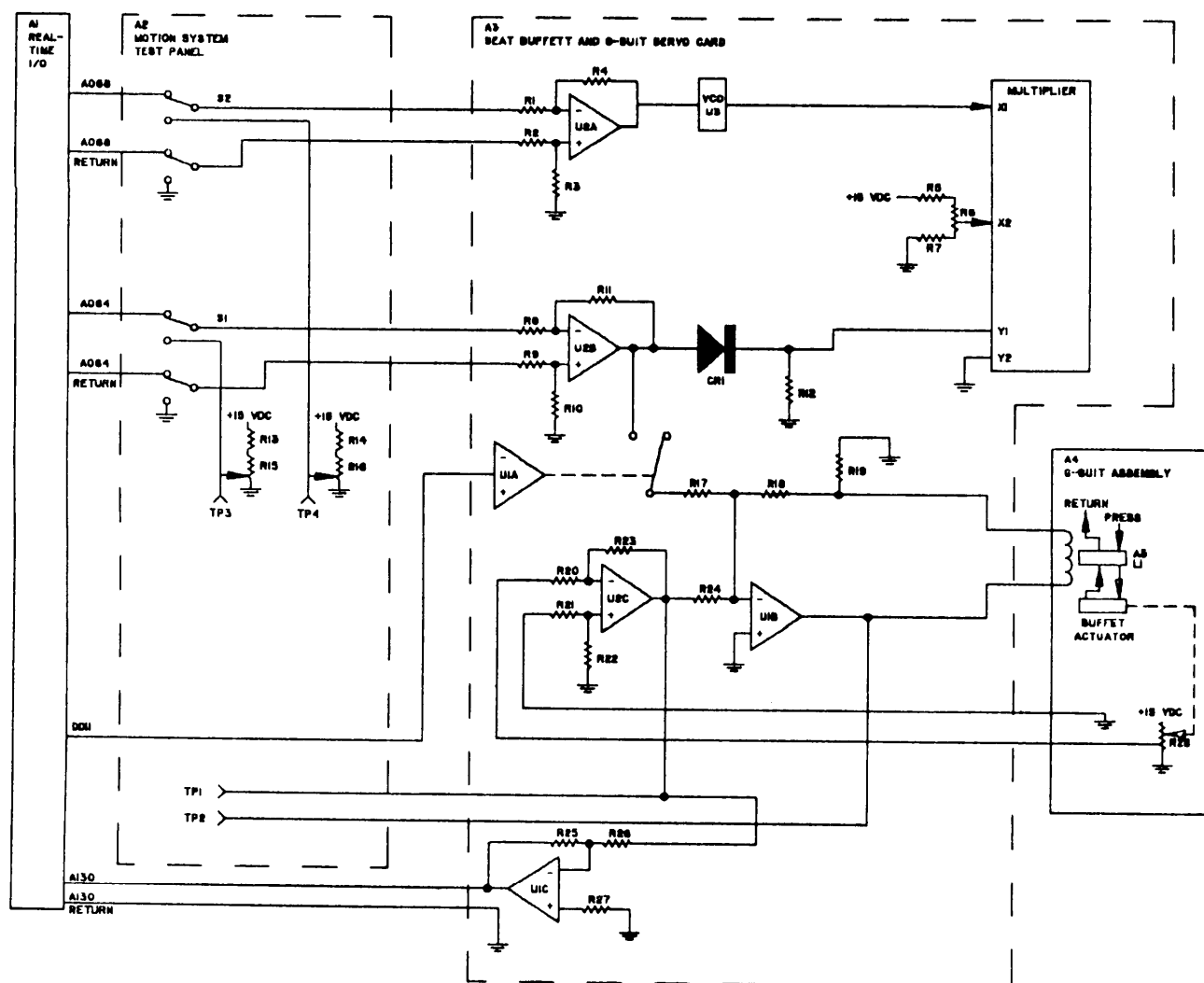


FIGURE 2. SIMPLIFIED SCHEMATIC DIAGRAM





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LUBRICATION CHART.				
PART	LOCATION	LUBRICANT	PROCEDURE	PERIOD
Bearings, Blinking motor B301	Rectifier Power Unit Chassis PP-238/APN-T4 See figure 5-27	Light machine oil, ANA 2120	Few drops in holes top front and rear of housing	Monthly
Bearings, blinking cam shaft MP301	Rectifier Power Unit Chassis PP-238/APN-T4 See figure 5-27	Light Machine oil, ANA 2120	Few drops in hole of brass bearing	Monthly
Bearings, keying motor B702	Interference Generator Chassis SM-20/APN-T4 See figure 5-6	Light Machine oil, ANA 2120	Few drops in holes top, front and rear of motor housing	Monthly
Bearings, keying cam Shaft MP701	Interference Generator Chassis SM-20/APN-T-4 See figure 5-6	Light machine oil ANA 2120	Few drops in holes front and rear bearings	Monthly

FIGURE 3. Lubrication chart (sample)

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Elevator Deflection Versus Stick Deflection and Stick ForceTest Procedure

1. Lock out the pitch input to the simulator.
2. With the elevator feel system detached, deflect the stick forward and aft.
3. Record stick and elevator deflections.
4. Plot the results on figure 4 (sh. 2).
5. Reattach the elevator feel system.
6. Establish a trimmed flight condition at a "q" less than 170 psf.
7. Deflect the stick over its positive and negative ranges, with both increasing and decreasing force to determine any hysteresis band.
8. Record stick force and elevator deflection,
9. Repeat Steps 7 and 8 for "q"s of 330 and 570 psf.
10. Plot the results on figure 4 (sh. 3).

Tolerances

1. Surface deflection versus control deflection:  $\pm 5$  percent from  $0^\circ$  to  $10^\circ$  control;  $\pm 0.1^\circ$  from  $10^\circ$  to maximum control deflection.
2. Control force versus surface deflection:  $\pm 5$  percent of local value or 1 percent of maximum value, whichever is greater.

Calculations

1. None required.

FIGURE 4. (F) Sample test procedure for periodic validation tests.  
(Sht 1 of 3)

MIL-M-823766  
FEEL SYSTEM DETACHED

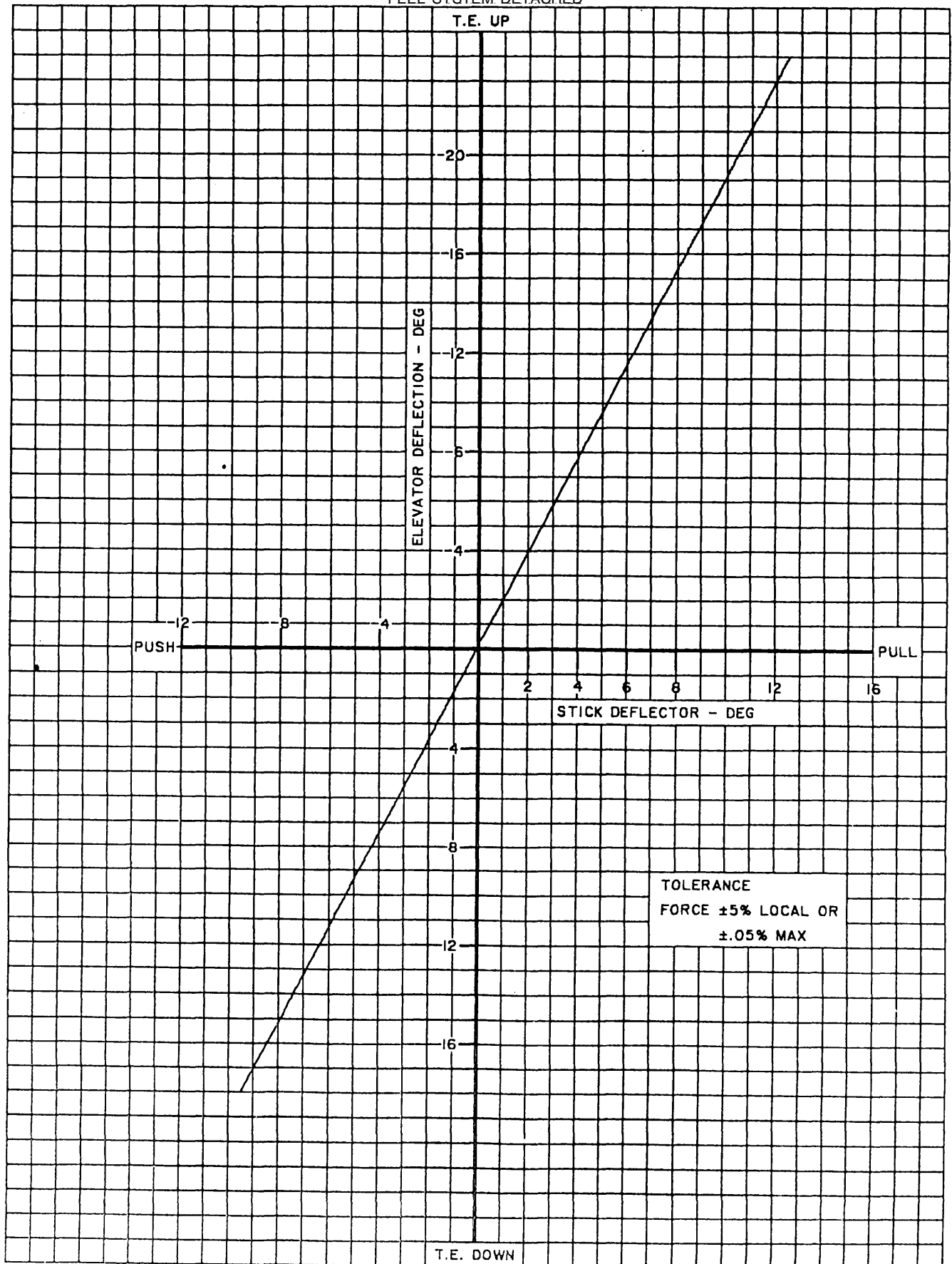


FIGURE 4 SAMPLE TEST PROCEDURE FOR PERIODIC VALIDATION TESTS (SHT 2 OF 3)

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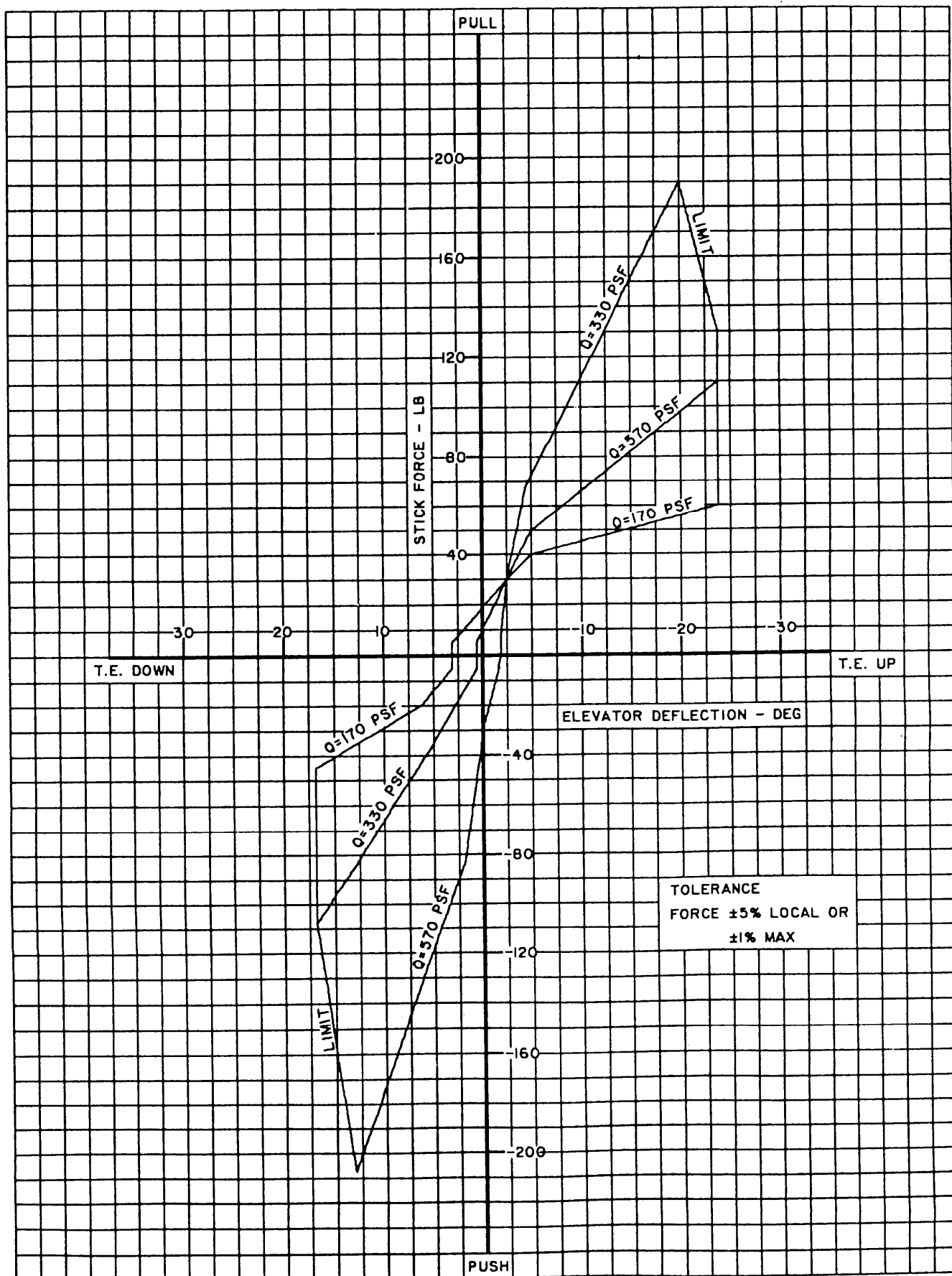


FIGURE 4 SAMPLE TEST PROCEDURE FOR PERIODIC VALIDATION TESTS (SHT 3 OF 3)

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High-Speed BuffetTest Procedure

1. Establish the configuration specified on figure 5 (sheet 2 of 2) with the simulator trimmed for straight and level flight at a gross weight of 180,000 lbs and at an airspeed of 180 knots, 5000 feet below indicated buffet boundary.
2. Perform a pull-up at specified weight and load factor until buffet occurs.
3. Record the airspeed, altitude, and load factor.
4. Plot results on figure 5 (sheet 2 of 2).
5. Repeat Steps 1 through 4 for additional weights and load factors, as noted on figure 21 (sheet 2 of 2) at airspeeds of 280 and 380 knots.

Tolerances

1. Altitude:  $\pm 10.0$  percent.
2. Airspeed:  $\pm 1.0$  percent.

Calculations

1.  $C_{L_{buffet}} = nW/q_s$   
 $C_{L_{buffet}}$  = lift coefficient at buffet  
 $n$  = load factor  
 $W$  = airplane weight, lb  
 $q$  = dynamic pressure,  $\text{lb/ft}^2$   
 $s$  = wing reference area,  $\text{ft}^2$

FIGURE 5. (F) Sample test Procedure for periodic validation tests.  
 (Sht 1 of 2)

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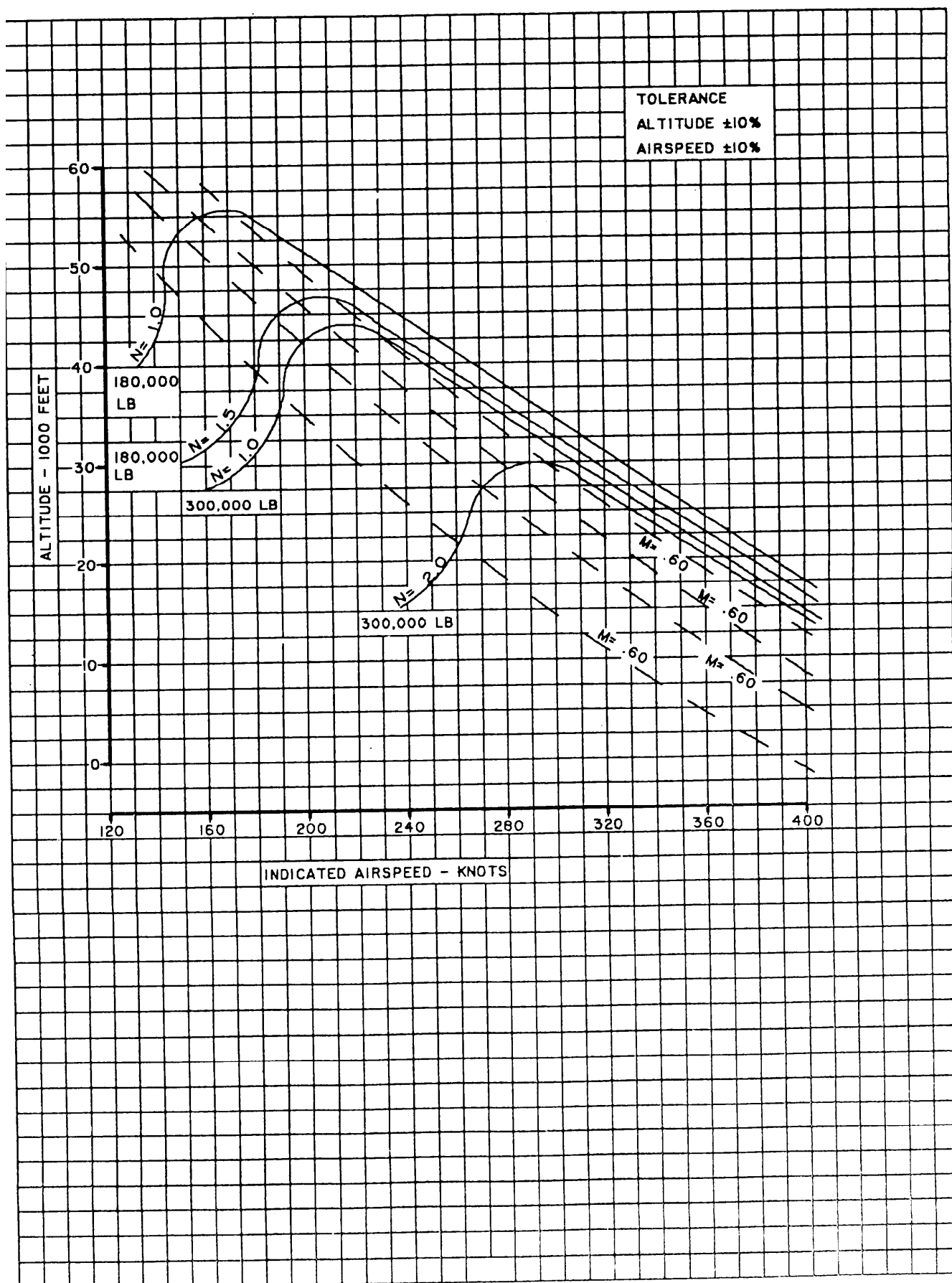
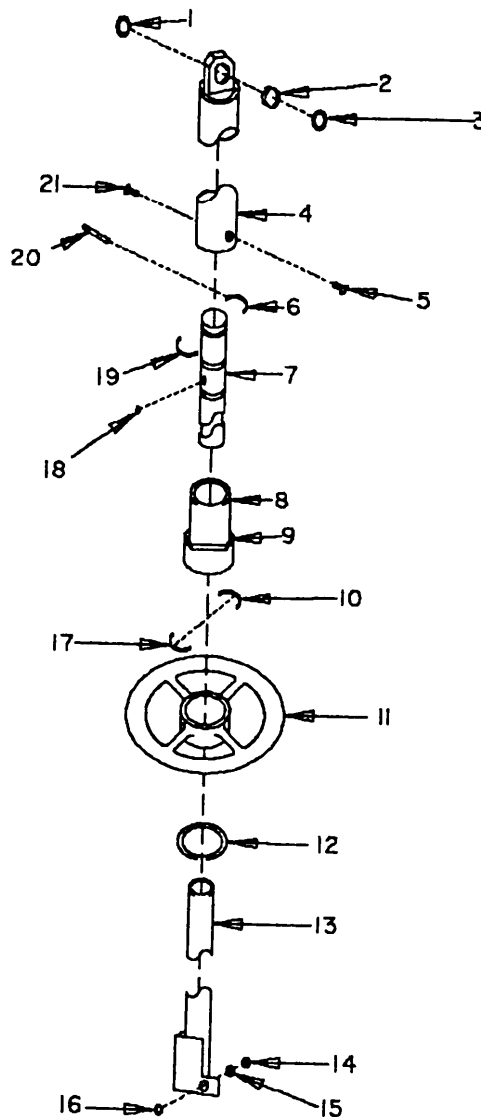


FIGURE 5 SAMPLE TEST PROCEDURE FOR PERIODIC VALIDATION TESTS (SHT 2 OF 2)

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- |    |                              |    |                       |
|----|------------------------------|----|-----------------------|
| 1  | RING (4 AIMP11)              | 12 | RING (4AIMP22)        |
| 2  | BEARING (4 AIMP12)           | 13 | ROD (4AIMP23)         |
| 3  | RING (4 AIMP13)              | 14 | RING (4AIMP24)        |
| 4  | TUBE (4 AIMP14)              | 15 | BEARING (4AIMP25)     |
| 5  | SCREW (4 AIMP15)             | 16 | RING (4AIMP26)        |
| 6  | RING HALF (4 AIMP16)         | 17 | RING HALF (4AIMP27)   |
| 7  | COUPLING ASSEMBLY (4 AIMP17) | 18 | KEY (4 AIMP28)        |
| 8  | NUT (4 AIMP18)               | 19 | RING HALF (4AIMP29)   |
| 9  | FITTING (2) (4 AIMP19)       | 20 | GROOVED PIN (4AIMP30) |
| 10 | RING HALF (4 AIMP20)         | 21 | SCREW (4 AIMP31)      |
| 11 | HANDWHEEL (4 AIMP21)         |    |                       |

FIGURE 6 EXPLODED VIEW SHOWING REFERENCE DESIGNATIONS

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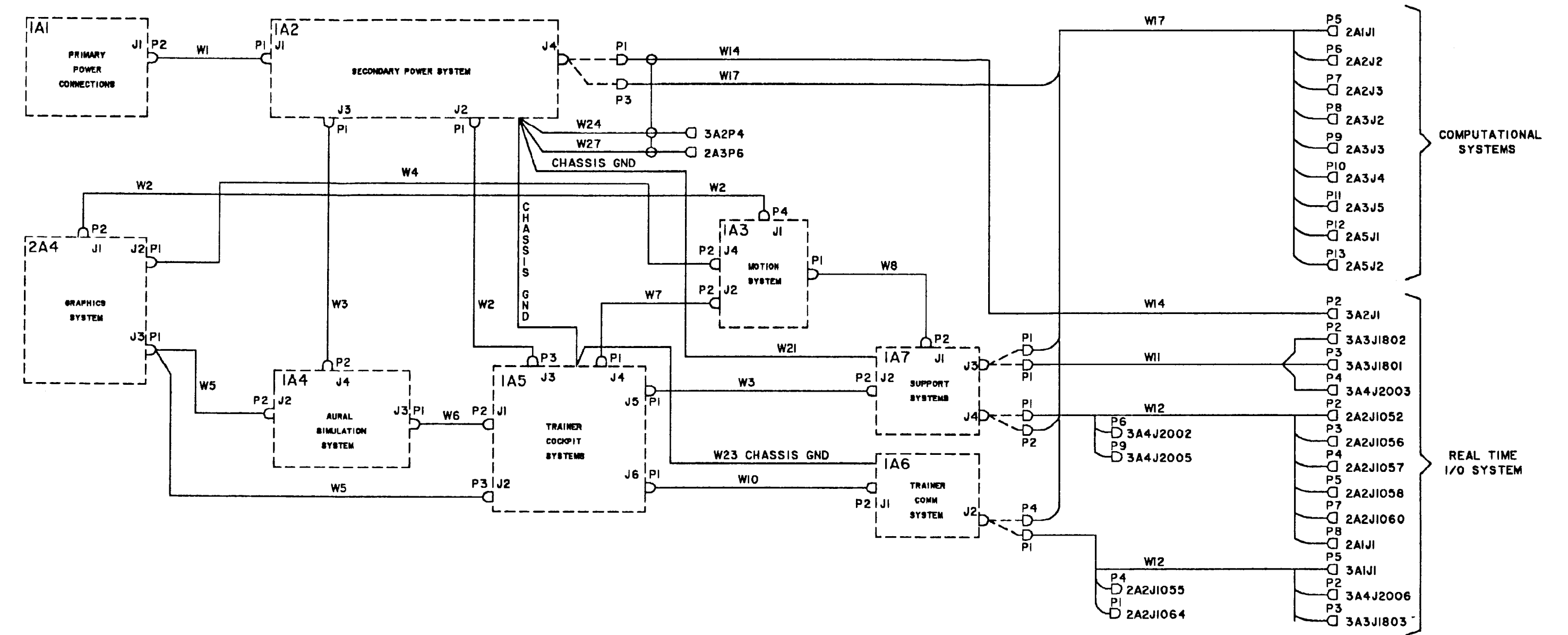


FIGURE 7. INTER-CABLING DIAGRAM

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<u>CABLE NO. WI</u> <u>ACTIVE WIRES -8</u>		<u>UNIT A - IA1</u> <u>UNIT B - IA4</u>	
<u>UNIT A</u> <u>TERMINATION</u>	<u>UNIT B</u> <u>TERMINATION</u>	<u>FUNCTION</u>	
PI- A	P4- A	+28 VDC	
PI- B	P4- B	+28 VDC RETURN	
PI- C	P4- C	IDKMTRG1	
PI- D	P4- D	IDKMTRG2	
PI- E	P4- E	AC IN	
PI- F	P4- F	AC NEUT.	
PI- G	P4- G	ICS SPKR	
PI- H	P4- H	ICS SPKR RET	
PI- J	P4- J	SPARE	
PI- K	P4- K	SPARE	
PI- L	P4- L	SPARE	
PI- M	P4- M	SPARE	

FIGURE 8. CABLE WIRE LIST

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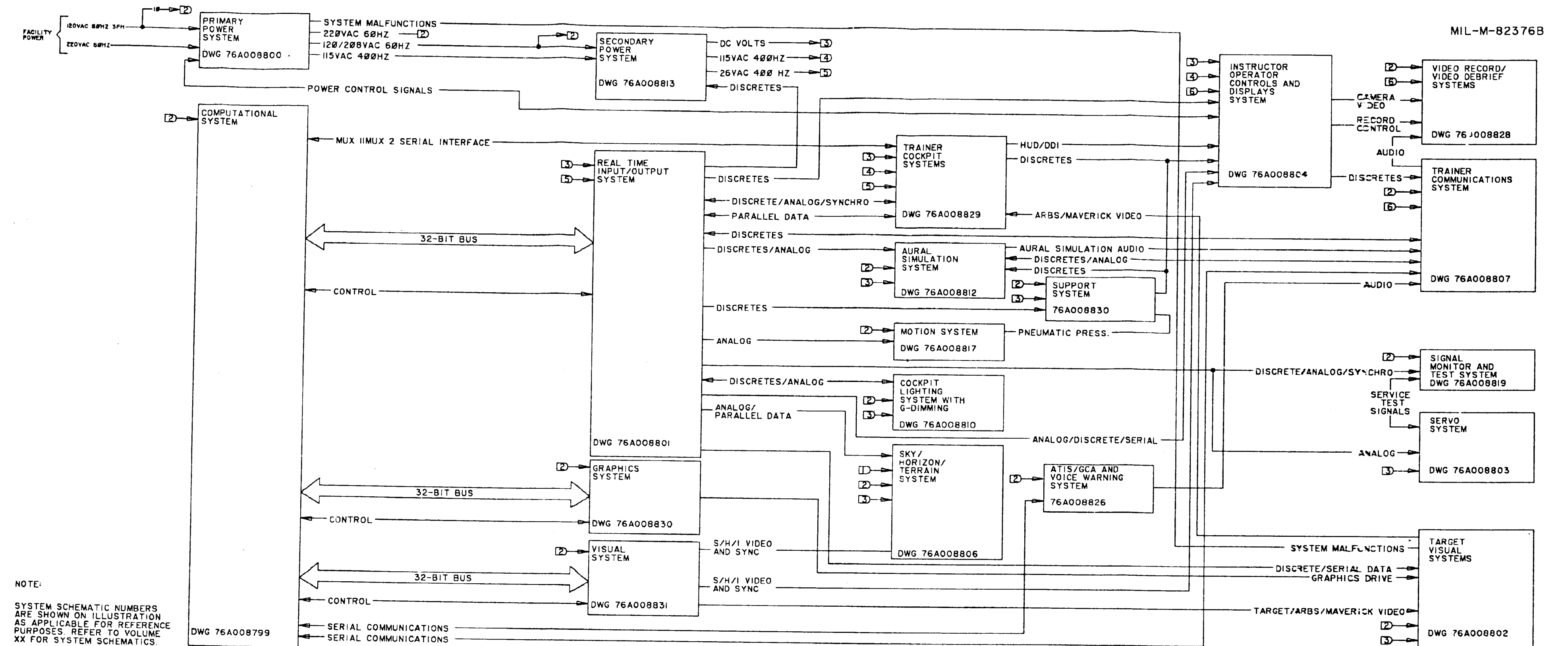


FIGURE 9. OVERALL FUNCTIONAL BLOCK DIAGRAM

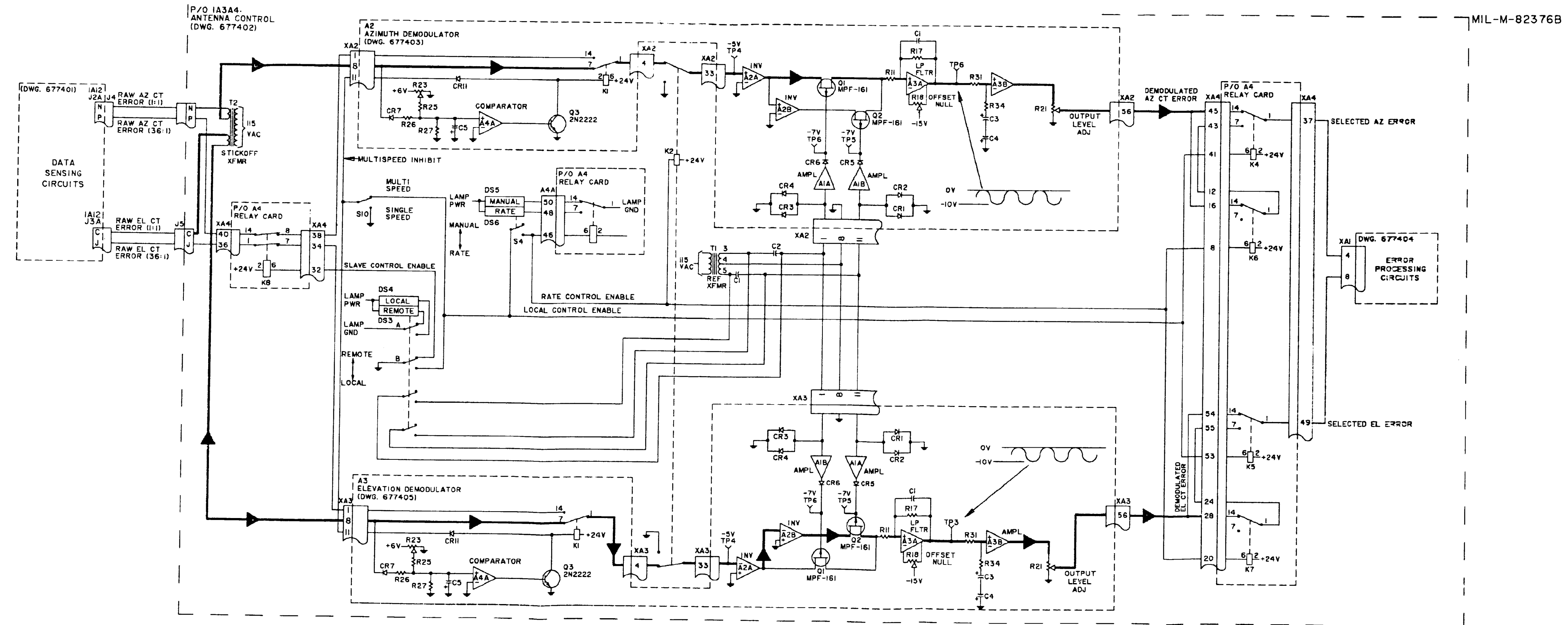


FIGURE 10. FUNCTIONAL SCHEMATIC DIAGRAM



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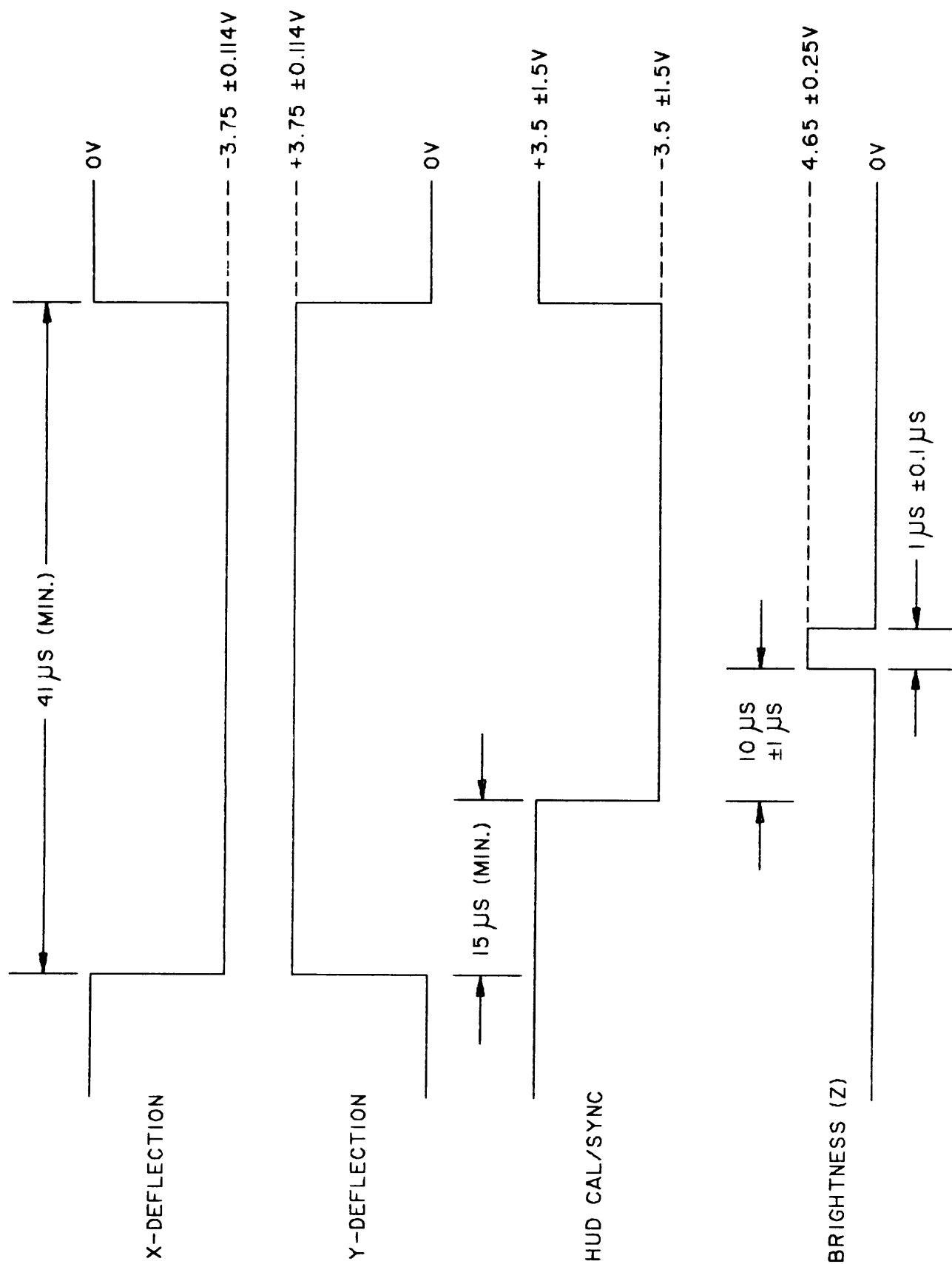


FIGURE 12 TIMING CIRCUIT DIAGRAM

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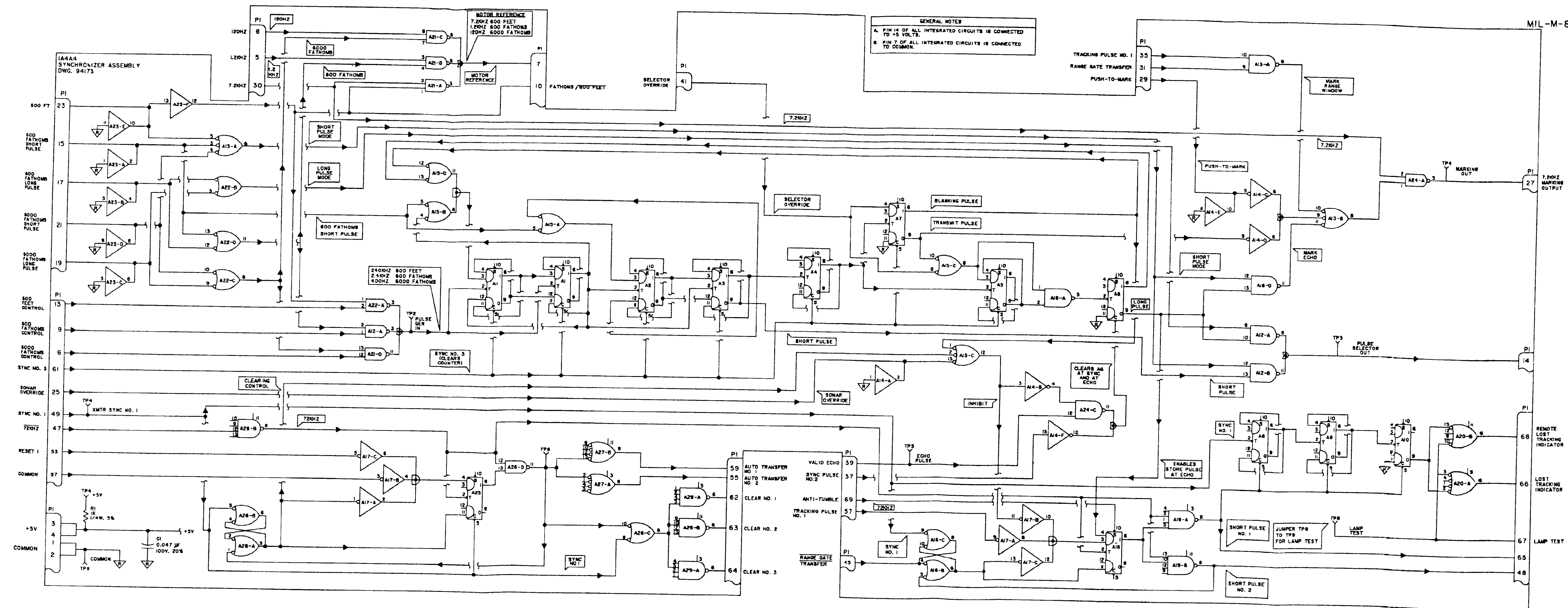


FIGURE 13 DETAILED LOGIC DIAGRAM

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WIRE LIST			
LINE NO.	FROM	TO	SIGNAL
1	JI-A	DS2-3	28 VDC
2	DS1-3	DS1-1	DC RETURN
3	DS2-3	DS3-3	28 VDC
4	DS3-3	DS6-3	↑
5	DS6-3	DS5-3	
6	DS5-3	DS7-3	
7	DS4-3	DS2-3	
8	DS7-3	DS8-3	
9	DS8-3	DS9-3	
10	DS9-3	S3-3	
11	S3-3	S2-3	
12	S2-3	S2-1	
13	JI-B	DS2-1	
14	DS1-1	DS2-1	
15	DS2-1	DS3-1	
16	DS3-1	DS6-1	
17	DS6-1	DS5-1	↓
18	DS5-1	DS7-1	28 VDC
19	DS4-1	DS4-3	DC RETURN
20	DS7-1	DS8-1	28 VDC
21	DS8-1	DS9-1	↑
22	DS9-1	S3-1	↓
23	S3-1	S2-1	28 VDC
24	TBI-8	DS1-2	TGT 1 PJTR PAIR ON
25	DS1-1	DS4-1	DC RETURN
26	JI-C	S3-2NO	↑
27	JI-D	S2-2NO	
28	S3-2NO	DS1-1	↓
29	S2-2NO	S3-2NO	DC RETURN

WIRE LIST			
30	JI-P	TBI-3	LAMP TEST
31	TBI-1	TBI-3	LAMP TEST
32	TBI-3	TBI-5	LAMP TEST
33	JI-G	DS1-2	TGT 1 PJTR PAIR ON
34	JI-H	DS2-2	TIG ON
35	JI-J	DS3-2	SKY/EARTH PJTR 1 ON
36	JI-K	DS4-2	TGT 2 PJTR PAIR ON
37	JI-L	DS5-2	SPARE DS5
38	JI-M	DS6-2	SKY/EARTH PJTR 2 ON
39	JI-N	DS7-2	SPARE DS7
40	JI-P	DS6-2	SPARE DS8
41	JI-R	DS9-2	SKY/EARTH PJTR 3 ON
42	JI-S	SI-2C	TGT PJRS ON 28V IN
43	JI-T	S-3C	SERVO 28V RETURN
44	SI-2C	SI-1C	TGT PJRS ON 28V IN
45	JI-U	S2-2C	SPARE S2
46	JI-V	S2-2	SPARE S2 LAMP
47	S2-2	TBI-4	SPARE S2 LAMP
48	JI-W	S3-2C	SPARE S3
49	JI-X	S3-2	SPARE S2 LAMP
50	S3-2	TBI-6	SPARE S2 LAMP
51	JI-E	EI	CHASSIS END
52	SI-1C	SI-2	TGT PJRS 28V IN
53	JI-Y	SI-1NO	TGT PJRS 28V OUT
54	SI-1NO	SI-2NO	TGT PJRS 28V OUT
55	SI-3	SI-1	SERVO RUN LAMP TEST
56	SI-1	TBI-2	SERVO RTN LAMP TEST
57	TBI-7	JI-Z	+28 VDC LAMP TEST
58	SI-3	SI-3NO	SERVO RTN LAMP TEST
59	TBI-10	DS4-2	TGT 2 PJTR PAIR ON

FIGURE 14 WIRE LIST

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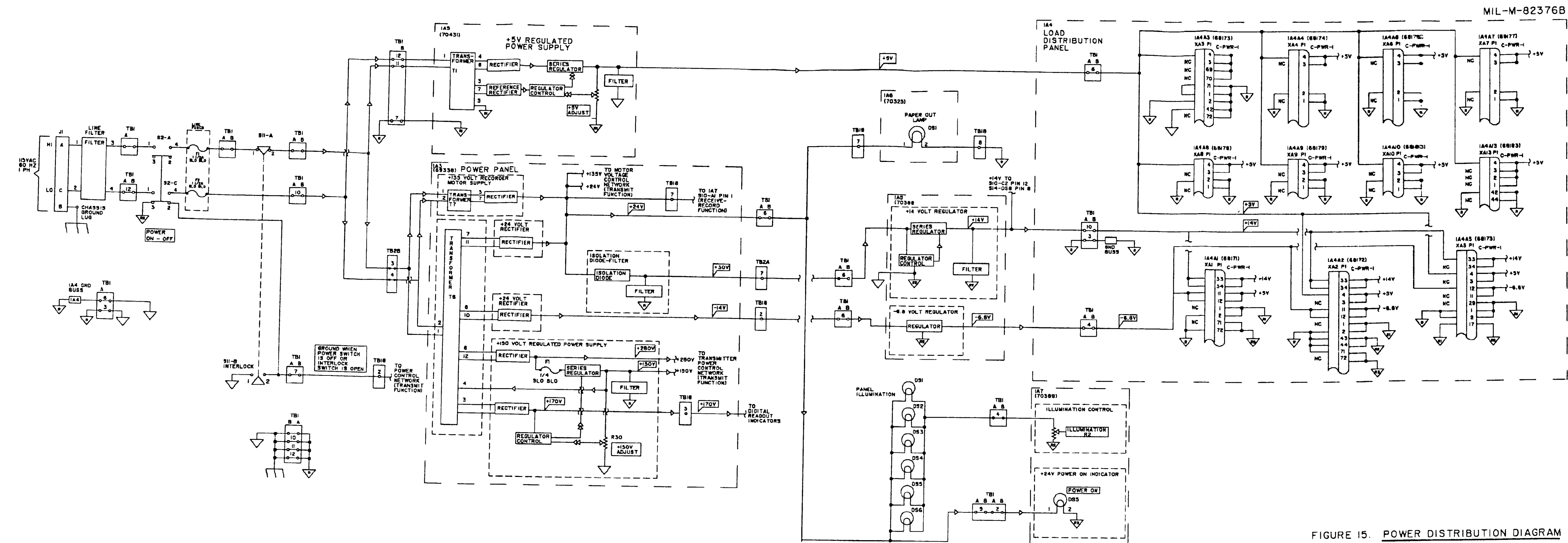


FIGURE 15. POWER DISTRIBUTION DIAGRAM

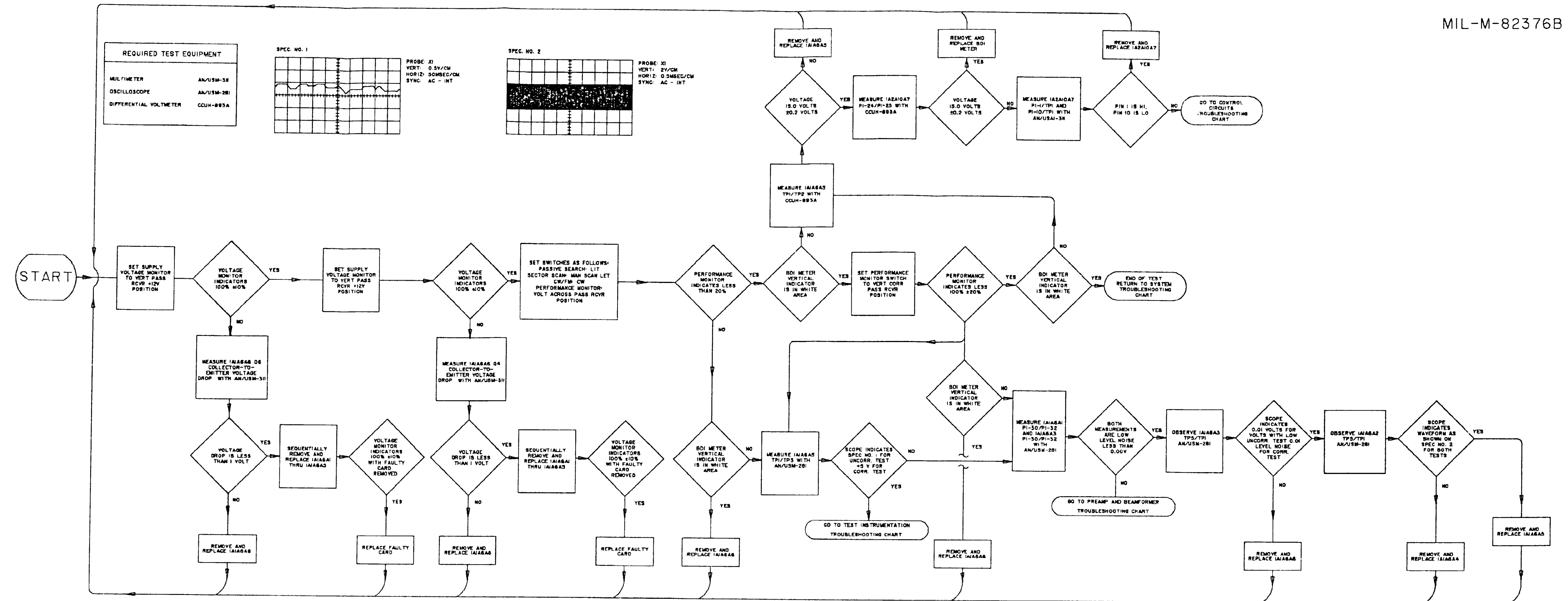


FIGURE 16. FAULT LOGIC DIAGRAM

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SECTION VIII

PARTS CATALOG

8-1. INTRODUCTION.

8-2. This section lists all the component parts for (enter name of the training device, device designator \_\_\_\_\_, manufactured by \_\_\_\_\_, under contract \_\_\_\_\_). The following paragraphs provide a brief description of the lists contained in this section and instructions for requisitioning parts.

8-3. LIST OF MANUFACTURERS

8-4. This list contains the Commercial and Government Entity Code (CAGEC) which are listed numerically by code number.

8-5. LIST OF MAJOR ASSEMBLIES.

8-6. This list indicates each major assembly which comprises the complete training device, together with the assigned reference designation series for the major assembly. In addition, the item number for each major assembly is listed for cross-reference to the Major Assembly Parts List (MAPL) and numerical parts list. This list is in item number order.

8-7. MAJOR ASSEMBLY PARTS LIST.

8-8. This list contains a complete breakdown of the device in top down breakdown order. Major assemblies are broken down into assemblies, subassemblies and components, with each item having an indenture number to show its relationship to the next higher assembly. Identical assemblies are broken down at the first appearance. All other appearances of those assemblies are not broken down but carry the notation in column 4 "see Item No. \_\_\_\_\_ for breakdown." The information provided in each of the columns of the MAPL is as follows:

8-9. COLUMN 1 - ITEM NUMBER. This column contains consecutive item numbers for each item listed.

8-10. COLUMN 2 - REFERENCE DESIGNATION OR FIGURE AND INDEX NUMBER. This column contains the reference designation appearing on drawings and schematics. For items without reference designation, the figure and index number for the illustrated part in the handbook is used.

FIGURE 17. (N) Parts catalog introduction (sample).  
(Sht 1 of 3)



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8-11. COLUMN 3 - INDENTURE NUMBER. The indenture number indicates the relationship to the next higher assembly for the item listed.

8-12. COLUMN 4 - PART NAME AND DESCRIPTION. The noun name, modifier, and basic characteristics for each part is provided in this column. When an item is identical to one previously listed in the MAPL, only the noun name and the phrase "Same as Item No. \_\_\_\_\_," referring to the item's first appearance, shall be listed.

8-13. COLUMN 5 - COMMERCIAL AND GOVERNMENT ENTITY CODE (CAGEC). The CAGEC for the manufacturer of the part, in accordance with Cataloging Handbook H4-1, is listed with each item's first appearance.

8-14. COLUMN 6 - PART NUMBER. The Government Standard Number, commercial catalog number, or the prime contractor's part number is listed. In each case, the part number, except for the Government Standard Numbers, is that of the actual manufacturer who supplies the part to the contractor. If a part is modified by the prime contractor, the prime contractor's part/drawing number is listed.

8-15. COLUMN 7 - QUANTITY PER ASSEMBLY. This column indicates the number of parts is the next higher assembly.

8-16. NUMERICAL PARTS LIST.

8-17. This list contains all maintenance significant parts of the training device in alphanumeric sequence by part number and indicates the manufacturer's 5-digit CAGEC, item number, National Stock Number (NSN), and quantity per trainer. The information provided in each of the columns of the Numerical Parts List is as follows:

8-18. PART NUMBER. The part number in this column is the number entered in column 6 of the MAPL.

8-19. SOURCE, MAINTENANCE AND RECOVERABILITY (SM&R) CODE. The SM&R code shall be listed when they are determined by the Government or contractor.

8-20. THE MANUFACTURER'S CODE. The manufacturer's code is the same CAGEC that is used in column 5 of the MAPL.

8-21. ITEM NUMBER. The item number is the same number listed in column 1 of the MAPL for the items first appearance.

8-22. NATIONAL STOCK NUMBER. The National Stock Number (NSN) appears in this column.

FIGURE 17. (N) Parts catalog introduction (sample).  
(Sht 2 of 3)

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8-23. QUANTITY PER TRAINER. The total quantity used for each item in the training device is listed.

8-24. USABLE ON CODE. The serial number of the applicable training device is listed.

8-25. REFERENCE DESIGNATION LIST.

8-26. This is an alphanumeric list of reference designations that appear on drawings, schematics, or figures with its corresponding part number and item number.

8-27. HOW TO USE THE PARTS CATALOG.

a. When the Reference Designation is known, refer to the Reference Designation List for the Part Number and Item Number. Use the item number in the MAPL to obtain the part name, description, and CAGEC.

b. When the Major Assembly Title is known, refer to the List of Major Assemblies to determine the Item Number. Use this item number to obtain the description and CAGEC in the MAPL.

c. When only the part number is known, refer to the Numerical Parts List for its first appearance and note the item number. Use this item number in the MAPL to obtain the reference designation, description, and CAGEC.

8-28. HOW TO REQUISITION PARTS.

8-29. Submit requisitions to the local Supply Office in accordance with local directives. The Supply Officer will obtain repair parts in accordance with local supply directives. Include the NSN on all requisitions. For items without an NSN, include all information such as part number, manufacturer, device number, and the publication in which the part is listed in order to facilitate procurement of the new required part.

FIGURE 17. (N) Parts catalog introduction (sample).  
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<u>LIST OF MANUFACTURERS</u>		
CAGEC	MANUFACTURER	ADDRESS
01121	Allen-Bradley Co.	1201 2nd Street South Milwaukee, WI 53204
02260	Bunker Ramo Corp.	2801 South 25th Avenue Broadview, IL 60153
02799	Arco Electronics	9822 Independence Avenue Chatsworth, CA 90501
03508	General Electric Co. Semi-Conductor Products Dept.	Electronics Park Syracuse, NY 13201
08806	General Electric Co. Miniature Lamp Product Dept.	Nela Park Cleveland, OH 44112
34534	Lectrohm Inc.	5560 Northwest Highway Chicago, IL 60630
63743	Ward Leonard Electric Co. Inc.	31 South Street Mount Vernon, NY 10550
FIGURE 18. (N) List of manufacturers (sample).		

<u>LIST OF MAJOR ASSEMBLIES</u>		
MAJOR ASSEMBLY	REFERENCE DESIGNATION SERIES	ITEM NUMBER
Shaft Assembly, Altitude	Unit 2	1
Delay Assembly	Unit 1	320
Computer	Unit 3	740
FIGURE 19. (N) List of major assemblies (sample).		

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DEVICE NAME		CONTRACT NO.		DEVICE NO.		MAJOR ASSEMBLY AND NO. SERIES	
WEAPONS SYSTEM TRAINER F-4B		N61338-76-C-1234		2F55H		Plus 300V Regulator Assembly - 6A14A4	
ITEM NO.	REF. DESIG. OR FIG. AND INDEX NO.	INDENTURE	PART NAME AND DESCRIPTION			MFR CODE	QTY PER ASSEMBLY
(1)	(2)	(3)	(4)	(5)	(6)	(7)	
1326	6A14A4	4	Plus 300 volt Regulator Assy	22525	690264	1	
1327	6A14A4J1	5	Connector, Receptacle, Electrical, 16 pins	02660	26-4401-16F	1	
1328	6A14A4R23	5	Resistor, Variable, Composition, 25K ohms, 1/1 W, 10%	81349	RV6TAYSA243A	1	
1329	6A14A4XVI	5	Socket, Electron Tube, Ceramic, 8 contacts	81349	MI2883/01-01	1	
1330	6A14A4Z2	5	Component Board Assy	22525	692152	1	
1331	6A14A4Z3C2	5	Capacitor: Same as Item No. 907	81349	CM20BD471JP3	1	
1332	6A14A4Z2C4	6	Capacitor, Fixed, Mylar, 0.01PF, 600VDC, 10%	81349	CQ09A1EF103K3	3	
1333	6A14A4Z2C5				CQ09A1EF103K3		
1334	6A14A4Z2C6				CQ09A1EF103K3		
1335	6A14A4Z2R12	6	Resistor: Same as Item No. 453	81349	RCR20G563JM		
1336	6A14A4Z2R13	6	Resistor, Fixed, Composition, 560K ohms, 1/2 W, 5%	81349	RCR20G564JM	1	
1337	6A14A4Z2R16				RCR20G564JM	2	
1338	6A14A4Z2R16	6	Resistor, Fixed, Composition, 240K ohms, 1/2 W, 5%	81349	RCR20G244JM	1	

FIGURE 20. (N) Major Assembly parts list (sample).

DEVICE NAME TRAINER, AIR NAVIGATION		CONTRACT NO. N61339-000	DEVICE NO. 57MM9	MAJOR ASSEMBLY AND NO. SERIES RADAR SET		UNIT 5
ITEM NO.	REF. DESIG. OR FIG. AND INDEX NO.	INDEN-TURE	PART NAME AND DESCRIPTION	MFR CODE	PART NUMBER	QTY PER ASSEMBLY
(1)	(2)	(3)	(4)	(5)	(6)	(7)
73	5	2	RADAR SET (GFP) NAVAER 16-30APG51-506	80058	AN/APG-51B/C	1

FIGURE 21. (N) Major assembly parts list (unmodified GFP sample).

102	5	2	RADAR SET (CAOE) NAVEAR 16-30APG51-506	80058	AN/APG-51B-C	1
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FIGURE 22. (N) Major assembly parts list (unmodified Contractor Acquired Operational Equipment (CAOE) sample).

73	5	2	RADAR SET AN/APG-51B/C (mod) GFP	23021	F6357	1
			NAVAER 16-30APG51-506			
74	5A1	3	AMPLIFIER ASSEMBLY, AF	23021	C734	1
75	5A1Q1 thru 5A1Q4	4	TRANSISTOR; Amplifier, medium gain	80131	2N279	4
76	5A1R1	4	RESISTOR RXD COMP; 10K ohms 10% 1/2W	81349	RC20GF103K	1

FIGURE 23. (N) Major assembly parts list (modified GFP sample).

102	5	2	RADAR SET AN/APG-51B/C (mod) (CAOE)	23021	F6357	1
			NAVAER 16-30APG51-506			
103	5A1	3	AMPLIFIER ASSEMBLY, AF	23021	F734	1
104	5A1Q1	4	TRANSISTOR: Amplifier, medium gain	80131	2N279	4
105	5A1R1	4	RESISTOR FXD COMP 10K ohms 10% 1/2W	81349	RC20GF103K	1
			AMPLIFIER, ASSEMBLY, AF (DELETED)			

FIGURE 24. (N) Major assembly parts list (Contractor Acquired Operational Equipment (CAOE) modified sample).

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PART NUMBER	SM&R CODE	MFR. CODE	ITEM NUMBER	NATIONAL STOCK NUMBER	QTY. PER TRAINER	USABLE ON CODE
CLA32-2C	PAHOD	46384	0302	5310-00-816-9394	40	1
CL23BH4R5UNE	PAOHH	81349	3444	5910-00-144-1556	1	2
CL35BE4R5MP3	PBOOH	56289	2683	5910-00-752-4544	4	3
CL35BJ200MP3	PBOOH	56289	5521	5910-00-947-8892	3	1&3
CL35BN030MP3	PBOOH	56289	2728	5910-00-833-6469	4	4
CL35BN100MP3	PAOHD	56289	2680	5910-00-824-9924	4	3
CL632-2C	PAOHD	46384	0400	5310-00-489-5009	6	2
CL832-1	PAOHD	46384	7407	5210-00-208-3242	4	1
CL832-2C	PAOHD	46384	6804	5310-00-655-9677	4	1&2
CM15BD200KN3	PAOHD	81349	0394	5910-00-449-4508	1	
CM15CD050KN3	PAOHD	81349	1194	5910-00-068-4653	1	
CM15CD121JN3	PAOHD	81349	2730	5910-00-497-4855	4	
CM15CD820JN3	PAOHD	81349	3121	5910-00-889-4777	1	
CM15DD221JN3	PAOHD	81349	2731	5910-00-829-3730	4	
CM15ED471JN3	PAOHD	81349	5733	5910-00-487-8425	3	
CM15FD101JN3	PAOHD	81349	5040	5910-00-003-5050	2	
1422	PAOHH	81245	0465	5940-00-549-8118	8	
1435W	PAOHH	70408	0536	5920-00-240-4038	1	
1486-10	PAOHH	83330	1102	5940-00-885-9674	7	
1488-8	PAOHH	83330	7950	5940-00-982-1120	1	
15G4AAC181	PAOHH	10051	7691	6105-00-950-0747	1	
150D334X9035A2	PAOHH	56289	1789	5910-00-898-8971	8	
150W	PAOHH	81030	1561	6615-00-174-9145	2	
154L	PAOHH	37942	7187	5930-00-754-7628	8	
1581-1	PAOHH	71279	7633	5940-00-143-4861	6	

FIGURE 25. (N) Numerical parts list (sample).

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REF. DESIG	PART NUMBER	ITEM NO.	REF. DESIG	PART NUMBER	ITEM NO.
54A5A3E5	RST-SM20TUR	6856	54A5A4E4	1423	6823
54A5A3J1	MS3102R28-21	6868	54A5A4E5	KST-SM38TUR	6822
54A5A3K1	T154X50	6905	54A5A4E6	RST-SM38TUR	6822
54A5A3MG1	690646-18	6887	54A5A4E7	RST-SM38TUR	6822
54A5A3R1	5613-509-0	6880	54A5A4E8	RST-SM38TUR	6822
54A5A3R10	RN70D1102F	6884	54A5A6	685238	6847
54A5A3R12	RC42GF361J	6852	54A5A6B1	AY201S1B	6895
54A5A3R7	RCR20G362JM	6864	54A5A6B2	AY201S1B	6895
54A5A3R8	RY4TAYSA252A	6858	54A5A6C1	CHR19A1NE474KM	6890
54A5A3R9	RCR20G123JM	6823	54A5A6C2	CHR19ALNV405KM	6895
54A5A3S1	M8805/27-001	6859	54A5A6E1	MS77070-2	6866
54A5A3S2	M8805/27-001	6859	54A5A6E10	RST-SM20TUR	6856
54A5A3S3	M8805/27-001	6859	54A5A6E2	1423	6865
54A5A3S4	SP3	6886	54A5A6E3	1423	6865
54A5A3TB1	326-20-06-006	6882	54A5A6E4	MST1070-2	6866
54A5A3TB2	326-20-06-005	6848	54A5A6E5	RST-SM20TUR	6856
54A5A3TB3	326-20-06-005	6848	54A5A6E6	RST-SM20TUR	6856
54A5A3XK1	30054-2	6906	54A5A6E7	RST-SM2TUR	6856
54A5A3Z1	616113	6870	54A5A6E8	RST-SM20TUR	6856
54A5A3Z1R2	RNR70E9310FM	6875	54A5A6E9	KST-SM20TUR	6856
54A5A3Z1R3	RNR70E4750FM	6876	54A5A6J1	MS3102R28-21P	6868
54A5A3Z1R4	RNR70E2490FM	6877	54A5A6K1	7154X30	6905
54A5A3Z1R5	RNR70E3740FM	6878	54A5A6MG1	690646-18	6887
54A5A3Z1R6	RNR70E2800FM	6870	54A5A6R1	5613-509-0	6880
54A5A4	690390	6817	54A5A6R10	RN70D1102F	6884
54A5A4C1	CHR19A1NE474KM	6821	54A5A6R12	RC42GF361J	6852
54A5A4C2	CHR19A1NV405KM	6820	54A5A6R7	RCR20G562JM	6864
54A5A4E3	1423	6823	54A5A6R8	RV4TAYSA524A	6858

FIGURE 26. (N) Reference decimation list (sample).

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APPENDIX A  
MANUALS, TECHNICAL:  
REQUIREMENTS FOR ARMY TRAINING DEVICES

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## APPENDIX A

## MANUALS, TECHNICAL: REQUIREMENTS FOR ARMY TRAINING DEVICES

## 10. SCOPE

10.1 Scope. This appendix contains the detailed requirements for the preparation of technical manuals for Army training devices. The general requirements of the main body of this document and MIL-M-38784 also apply. This appendix is a mandatory part of the document. The information contained herein is intended for compliance.

10.2 Classification. The types of technical manuals to be prepared in accordance with this appendix are:

Type -10 - Operator's Manual

Type -20 - Organizational Maintenance Manual

Type -12 - Operator and Organizational Maintenance Manual

Type -14 - Operator, Unit, Direct Support, and General Support  
Maintenance Manual

Type -24 - Unit, Direct Support, and General Support Maintenance Manual

Type -34 - Direct Support and General Support Maintenance Manual

20. APPLICABLE DOCUMENTS. (This section is not applicable to this appendix. )

## 30. REQUIREMENTS

30.1 General. The inclusion of Repair Parts and Special Tools Lists (RPSTL) in a combined manual such as a Type -34 shall be indicated by adding, "Including Repair Parts and Special Tools List" to the title and adding "&P" to the number, i.e.; -34&P. These lists shall be prepared in accordance with MIL-STD-335 (TM) and shall be included as an appendix in each manual as indicated. For large or complex devices, the RPSTL may be a separate manual with the number followed by "P," i.e.; -34P.

30.2 Type -10 - Operator's manual. The operator's manual shall describe in detail the operation of the item. It shall also describe the maintenance allocated to the operator/crew by the maintenance allocation chart (MAC). The arrangement of the manual shall be as follows:

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How to use this manual (see MIL-M-63036)

Chapter 1 - Introduction

Chapter 2 - Operating Instructions

Chapter 3 - Operator/Crew Maintenance Instructions

Appendix A - References

Appendix B - An expendable/durable supplement and material list

Index

30.2.1 Front matter. Unless otherwise specified, front matter shall be in accordance with MIL-M-38784.

30.2.1.1 Reporting errors and recommending improvements. Except for classified manuals, pocket size manuals, and manuals with fewer than eight pages, the following statement shall precede the table of contents title:

"REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: (address of proponent). A reply will be furnished to you."

30.2.2 Chapter 1 - Introduction. Chapter 1 shall consist of the sections content.

30.2.2.1 Section I - General.

- a. Maintained forms and records. This paragraph shall contain the following statement: "Maintenance forms, records, and reports which are to be used by maintenance personnel at all maintenance levels are listed in and prescribed by DA PAM 738-750."
- b. Reporting equipment improvement recommendation (EIR)'s). This paragraph shall contain the following statement:

"If you (insert equipment short item name) needs improvement, let us know. Send us an EIR. You, the user, are the only one who



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can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on an SF 368 (Product Quality Deficiency Report). We'll send you a reply."

- c. Description. The description paragraph shall briefly describe the features, function, and purpose of the training device. Illustrations shall be used to show general features, essential operating times, major components, and accessories. Only information pertaining to the operator/ instructor shall be included. Information to be included as tabulated data shall not appear here. Differences between models shall be briefly described. Each system of the training device shall be described separately, using the name of the system as a paragraph heading. The description shall include the concept of each system, its function, and how it affects and is affected by other systems. The internal mechanics of the system shall be described only if the operator/instructor cannot otherwise efficiently operate the equipment. Paragraphs shall be included describing all capabilities of the training device in relation to the operational equipment being simulated or stimulated.
- d. Limitations. This paragraph shall describe the limitations of the training device which prevents it from simulating all conditions of the operational equipment. Nonfunctional portions of the training device shall be presented in tabular form and described.
- e. Equipment data. A table which contains overall dimensions, electrical characteristics, make, model, type, and any other pertinent data shall be included.

30.2.3 Chapter 2 - Operating instructions. This chapter shall contain the instructions needed by the operator to effectively and efficiently use the training device. The following sections and paragraphs shall be included. They shall be complemented with tables and illustrations.

30.2.3.1 Section I - Preparation for operation. Section I shall contain the procedures for preparing the training device for operation. These procedures shall include instructions for a preliminary inspection, warm-up, and operational check.

30.2.3.1.1 Preliminary inspection. Preliminary inspection procedures shall provide for a walkaround inspection of the training device to ensure that major components are intact and ready for application of power. Instructions shall be provided, as applicable, for the inspection of such components as hoses, drive belts, electrical wiring, and indicators. Switches and controls which require positioning before energizing the equipment shall be described in a tabulation under the heading(s), "Name," "Location," and "Position or Setting."

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30.2.3.1.2 Warm-up. The warm-up paragraph shall contain instructions for energizing the equipment and for making it ready for operation, including the application of power, energizing applicable systems, preliminary adjustments and settings, and release of locks.

30.2.3.1.3 Operational check. The operational check paragraph shall provide inspection instructions and check procedures for the energized trainer. These tests shall be logically arranged detailed procedures which, when applicable, may make use of Built-In-Test Equipment or computer programs, to fully exercise the training device. For example, the check sequence for a flight simulator would include simulated engine start, before takeoff checks, takeoff, climb, normal cruise, slow cruise, descent, and landing. It shall be emphasized that all phases of the operational check must be accomplished before the training device can be used.

30.2.3.2 Section II - Operation of the training device. Section II shall contain instructions for and list the responsibilities for operation of the training device under the headings, "Preoperational procedures," "Operational procedures," and "Post-operational procedures."

- a. Preoperational procedures. The preoperational procedures paragraph shall contain all procedures, such as making necessary adjustments and briefing the student on what he has to do during simulated operation, which must be completed before actual operation begins.
- b. Operational procedures. The operational procedures paragraph shall describe the duties which are the responsibility of the instructor, such as instructing, observing, and injecting simulated difficulties of emergencies into the device. The simulated difficulties or emergencies which are to be injected into the device shall be listed in a logical order and the proper time and phase of the operation when difficulties or emergencies will be inserted shall be discussed. Procedures for all modes of operation as required to exercise all capabilities of the training device shall be included.
- c. Post-operational procedures. The post-operational procedures paragraph shall provide the procedures for securing the training device. This shall include such procedures as positioning component assemblies, locking assemblies in proper position, securing applicable systems, and securing electrical power.

30.2.4 Chapter 3 - Operator\Crew maintenance. When operator/crew level maintenance checks and services are required, a PMCS table shall be prepared in accordance with MIL-M-63036.

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30.2.5 Appendix A - References. Information contained in Appendix A, References, shall be in accordance with MIL-M-63036.

30.2.6 Index. An index shall be prepared in accordance with MIL-M-38784.

30.3 Type -20 - Unit maintenance manual. The organizational maintenance manual shall describe in detail the maintenance allocated to organizational maintenance by the maintenance allocation chart. The arrangement of the manual shall be as follows:

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How to use this manual (see MIL-M-63036)

Chapter 1 - Introduction

Chapter 2 - Unit Maintenance Instructions

Chapter 3 - Maintenance of Materiel Used in Conjunction with Major Item

Chapter 4 - Administrative Storage

Appendix A - References

Appendix B - Maintenance Allocation Chart (MAC)

Appendix C - Repair Parts and Special Tools List (only if specified in the contract or by the procuring activity)

Appendix D - Expandable/durable supplies and materials list

30.3.1 Front matter. See 30.2.1.

30.3.2 Chapter 1 - Introduction.

30.3.2.1 Section I - General. Section I shall consist of sections specified in 30.3.2.1.1 through 30.3.2.1.4.

a. Scope. The scope paragraph shall briefly state the type of information contained in the manual.

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- b. Reporting equipment improvement recommendation (EIR's) (see 30.2.2.1b)

Destruction instructions. The destruction paragraph shall be in accordance with MIL-M-63042.

30.3.2.2 Section II - Description and data. Section II shall consist of a description paragraph and a tabulated data paragraph. The description paragraph shall reference the operator's manual for general description. The tabulated data paragraph shall contain the tabulated data pertinent to unit maintenance but which is not contained in the operator's manual.

30.3.3 Chapter 2 - Unit maintenance instructions.

30.3.3.1 Section I - Service upon receipt of materiel. Section I shall consist of the following paragraphs.

- a. Inspection, service, installation, and setup instructions.  
Instructions for inspecting and servicing the equipment, including reference to pertinent organizational daily preventive maintenance checks and services, shall be provided in tabular form. Equipment requiring calibration shall be indicated and reference made to a publication containing the applicable calibration procedure. Procedures for setting up the equipment shall be included and, if necessary for clarity, illustrated.
- b. Equipment adaptation, The equipment adaptation paragraph shall contain procedures for adapting the equipment for the various operations for which it is designed and for which organization maintenance has the responsibility.

30.3.3.2 Section II - Parts, special tools, and equipment. Section II shall make reference to the Repair Parts and Special Tools List (RPSTL) pertaining to unit maintenance. The use of special tools and equipment shall be described and, if necessary for clarity, illustrated.

30.3.3.3 Section III - Lubrication instructions. Section III shall contain references to pertinent lubrication orders. When there are no separately published lubrication orders or when there are lubrication instructions in addition to those contained in such orders, the instructions shall be provided in this section.

30.3.3.4 Section IV - Preventive Maintenance Checks and Services (PMCS). PMCS shall be prepared in accordance with MIL-M-63036.

30.3.3.5 Section V - Troubleshooting. The troubleshooting section of the manual shall consist of text, diagrams, and tables as required to support fault isolation to the lowest replaceable assembly, subassembly, or piece part

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authorized at the unit level. For complex electronic equipment, the section shall describe the use of computer diagnostic tapes and programs and Built-In-Test Equipment (BITE) and shall include functional block and schematic diagrams supported by text describing the theory of operation of the equipment. If computer diagnostic programs or BITE are not included in the equipment or do not cover all troubleshooting requirements logic-tree diagrams shall be developed and included to provide for fault isolation to the printed circuit card or equivalent level. When the lack of complexity of the equipment is such that the above troubleshooting tools are not required, a troubleshooting table shall be provided which lists malfunctions, tests and inspections necessary to determine cause of the malfunctions, and corrective actions arranged in a logical order. The format of the troubleshooting table will be prepared in accordance with figure A-1.

30.3.3.5.1 Scope of table. When a troubleshooting table is provided, the scope paragraph for this table will consist of the following:

- a. This section contains troubleshooting or malfunction information and tests for locating and correcting most of the troubles which may develop in the (insert types of equipment or system). Each malfunction or trouble symptom for an individual component, unit, or system probable causes and suggested corrective actions to remedy the malfunction.
- b. This table cannot list all possible malfunctions that may occur or all tests, inspections, and corrective actions. If a malfunction is not listed (except when malfunction and cause are obvious), or is not corrected by listed corrective actions, you should notify higher level maintenance.
- c. Table (0-0) lists the common malfunctions that you may find during the operation or maintenance of the (insert type of equipment or system) or its components. You should perform the tests/inspections and corrective actions in the order listed.

30.3.3.5.2 Format. The following note shall precede the troubleshooting table. The first sentence will be included only if operational checks exist for the equipment or system: "Note: Before you use this table, be sure you have performed all normal operational checks. If you have a malfunction which is not listed in this table, notify the next higher level of maintenance." The malfunctions, tests/inspections, and corrective actions are aligned with their respective headings, as indicated in the sample by the vertical arrowed lines.

- a. Headings. The column headings shall be entitled, "Malfunction," "Test or Inspection," and "Corrective Action." The "Malfunction" heading shall be aligned with the margin. The column headings will be separated from the table number and title and troubleshooting text by two margin-to-margin lines approximately three-fourths of

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an inch apart. The headings shall be in boldface, upper case type. These headings shall be included on each succeeding page of the troubleshooting table.

- b. Text. The text portion of the table shall be prepared as follows:
  - (1) Title of the assembly group or system breakout and functional group, when applicable, shall be centered preceding the malfunction listing, and if continued on a succeeding page, the group or system breakout will be carried forward followed by, "(Cent). "
  - (2) Malfunctions shall be numbered with consecutive Arabic numerals beginning with 1. Tests or inspections shall be numbered as "Step 1," "Step 2," etc., within each malfunction breakdown. A single corrective action shall not be numbered; however if more than one corrective action is used, lower case a, b, c, etc., will be used.
  - (3) Malfunctions, tests or inspections, and corrective action text shall be aligned with the related column headings. The malfunction text shall be in boldface, upper case type; test or inspection text will be lightface, upper and lower case type; and corrective action text shall be in boldface, upper and lower case type.
  - (4) Illustrations, functional block diagrams, or schematics considered essential to support the text shall be placed on a facing page to the text unless the number of illustrations, functional block diagrams, or schematics required dictates otherwise.

#### 30.3.3.5.3 Text development.

- a. Text shall be developed in accordance with MIL-M-38784. Troubleshooting instructions should be limited to isolation of the causes of the malfunction the technician is authorized to correct. (The note preceding the troubleshooting table (b above), instructs the technician to report malfunctions that are not listed in the table to the next higher level of maintenance).
- b. The troubleshooting table, figure A-1, shall be divided into logical groups (functional group, assembly group, or system breakout). Malfunctions within the groups will be listed in the order of operation.
- c. The text shall consist of a list of malfunctions, the tests or inspections necessary to locate or verify the malfunction, and

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corrective action needed to remedy the malfunction. Only those malfunctions shall be listed which require several steps of testing or inspection before the cause of the malfunction can be determined for corrective action or referral to a higher level of maintenance. Exclude those malfunctions for which the cause and correction are obvious by visual inspection (e.g. , flat tire, broken glass, etc.). Malfunctions for which the only possible corrective action is referral to a higher level of maintenance shall not be listed.

- d. Tests and inspections shall be listed in logical sequence for each malfunction listed. The test and inspection shall be complete so as to ensure that the malfunction can be isolated and verified.
- e. Corrective action shall be shown only when pertinent to the maintenance level included in the manual. When corrective action is required by a higher level of maintenance, the statement, "Notify higher maintenance" shall be placed under the "Corrective Action" column.
- f. Use of references shall be kept to a minimum. Procedures for tests or inspections and corrective actions shall be duplicated in the troubleshooting chart rather than referencing paragraphs within the manual or other manuals, providing that the information does not exceed 120 words, or 10 lines, whichever is more. If references are necessary, paragraph, table, figure, or TM numbers shall be used to reference procedures or illustrations required to accomplish tests, inspections, or corrective actions. Paragraphs or illustrations within the same manual will be referenced by paragraph or figure number only; those in another publication shall be referenced by publication number and name of equipment (basic noun and model or type number of equipment. Example: TM X-XXXX-XX, Truck, M151). Reference to another publication shall include paragraph, figure, or table number.
- g. The troubleshooting procedures shall be indexed as a part of the total manual; a separate index shall not be prepared exclusively for the troubleshooting portion of the manual. In manuals containing less than 50 paragraphs, the long form table of contents shall list the troubleshooting procedures as a portion of the manual. When preparing the index for a manual with over 50 paragraphs, care must be taken to include entries for assemblies, subassemblies, systems, etc. , listed in the troubleshooting procedures for which users are likely to look.

30.3.3.6 Section VI - Maintenance of (insert name or component or assembly). Section VI and any subsequent sections shall contain the maintenance procedures. Only those illustrations which are essential for clarity shall be included. Each component shall be described in its own

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section. For example: student station, instructor station, simulated power plant and related systems, hydraulic and pneumatic systems, controls system, instruments, utility systems, electrical systems, and any other major components. The installation, removal, disassembly and assembly procedures, for maintenance of these components or their subassemblies shall also be described. The required sections may be expanded into two or more sections if complexity so dictates. Schematic diagrams, prepared in accordance with ANSI Y14.15, shall be supplied for all electrical and electronic systems and circuits applicable to the unit level maintenance procedures described in this section. Critical wire and cable data not lending itself to diagrammatic presentation shall be included in the narrative portion of the manual.

30.3.4 Chapter 3 - Maintenance of materiels used in conjunction with major item. Chapter 3 shall include all maintenance procedures which are related to accessories, components, attachments, or avionics used in conjunction with the major item and which are assigned by the maintenance allocation chart to unit maintenance. If maintenance of the auxiliary equipment is covered in a separate manual, reference shall be made to the manual.

30.3.5 Chapter 4 - Administrative storage. Chapter 4 shall provide instructions on administrative storage according to guidance in AF 750-1.

30.3.6 Appendix A - References. Appendix A shall be prepared in accordance with MIL-M-63036.

30.3.7 Appendix B - Maintenance allocation chart (MAC). The MAC shall be prepared in accordance with MIL-M-63038.

30.8 Appendix C - Repair parts and special tool list. Appendix C shall be prepared in accordance with MIL-STD-335 (TM).

30.3.9 Index. An index shall be prepared in accordance with MIL-M-38784.

30.4 Type-12 - Operator and unit maintenance manual. The Type-12, operator and unit maintenance manual, shall describe in detail the operation of the equipment and the maintenance allocated to the operator/ crew and to unit maintenance by the maintenance allocation chart. The arrangement of the manual shall be as follows:

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Chapter 2 - Operating Instructions

Chapter 3 - Operator/Crew Maintenance Instructions

Chapter 4 - Unit Maintenance Instructions

Chapter 5 - Maintenance of Materiel Used in Conjunction with Major Item

Appendix A - Administrative Storage

Appendix B - Maintenance Allocation Chart

Appendix C - Repair Parts and Special Tools List (only if specified in the contract or by the procuring activity).

Appendix D - Expandable/durable supplies and materials list

Index

30.4.1 Front matter. Front matter shall be prepared in accordance with MIL-M-38784.

30.4.2 Chapter 1 - Introduction. Chapter 1 shall be prepared in accordance with 30.2.2.

30.4.3 Chapter 2 - Operating instructions. Chapter 2 shall be prepared in accordance with 30.2.3.

30.4.4 Chapter 3 - Operator/Crew maintenance instructions. Chapter 3 shall be prepared in accordance with 30.2.4.

30.4.5 Chapter 4 - Unit maintenance instructions. Chapter 4 shall be prepared in accordance with 30.3.3. instructions on administrative storage.

30.4.6 Chapter 5 - Maintenance of materiel used in conjunction with major item. Chapter 5 shall be prepared in accordance with 30.3.4. Separate sections shall be used for operator/crew and unit instruction.

30.4.7 Chapter 6 - Administrative storage. Chapter 6 shall be prepared in accordance with AR 750-1.

30.4.8 Appendix A - References. Appendix A shall be prepared in accordance with MIL-M-63036.

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30.4.9 Appendix B - Maintenance allocation chart. Appendix B shall be prepared in accordance with MIL-M-63038.

30.4.10 Appendix C. (As required) Repair parts and special tools list shall be prepared in accordance with MIL-STD-335 (TM).

30.4.11 Appendix D. Expendable/durable supplies and materials list shall be prepared in accordance with MIL-M-63036.

30.4.12 Index. An index shall be prepared in accordance with MIL-M-38784.

30.5 Type-14 - Operator, unit, intermediate direct support, and general support maintenance manual. The Type-14, operator, unit, direct support and general support maintenance manual shall document in detail the maintenance allocated to the operator, unit, direct support, and general support maintenance levels by the maintenance allocation chart. The arrangement of the manual shall be as follows:

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How to use this manual (see MIL-M-63036)

Chapter 1 - Introduction

Chapter 2 - Operating Instructions

Chapter 3 - Operator/Crew Maintenance Instructions

Chapter 4 - Unit Maintenance Instructions

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Chapter 7 - Maintenance of Materiel Used in Conjunction with Major Item

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Appendix B - Maintenance Allocation Chart

Appendix C - Repair Parts and Special Tools List (only if specified in the contract or by the procuring activity) .

Appendix D - Expendable/durable supplies and materials list.

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30.5.1 Front matter. Front matter shall be prepared in accordance with MIL-M-38784.

30.5.2 Chapter 1 - Introduction. Chapter 1 shall be prepared in accordance with 30.2.2, but shall be expanded to include data for unit, direct support, and general support maintenance levels.

30.5.3 Chapter 2 - Operating instructions. Chapter 2 shall be prepared in accordance with 30.2.3.

30.5.4 Chapter 3 - Operator/Crew maintenance instructions. Chapter 3 shall be prepared in accordance with 30.2.4.

30.5.5 Chapter 4 - Unit maintenance instructions. Chapter 4 shall be prepared in accordance with 30.3.3.

30.5.6 Chapter 5 - Direct support and intermediate general support maintenance instructions. Chapter 5 shall contain the section specified in 30.5.6.1 through 30.5.6.4.

30.5.6.1 Section I - Repair parts, special tools, and equipment.

30.5.6.1.1 Special tools and equipment. A table listing special tools and equipment so coded that the items can be related to direct support and general support maintenance functions allocated in the maintenance allocation chart shall be prepared. These tools shall be illustrated if necessary for clarity. Where there are no special tools or equipment, it shall be so stated.

30.5.6.1.2 Repair parts. The repair parts paragraph shall contain a statement similar to the following:

Direct and general support maintenance repair parts are listed and illustrated in (insert applicable - P manual number) or in (insert applicable appendix letter)."

30.5.6.2 Section II - Troubleshooting. Section II shall be prepared in accordance with 30.3.3.5 of this document.

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30.5.6.3 Section III - General maintenance. Section III shall contain those repair instructions which are general in nature (not specific to one component or assembly) and which would otherwise have to be repeated several times. References shall be made to pertinent lubrication order. instructions for the application of corrosion control preservatives as well as cautions regarding temperature, range operation, removal prior to operation, and the like, shall be included.

30.5.6.4 Section IV - Removal and installation of major components. Section IV shall contain procedures for the removal and installation of all major units and auxiliaries. All special adjustments or maintenance procedures required during installation shall be included. Paragraphs shall be arranged in the order in which the units should logically be removed.

30.5.7 Chapter 6 - Repair of (insert name of component or assembly). Chapter 6 shall provide instructions for those repair functions allocated to direct support and general support by the maintenance allocation chart. The chapter shall be divided into sections according to the major units such as: main structural sections, simulated power plant, hydraulic and pneumatic systems, simulated controls, instruments, utility systems, and electrical and electronic systems. Paragraphs within the sections shall be arranged in the logical order of disassembly. The first paragraphs of each section shall provide a brief technical description of the major components. Subsequent paragraphs shall provide for removal, testing, disassembly, cleaning, inspection, repair or replacement, reassembly, final testing, and inspection and installation. Instructions for lubrication required during repair shall be included and the lubrication order referenced. Illustrations shall be used when required for proper performance of maintenance operations.

30.5.8 Chapter 7 - Maintenance of materiels used in conjunction with major item. Chapter 7 shall contain the information specified in 30.3.4 but it shall be adjusted to fit direct and general support maintenance.

30.5.9 Chapter 8 - Final inspection/test. Chapter 8 shall contain procedures to ensure that a component or assembly which has been repaired and reinstalled meets all pertinent equipment or system operating parameters. If applicable, the inspection/test procedures shall contain a statement that the assembly, equipment, or system has been restored to a completely serviceable condition for return to the user or to stock.

30.5.10 Chapter 9 - Administrative storage. Chapter 9 shall provide instructions on administrative storage.

30.5.11 Appendix A - References. Appendix A shall be prepared in accordance with MIL-M-63036.

30.5.12 Appendix B - Maintenance allocation chart. Appendix B shall be prepared in accordance with MIL-M-63038.

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30.5.13 Appendix C - Repair Parts and Special Tools List (RPSTL). The RPSTL shall be prepared in accordance with MIL-STD-335 (TM).

30.5.14 Index. An index shall be prepared in accordance with MIL-M-38784.

30.6 Type-24 - Unit, direct support and general support maintenance manual. The Type-24, unit, direct support, and general support maintenance manual shall describe in detail the maintenance allocated to unit, direct support, and general support maintenance by the maintenance allocation chart. The arrangement of the manual shall be as follows:

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Appendix C - Repair Parts and Special Tools List (only if specified in the contract or by the procuring activity).

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30.6.1 Front matter. Front matter shall be prepared in accordance with MIL-M-38784.

30.6.2 Chapter 1 - Introduction. Chapter 1 shall be prepared in accordance with 30.2.2, but shall be expanded to include data for unit, direct support, and general support maintenance levels. Reference shall be made to any applicable lower level manual.

30.6.3 Chapter 2 - Unit maintenance instructions. Chapter 2 shall be prepared in accordance with 30.3.3.

30.6.4 Chapter 3 - Direct support and general support maintenance instructions. Chapter 3 shall be prepared in accordance with 30.5.6.

30.6.5 Chapter 4 - Repair of (insert name of component or assembly). Chapter 4 shall be prepared in accordance with 30.5.7.

30.6.6 Chapter 5 - Maintenance of materiel used in conjunction with major item. Chapter 5 shall be prepared in accordance with 30.3.4 and 30.5.8.

30.6.7 Chapter 6 - Final inspection. Chapter 6 shall be prepared in accordance with 30.5.9.

30.6.8 Chapter 7 - Administrative storage. Chapter 7 shall provide instructions on administrative storage according to guidance in AF 750-1.

30.6.9 Appendix A - References. Appendix A shall be prepared in accordance with MIL-M-63036.

30.6.10 Appendix B - Maintenance allocation chart. Appendix B shall be prepared in accordance with MIL-M-63038.

30.6.11 Appendix C - Repair Parts and Special Tools List (RPSTL). The RPSTL shall be prepared in accordance with MIL-STD-335 (TM).

30.6.12 Index. An index shall be prepared in accordance with MIL-M-38784.

30.7 Type-34 - Direct support and general support maintenance manual. The Type-34, direct support and general support maintenance manual shall describe in detail the maintenance allocated to direct support and general support maintenance by the maintenance allocation chart. The arrangement of the manual shall be as follows:

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Chapter 4 - Maintenance of Materiel Used in Conjunction with Major Item

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Appendix A - References

Appendix B - Repair Parts and Special Tools List (only if specified in the contract or by the procuring activity).

Index

30.7.1 Front matter. Front matter shall be prepared in accordance with MIL-M-38784.

30.7.2 Chapter 1 - Introduction. Chapter 1 shall be prepared in accordance with 30.2.2 and include data for direct and general support maintenance levels. Reference shall be made to any applicable lower level manuals.

30.7.3 Chapter 2 - Direct support and general support maintenance instructions.

30.7.3.1 Section I - Repair parts, special tools, and equipment. Section I shall be prepared in accordance with MIL-STD-335 (TM).

30.7.3.2 Section II - Troubleshooting. Section II shall be prepared in accordance with 30.3.3.5.

30.7.3.3 Section III - General maintenance. Section III shall be prepared in accordance with 30.5.6.3.

30.7.3.4 Section IV - Removal and installation of major components. Section IV shall be prepared in accordance with 30.5.6.4.

30.7.4 Chapter 3 - Repair of (insert name of component or assembly). Chapter 3 shall be prepared in accordance with 30.5.7.

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30.7.5 Chapter 4 - Maintenance of materiel used in conjunction with major item. Chapter 4 shall be prepared in accordance with 30.3.4 and adjusted to fit direct support and general support maintenance.

30.7.6 Chapter 5 - Final inspection. Chapter 5 shall contain procedures ensuring that equipment meets standards contained in chapter 3 and shall contain a statement that the equipment has been restored to a completely serviceable condition for return to the user or to stock.

30.7.7 Appendix A - References. Appendix A shall be prepared in accordance with MIL-M-63036.

30.7.8 Appendix B - Repair parts and special tools list. Appendix B shall be prepared in accordance with MIL-STD-335 (TM).

30.7.9 Index. An index shall be prepared in accordance with MIL-M-38784.

30.8 Validation and verification. Validation and verification shall be performed in accordance with 4.2.



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MALFUNCTION	
TEST OR INSPECTION	CORRECTIVE ACTION
<p>1. (Malfunction-identify the malfunction)</p> <p>Step 1. (Test or inspect-tell what tests or inspections are to be made)</p> <p>(Corrective action-tell what corrective action is to be taken)</p> <p>Step 2. (Test or inspect-tell what tests or inspections are to be made)</p> <p>(Corrective action-tell what corrective action is to be taken)</p> <p>Step 3. (Test or inspect-tell what tests or inspections are to be made)</p> <p>(Corrective action-tell what corrective action is to be taken)</p> <p>2. Malfunction.....</p> <p>Step 1. ....</p> <p>.....</p> <p>(Corrective action.....</p>	

FIGURE A-1. Troubleshooting table illustrating alignment of heading and text.

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HANDBOOK : DEVICE UTILIZATION FOR NAVY TWINING DEVICES

10. SCOPE

10.1 This appendix contains the detailed requirements for the preparation of the Device Utilization Handbook for use on Navy training devices.

20. DESCRIPTION/PURPOSE

20.1 The Device Utilization Handbook is designed for instructors, operators, and training officers (users) to aid them while using specific simulation equipment when presenting a course of instruction.

30. STYLE AND FORMAT

30.1 The style and format shall be in accordance with MIL-M-38784.

40. REQUIREMENTS

40.1 Device utilization handbook. The handbook shall contain the following sections in the sequence shown.

a. Volume 1.

- (1) Front Matter.
- (2) Section I, Introduction.
- (3) Section II, Description of the Simulation Equipment.
- (4) Section III, Simulation Equipment Operating procedures.
- (5) Section IV, Emergency Procedures.
- (6) Section V, Reference and Text Materials.
- (7) Appendix A, Supplementary Information.

b. Volume 2.

- (1) Front Matter.
- (2) Section VI, Training Syllabus and Index.
- (3) Section VII, Training Exercises.
- (4) Section VIII, Formulation of New Training Exercises.

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40.1.1 Front matter. Content of the front matter shall be in accordance with MIL-M-38784

40.1.2 Section I - Introduction. The introduction shall describe the purpose of the simulation equipment and the intended use of the Training Exercise and Equipment Utilization. This section shall provide three types of explanation:

- a. How the handbook will aid the instructor in the operation of the simulation equipment (hardware and software).
- b. All capabilities designed into the hardware and software that will assist the instructor in the full use of the training device during the presentation of a course of instruction (s) for which the device was designed.
- c. List all tasks the instructor must perform to use the simulation equipment in a course of instruction. It shall be based on a job task analysis. Task shall be sequenced in the order of performance and include the planned time allotment, in hours, of each task to be performed.
  - (1) The job task analysis shall identify all tasks performed by the instructor to use the simulation equipment in a course of instruction. Task statements shall express actions which are observable, measurable, and performed for their own sake. Each task shall be further broken into task elements. Elements are those steps required to perform the task. Elements shall be expressed as actions which are both observable and measurable. Conditions and standards are not required for task elements, see table B-I.
  - (2) Objectives shall be developed in accordance with MIL-STD-1379 and shall approximate the job task as closely as possible, see table B-II.

40.1.3 Section II - Description of the simulation equipment. The general description of the simulation equipment section shall consist of:

- a. A description of the simulation equipment.
- b. A depiction of all systems, subsystems, etc., included with the simulation equipment.
- c. A description of the simulation equipment (hardware and software) capabilities.

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- d. A description of the simulation equipment limitations compared to the actual hardware and software capabilities.

TABLE B-I. Job tasks performed by instructor.

Job Task 1
Element 1.1
Element 1.2
Element 1.3
Job Task 2
Element 2.1
Element 2.2
Element 2.3
Job Task 3
Element 3.1
Element 3.2

TABLE B-II. Tasks performed by instructor.

	Sub Hours	Unit
Terminal Objective 1 .....		4
E.O. ....	1	
E.O. ....	1	
E.O. ....	2	
Terminal Objective 2 .....		4
E.O. ....	1	
E.O. ....	2	
E.O. ....	1	

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- e. A list of malfunctions that can be introduced.
- f. A description of the operating (hardware and software) parameters of the simulated system, environment, etc.
- g. Personnel aspects (e.g background, prerequisites, physical requirements) to be considered for the instructors and or students being trained by use of the simulation equipment.

40.1.4 Section III - Simulation equipment operating Procedures. This section shall provide complete step-by-step standard operating procedures prepared in such a manner that it can be reproduced in its entirety as operating instructions, separate from other parts of the Training Exercise and Equipment Utilization. It shall make no reference to other parts of the handbook. Classified information shall be included only if necessary for complete operating instruction coverage. This section shall have five parts:

- a. Performance characteristics - A summary of the configuration and performance characteristics of the simulation equipment shall be presented. This shall include the performance limits of the system, environmental factors, and targets or other operational equipment being simulated by the simulation equipment.
- b. Functional description - A description of the simulation equipment instructor controls and displays used for training, and a description of the student station(s) and their controls and displays shall be provided. Each control and display shall be keyed to a picture of the actual equipment to provide easy identification of the items. A functional description of each control and display shall be provided. Controls and displays shall be covered as related groups or major panels/sections. The functional description of each simulation equipment control and display shall depict the status or malfunction of a particular system or equipment, and a detailed description provided beside each indicator as to what is being and what is not being depicted, affected, displayed, or is exclusive or other indicators and controls.
- c. Operational instructions - Complete step-by-step instruction shall be listed which provide:
  - (1) Simulation equipment preparation considerations/assumptions.
  - (2) Procedures for placing the simulation equipment in a power-on/turn-on condition.
  - (3) Procedures for checking the simulation equipment to ensure that it is operating properly.

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- (4) Procedures for "loading" the simulation equipment computer programs and files, including the use of all computer and peripherals.
- (5) Procedures for setting up problems and generating training problems and generating training problems in advance of the simulation equipment session.
- (6) Procedures for operating the simulation equipment during exercises.
- (7) Procedures for using computer system vendor or simulation developer performance monitoring and support functions available in the on-line mode.
- (8) Procedures for placing the simulation equipment in a power-off condition.
- (9) Procedures for recovering from a power-fail or casualty condition.
- (10) Procedures for integrating (coupling) the simulation equipment with other simulation equipment, if applicable.
- d. Controls to be used only by experienced maintenance personnel - When appropriate, a tabular list of controls which are not to be disturbed by other than experienced maintenance personnel shall be provided.
- e. Daily readiness tests - List and describe each daily readiness test provided with the simulation equipment. Delineate those test that the instructor may use and enter to assure the proper functioning of the simulation equipment in its complete operational modes and environment. Describe in detail how to set up, run, and diagnose the results and readouts of the daily readiness tests.

40.1.5 Section IV - Emergency procedures. This section shall provide a list of procedural steps required to safely remove a trainee or trainees from the training device in the event of a mishap. The procedures shall address the use of all emergency release mechanisms/devices built into the training device, the conditions under which they will be used, and the personnel who will use them. Diagrams or pictures of the emergency release mechanisms devices and their operation shall be included. A list of equipment required but not supplied will also be provided.

40.1.6 Section V - Reference and text materials. This section shall provide a complete bibliography of materials, handbooks, documents, etc., that can be used as reference material to assist in the understanding and

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application of the simulation equipment. Text material shall include, as applicable, the operation and maintenance handbook, COTS documentation, and other publications that contain information that may be helpful to the instructor and the student. Text material must contain all of the information needed by students to perform each exercise.

40.1.7 Appendix A - Supplementary information. The appendix shall contain, as required, additional information of interest to instructors.

40.1.8 Section VI - Training syllabus and index. This section shall provide an outline of the training exercises to be presented in Section VII of the handbook. This shall include a tabular listing of significant considerations associated with specific exercises and a means of exercise selection for any given training situation. The selection index shall consist of:

- a. Title and identification number.
- b. A descriptive statement of the exercise objectives. Exercises developed in conjunction with an Instructor Guide/Lesson Plan (IG/LP) do not require objectives; the exercises will support the course learning objectives and topic learning objectives.
- c. A synopsis of the conditions under which the exercise shall be performed and a list of the tactical situation, environmental consideration, or equipment condition.
- d. A list of the major status, lineup, or mode or operation of the system/subsystem. If it is not an equipment related task, indicate task/function configuration.
- e. The average length of time, in minutes, to complete each exercise. If exercise length is variable due to the flexibility of the exercise, the entry shall be a time span (e.g., "20-40") or the word variable.
- f. The training level of each exercise specified by the training objective statement (TOS), task or function.
- g. The degree of difficulty (e.g., basic, intermediate or advanced) in relation to the appropriate TOS, task or function.

40.1.9 Section VII - Training exercises. This section shall contain the following:

- a. Pretraining Diagnostic Exercise. This exercise shall provide a method for the instructor to use in measuring the proficiency level

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of the students entering a training program. The diagnostic exercise shall be designed to be performed upon the student's arrival at the training site. It shall be designed to aid the instructor in selecting the appropriate stage for each team to enter the sequence of training exercises. Objective-type scoring techniques are required in identifying the student proficiency level and for prescribing specific training exercises that shall be used to remedy any deficiencies. An alternate version of the pretraining diagnostic exercise is required.

- b. Training Exercises. The Training Exercise shall provide training exercises (e.g., Flight, Tactical, Maintenance, etc.) for use by the instructor in conducting student through an actual training situation on the equipment. The exercises shall include:
    - o Exercise title sheet.
    - o Exercise data sheet (as required).
    - o Event - activities sheet.
- (1) Exercise Title Sheet. The exercise title sheet shall provide information relevant to the conduct of an exercise. Exercises developed in conjunction with, or intended for use in the formal environment, do not require objectives; the exercises will support the curriculum objectives and topic learning objectives.
- (a) Exercise number shall identify the exercise, by system/subsystem category designation or by task/function configuration, the applicable PPP table number, training task number or outline event number, and an assigned sequence number.
  - (b) Title.
  - (c) Page \_\_\_\_\_ of \_\_\_\_\_ pages identifies the exercise page number and total number of exercise pages.
  - (d) A descriptive statement and a list encompassing all of the exercise objectives. Exercises developed in conjunction with an IG/LP do not require objectives; the exercises will support the course objectives and topic learning objectives. Reference to the appropriate portion of the IG/LP shall be inserted.
  - (e) The average length of time, in minutes, to complete each exercise. If the exercise length is variable due to the



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flexibility of the exercise, the entry will be a time span (e.g., 20-40) or the word variable.

- (f) The training level of each exercise specified by the training objective statement (TOS).
  - (g) The degree of difficulty (e.g., basic, intermediate, or advanced) relative to the appropriate TOS for each exercise. The degree of difficulty is used in addition to the training level because exercises at one level may require varying degrees of proficiency for satisfactory completion. For example, a normal operating procedure requiring advanced analysis may require advanced operator proficiency, while a casualty operating procedure may require only basic proficiency.
  - (h) A list of any support (e.g., equipment, references, special manning) required to execute the exercise.
  - (i) Approach, used only when the ECG is a stand-alone document, identifies the directions for conducting the exercise.
  - (j) An pertinent instructions not provided.
- (2) Exercise Data Sheet. The exercise data sheet shall provide exercises for use in simulated or actual on board training, which is performed entirely, or in part, on a tactical system/subsystem. The data sheet shall consist of:
- (a) Exercise number identifies the exercise, by system/subsystem category designation or by task/function configuration, the applicable PPP table or training task number or outline event number, and an assigned sequence number.
  - (b) Title and identification number.
  - (c) Page \_\_\_\_\_ of \_\_\_\_\_ pages identifies the exercise page number and total number of exercise pages.
  - (d) The exercise data shall provide applicable exercise information (e.g. , ship's parameters) area Parameters) sea conditions, exercise time). Figures, charts, and pertinent data relevant to the safety and security of the ship, airplane, or unit may also be included.
  - (e) A descriptive statement of the exercise objectives.

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- (f) A list of all exercise constraints.
- (3) Event-Activities Sheet. The event-activities sheet shall provide information or instructions for conducting the exercise. The event-activities sheet shall consist of:
- (a) Exercise number identifies the exercise, by system/subsystem category designation or task/function configurations, the applicable PPP table or training task number or outline event number, and an assigned sequence number.
  - (b) Title and identification number.
  - (c) Page \_\_\_\_\_ of \_\_\_\_\_ pages identifies the exercise page number and total number of exercise pages.
  - (d) Time duration of the exercise.
  - (e) Event related to a particular time.
  - (f) Controller activity, related to a particular time or event.
  - (g) Operator activity, related to a particular time or event.
- c. Post-training Diagnostic Exercise. This exercise shall provide a method for the instructor to use in measuring the proficiency level of students after their training has been completed. The post-training diagnostic exercise shall have the same complexity, length, content coverage, and scoring characteristics as the pretraining diagnostic exercise, so that it may be used in measuring the actual learning achievement. The post-training diagnostic exercise shall be constructed to measure the student's learning as objectively as possible. The exercise shall be scored by the instructor and used as a basis for determining whether the student has reached the required proficiency level. It will also determine which training exercises must be repeated by the student in order for him to reach this level. An alternate version of the post-training diagnostic exercise is required.
- d. Instructor Training Exercises. The Instructor Training Exercise shall present tutorial exercise(s) for use by the instructor in learning or upgrading his proficiency in the use of the training device. The tutorial(s) shall cover all aspects of the hardware, software and simulations required to utilize the full capabilities of the training device while presenting courses of instruction.

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Format and content of the instructor training exercises shall be the same as the student training exercises.

40.1.10 Section VIII - Formulation of new training exercises. Detailed description and instructions shall be provided on how to modify existing detailed training exercises and develop new detailed training exercises. The formulation of new detailed training exercises is a mode of operation which guides the instructor in how to enter, modify, and specify new parameters and characteristics of each new item in the detailed training exercises.

40.2 The Device Utilization handbook. The Device Utilization shall possess the following characteristics as a minimum:

40.2.1 The capability to realize 100% use of the training device while presenting courses of instruction in accordance with the operational concept of the device.

40.2.2 Several means of entry into the data.

40.2.3 All characteristics of the simulation equipment described in one location.

40.2.4 Minimal references to other documents.

40.2.5 Indication of how the equipment shall respond when mistakes are made by the operator on the equipment.

40.2.6 Instructions presented so that they shall produce actions in the correct and preferred order.

40.2.7 The format for training objectives and exercises shall be arranged to allow updates, additions and/or deletions without altering the arrangement of the remainder of the Device Utilization handbook.

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