

MIL-M-81260A(AS)  
28 May 1971  
SUPERSEDING  
MIL-M-81260 (WP)  
18 May 1965

## MILITARY SPECIFICATION

### MANUALS, TECHNICAL, AIRCRAFT /SYSTEM/ EQUIPMENT MAINTENANCE

This specification has been approved by the Naval  
Air Systems Command, Department of the Navy.

#### 1. SCOPE

1.1 This specification covers the requirements for the preparation of technical manuals for organizational, intermediate and depot levels of maintenance for aircraft systems, components, accessories, and Ground Support Equipment (GSE). This specification also covers technical manuals for the combined operation and intermediate maintenance of components and equipment. Technical manuals for intermediate and depot level maintenance of uninstalled aircraft engines are not covered by this specification.

#### 2. APPLICABLE DOCUMENTS

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

##### SPECIFICATIONS

###### Military

MIL-M-8910

Manuals, Technical, Illustrated Parts  
Breakdown, Preparation of

MIL-M-38784

Manuals, Technical: General Require-  
ments for Preparation of

TMSS

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Military (Cont)

MIL-P-38790	Printing Production of Technical Manuals, General Requirements for
MIL-C-38793	Manuals, Technical: Calibration Procedures, Preparation of
MIL-M-81203	Manuals, Technical, In-process Review, Validation and Verification Support of

## PUBLICATIONS

DOD Manual	
DOD 5220.22M	Industrial Security Manual for Safeguarding Classified Information
NAVAIR 00-25-600	Manuals, Technical: In-process Reviews, Validation, and Verification, Support of

(Copies of documents, other than specifications and standards required by suppliers in connection with specific procurement functions should be obtained from the procurement activity or as directed by the contracting officer. Specifications and standards are available from the U.S. Naval Publications and Forms Center, 5801 Tabor Ave., Phila., Pa. 19120. )

## 3. REQUIREMENTS

3.1 COVERAGE. - Technical manual (s) shall provide general and specific instructions required to perform organizational, intermediate or depot level maintenance. Information contained in other maintenance manuals shall be repeated only as specifically required for job performance and clarity. Standard shop practices and techniques contained in general maintenance engineering series manuals shall not be duplicated. Reference shall be made to such other manuals, as required. Instructions for maintenance of equipment utilizing authorized support equipment at the appropriate maintenance level shall be included. The contractor shall use sound engineering principles and techniques, available engineering analysis, service experience, performance data on similar items, and all other reliability and maintainability data available when expressing specific instructions.

3.1.1 Content Verses Equipment Configuration. - The technical manual content shall be consistent with current configuration, maintenance, and operational data of the equipment. The contents shall be validated by the contractor for accuracy and adequacy.

3.1.2 Source Data. - Reliability and maintainability documentation shall serve as a primary source of requirements, tasks and resources when such documentation is included within the equipment contract.

3.1.3 Types of Manuals. - The following types of technical manuals may be prepared to to is specification:

- Type I - Organizational Maintenance Manuals
- Type II - Intermediate Maintenance Manuals
- Type III - Depot Maintenance Manuals

3.1.3.1 Coverage Options. - Coverage may be provided for a weapon system, subsystem, component, or accessory. The extent and method of coverage will be designated by the procuring activity and may provide for:

- a. A consolidation of any combination of Type 1, II or III manuals. (Information presented for one level of maintenance shall not be duplicated in the coverage of the other level(s), unless such duplication is essential for clarity and continuity.)
- b. Preparation in single manual or separately sectionalized manual format.
- c. Inclusion of an integral illustrated parts breakdown (IPB) prepared in accordance with MIL-M-8910.
- d. Preparation of a single manual to cover both operation and intermediate maintenance of components. (If the item is complex, a separate operation manual may be prepared.)

3.1.4 Security Classification. - The requirements established by DOD 5220.22M shall govern the handling of classified material. When classified material is included, classification marking shall be in accordance with MIL-M-38784.

3.2 MANNER OF PREPARATION. - General requirements for the preparation of technical manuals identified herein shall be in accordance with MI L-M -38784. Negatives (when required) shall be prepared in accordance with MIL-P-38790. Printing and binding (when required) shall be accomplished in accordance with MI L-P-38790. When multiple (separately sectionalized) manuals are prepared each manual shall be considered independent for purposes of format. For example, each shall have a title page. "A" page, table of contents, introduction, separate sections, chapters or covers (if applicable), etc.

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3.2.1 Publications. - Pertinent maintenance information contained in existing military standards, Navy Technical Directives, instructions, and other sources shall be referenced and not repeated except where specifically required for job performance and clarity. See appropriate publication indexes for listing.

3.2.2 Designations. - Text shall refer only to types or model of equipment covered by the manual(s). To facilitate later incorporation of additional series (different dash numbers), reference to type or model designation shall be held to a minimum consistent with clarity. Reference shall be expressed in definite terms, such as type or model, serial number range, or similar means. Military serial numbers and AN model designators shall be used when these designators have been assigned to the equipment.

3.2.3 Illustrations. - Illustrations shall be prepared in accordance with MIL-M-38784.

3.2.3.1 Exploded Views. - An exploded view of the equipment shall be used for reference in disassembly and reassembly instructions. Index numbers and a nomenclature list or legend, keyed to the index numbers, shall be used to identify each part. If the equipment is of such a nature that it cannot be adequately illustrated by a single exploded view, it may be exploded by subassemblies as separate views. In such cases, an exploded view showing the complete equipment exploded into its major assemblies shall be shown first. Parts serving to assemble the major assemblies shall be shown on this illustration. These views and those in the illustrated parts breakdown shall be the same, with the sequence of key index numbers in the order of disassembly. If an illustrated parts breakdown is combined with a maintenance manual, the exploded view shall not be repeated; reference shall be from the maintenance portion to the IPB illustration.

3.2.3.2 Diagrams. - The manual(s) shall include diagrams and associated data required for reference purposes during actual maintenance work. Diagram shall contain information necessary for maintenance personnel to:

- a. Understand the makeup and function of each intercomponent, power, control, signal circuit, and mechanical system.
- b. Trace each circuit and mechanical system.
- c. Accomplish general and specific troubleshooting on inoperative or malfunctioning circuits or mechanical equipment.

3.2.3.2.1 Full Page and Foldout Diagrams. - Diagrams consisting of a full page or more shall be printed on a right-hand page with a blank apron

so that the entire diagram is fully visible when the manual is closed on the extended foldout. This requirement shall not apply to wiring diagram manuals, partial page presentations, when all text relating to the illustrations appears on a single page or when diagrams are contained in a separate manual.

3.2.3.2.2 Types of Diagrams. - The following types of diagrams shall be furnished as applicable:

- a. Functional flow diagrams including block, semi-block, and logic diagrams.
- b. Schematic diagrams.
- c. Others as approved by the procuring activity.

3.2.3.2.2.1 Functional Flow Diagrams. - Functional flow diagrams shall be included to the extent necessary for an understanding of the data flow within a system, subsystem, or component and its interaction with other systems or systems elements (see figures 1 through 6).

3.2.3.2.2.2 Schematic Diagrams.

3.2.3.2.2.2.1 Single Schematic Diagrams. - Where the nature of the equipment, relative complexity, and number of components make it practicable, a single schematic diagram shall be prepared to cover all components of the equipment covered in the manual(s).

3.2.3.2.2.2.2 Separate Schematic Diagrams. - When a single diagram is not practicable, a separate diagram shall be prepared for each component or subgrouping of components. Interconnecting points for components covered in separate diagrams shall be identified. For example: circuits requiring continuation to other diagrams and which terminate with a plug, terminal strip, jack, etc., shall show a composite plug grouping. Each lead shall be extended through the plug, terminal strip, jack, etc., and labeled to indicate the necessary designator of the first connection within the other component or other significant point of termination.

3.2.3.2.2.2.3 Component and Subassembly Identification. - When the equipment is covered by a single schematic diagram, individual components shall be identified by a series of broken lines forming a rectangle or closed box. When separate diagrams of components or subgroups of components are prepared, sub-assemblies shall be identified by a series of broken lines forming an enclosure.

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3.2.3.2.2.2.4 Detail Parts Identification. - Detail parts shall be identified by reference designations when such designations are applicable. Designations shall agree with those used in related engineering drawings.

3.2.3.2.2.2.5 Electrical Characteristics. - For each detail part, the principal electrical characteristics expressed in actual values (ohms, microfarads, microhenrys, etc) may be tabulated on the apron and indexed by reference designations to applicable points on the diagram when sufficient space is not available on the diagram itself. Values shall normally be expressed as numbers, omitting the unit of measurement (such as ohms). However, a general note shall state which units are used.

3.2.3.2.2.2.6 Wave Forms and Voltages. - Wave shapes, duration, and amplitude of voltages at significant test points throughout the circuit and at interconnecting points within the equipment or systems, under normal operating conditions and other specified conditions, shall be indicated on the schematic diagram of the component.

3.2.3.2.2.2.7 Simplified Schematic Diagram. - Simplified schematic diagrams may be used in the preparation of material required by 3.2.3.2.2.1.

3.2.3.2.2.3 Power and Control Diagrams. - Separate diagrams shall be prepared to show power and control circuits when it is impracticable to show such information on overall diagrams. Each power circuit and each control circuit with its relationship to signal circuits, using a combination of functional and schematic diagrams as required, shall be included.

3.2.3.3 Test Point Identification Symbols. - A system of test point identification by symbol shall be incorporated where appropriate on schematics, tables, charts, and illustrations. Test point identification symbols shall be assigned consecutively within a system or within a component.

3.2.3.3.1 Major Test Points. - A star-encircled test point numeral (see figure 9) shall be used to identify and designate test points used in checking overall functions of, and localizing trouble to, individual components, assemblies (such as IF strips, oscillator circuits, or amplifier stages) and groups of components. Major test points will always be identified on schematics, wiring diagrams, tables, charts, and illustrations by use of the test point numeral 1,2,3, etc, enclosed in a star, but will be referred to in the text as test point 1, test point 2, etc. Typical examples of major test points are input terminals for supply source voltage, high voltage output terminals of the equipment's power system, signal input terminals of equipment, signal output terminals of the equipment, input and output points of IF or A F amplifiers, oscillator circuits, and major points of power or voltage distribution within the equipment.

3.2.3.3.2 Secondary Test Points. -An encircled capital letter (see figure 9) shall be used to identify and designate test points used in isolating causes of subnormal performance with a specific assembly or subassembly of the equipment. These letters will always be identified on schematics, wiring diagrams, tables, charts, and illustrations by use of capital letters (A, B, C through Z; AA, AB through AZ; BA, BB through BZ, etc, ) enclosed in a circle, but will be referred to in the text as test point A, test point B, etc. Typical examples of secondary test points are circuit supply voltage terminals, signal injection points for gain measurements of a stage or a group of stages, and signal output points used in checking the gain of a stage or group of stages.

3.2.3.3.3 Minor Test Points. - An encircled capital letter and Arabic numeral (see figure 9) shall be used to identify and designate test points used in isolating causes of abnormal indication within a specific circuit of the equipment. Minor test points will always be identified on schematics, wiring diagrams, tables, charts, and illustrations by use of a capital letter and Arabic numeral A1, A2, etc, enclosed in a circle, but will be referred to in the text as test point A1, test point A2, etc. Typical examples of minor test points to be so designated are signal injection and output points of a stage for a check or measurement of gain, specific voltage and resistance check points, and other points used in checking for trouble in any specific circuit. Minor test points shall be numbered separately and consecutively within each circuit, starting with A1, A2, etc for the first circuit; B1, B2, etc, for the second circuit, etc.

3.2.3.3.4 Test Point Symbol Application.- Example of major, secondary, and minor test points are shown in figure 9.

3.2.4 Maintenance Checks for Critical Procedures. - Maintenance check requirements shall be indicated for all maintenance procedures that, if improperly performed, could cause equipment failure or jeopardize ground personnel. The need for these maintenance procedure checks will be indicated by use of underlining, italics, or bold type for an individual procedure when a check must be performed prior to proceeding to the next step, or by summarizing at the end of the maintenance procedure the checks that can be performed after completion of the procedure. An explanation of the underlining, italics, or bold type shall be included in the introduction to the manual.

3.2.5 Lubrication. - Unscheduled lubrication requirements shall be provided in applicable assembly procedures. Scheduled lubrication not covered by Maintenance Requirements Cards (MRC) shall be provided by depot maintenance.

3.2.6 "Make From" and "Assemble From" Items. - Coverage shall be provided for items assigned source codes to reflect "make from" and "assemble from" at the organizational and intermediate maintenance levels.

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Items whose manufacture or assembly is simple, and those items adequately depicted in the Illustrated Parts Breakdown, shall not be covered.

3.3 TECHNICAL CONTENT. - Technical content shall be arranged as specified herein for Type I, Type II, and Type III manuals (See 3.4, 3.5, and 3.6). Data shall be consistent with the capabilities of the organization, intermediate and depot activities and the approved GSE. Maintenance procedures shall refer to the approved GSE. The requirements for coverage of approved GSE use, maintenance, and fabrication are common to all maintenance manuals defined herein; therefore, coverage for GSE shall be prepared in accordance with the applicable maintenance manual (Type I, Type II, *or* Type III) plan. If GSE is not required, a statement shall be included in the manual to this effect. GSE presentation shall be as follows:

3.3.1 GSE Listing. - The NAVAIR approved GSE required to perform the appropriate level of maintenance covered in the manual shall be listed in tabular form in four columns consisting of, Part Number, Manufacturer, Noun Name, and Key to Text. If alternate GSE is approved, it shall be listed. Common types of test equipment, such as voltmeters, signal generators, tube testers, etc., shall be listed; however, common tools, such as screw drivers, pliers, side cutters, soldering irons, etc., shall not be listed. When multi-volume manuals are used, the first volume shall include a consolidated listing of all GSE listed in all volumes.

3.3.1.1 Part Number Column. - The part number column shall list the manufacturer's part number. Superseding part number(s) shall use the same index number(s) as the super sealed part number(s).

3.3.1.2 Manufacturer's Column. - This column shall indicate the numerical code or company name as used on the drawing on which it appears.

3.3.1.3 Noun Name Column. - The noun name listed in this column shall be the one that appears on the engineering drawing.

3.3.1.4 Key to Text Column. - This column shall indicate by section and paragraph numbers the parts of the text which calls out the use of each item of equipment by part number.

3.3.2 GSE Maintenance. - When separate GSE maintenance manuals or MRC work cards are not procured for peculiar GSE provided by the contractor (very simple items; tools, work stands, etc), maintenance instructions for such GSE shall be included in the maintenance manual(s) applicable to the aircraft, equipment, or component for which the peculiar GSE was provided. Instructions for required fabrication of peculiar tools, when such fabrication is approved by the procuring activity, shall be included. Concise step-by- step



procedures shall be included for proper care of GSE while in and out of service. These procedures shall cover instructions for storage, preventive maintenance, troubleshooting, lubrication, operating checks, adjustments, periodic inspection, and calibration, if required. GSE maintenance information to be included in each type manual shall include parameter, range and accuracy, and be to the skill level for which the GSE is authorized.

3.3.2.1 GSE Calibration. - This coverage shall contain step by step procedures which will enable the operator to check definitely, the reliability of the indications or readings provided in the test item. The instructions shall outline precisely the steps required to restore the original accuracy of such indications or readings and shall include the physical location of test connections and the values expected at these points. The calibration data furnished shall be precise, complete and independent of all other data prepared in other manuals.

3.3.3 Consumable/Expendable Items. - Each maintenance procedure shall contain a list of consumable and expendable items required to complete the procedure. This list shall precede the GSE list for the applicable procedure. Nomenclature material specification number, and item part number or Government standard number shall be given.

#### 3.4 TYPE I - ORGANIZATIONAL MAINTENANCE MANUALS

3.4.1 Content Requirements for Type I Manuals. - Type I manuals shall contain all essential information required for the performance of organizational maintenance, and may be in sections or volumes. Information presented shall be concise and so clearly worded to be readily understandable to applicable personnel skill level requirements.

3.4.2 Content Arrangement for Type I Manuals. - In addition to, and to supplement the applicable content requirements specified in 3.3 through 3.3.3, the following shall be included in the order listed:

- a. General Aircraft Information
  1. Introduction
  2. System description
  3. Engine operation, ground handling, and servicing
  4. Emergency procedures

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- b. System Integrated Maintenance Information
  - 1. Introduction
  - 2. GSE maintenance
  - 3. General information
- c. System Organizational Maintenance
  - 1. Introduction n
  - 2. GSE maintenance
  - 3. System description
  - 4. System maintenance
- d. Wiring Diagrams
  - 1. Introduction
  - 2. General information
  - 3. Wiring diagrams

### 3.4.3 General Aircraft Information.

3.4.3.1 Introduction. - This section shall contain an introduction in accordance with MIL-M-38784. An overall description supplemented by a one-view illustration of the aircraft shall be given. The description shall depict the purpose, type, series, and main features of the aircraft. When multi-volumes are prepared, all common information shall be included in the first volume; other volumes shall include specific information applicable to that volume.

3.4.3.2 System Description. - A short narrative paragraph describing each functional system shall be included in the manual(s).

3.4.3.2.1 Aircraft Dimensions. - Significant principal aircraft dimensions required for maintenance functions shall be provided. Dimensions shall be given as specifically required for the manual(s) being prepared and shall

not duplicate information provided in other manuals. Information shall include special dimensions for maintenance facilities with limited space. Examples of special dimensions are as follows:

- a. Dimensions (distance) from deck/ground to highest point on aircraft (canopy, vertical tail, etc. ) with tail wheel/skid/nose wheel on deck/ground.
- b. Increase in dimension from deck/ground to critical high points on aircraft when nose gear or main gear rolls over a 2-, 4-, and 6-inch still. For example, an increase in dimension from deck/ground to highest point on vertical tail when main gear mounts still.
- c. Height dimensions which will increase with the aircraft in various possible conditions. For example, an increase in dimension from deck/ground to highest point on vertical tail when nose gear strut, nose gear tie, or nose gear tie and strut are deflated, or an increase in dimension from deck/ground to highest point on canopy under similar main gear and tie conditions, when the canopy would be the critical high point on the aircraft under these conditions.

3.4.3.2.2 Aircraft Stations. - The fuselage, hull, wings, booms, etc, shall be shown by a line drawing which shall indicate the dimension to each station from the reference or datum line. A note explaining how station locations may be determined by measurement from a physically recognizable point shall be included. The location of station zero shall be clearly indicated on all such diagrams. Numbers shall be identified with the station by use of connection lines. The zero waterline of the aircraft shall be shown on the fuselage station illustrations.

3.4.3.2.3 Access and Inspection Openings. - Illustration shall indicate by index and tabulation, the equipment (including GSE) or parts to which access is provided. Identification (dimensions, type, and number of fasteners and latches) shall be given for all access doors, panels, and hatches; however, information contained on MRC work cards or illustrated parts breakdowns shall not be repeated herein.

3.4.3.2.4 Safety Information. - Information shall be provided as necessary to clearly identify hazardous areas on or around the particular aircraft. Information concerning ground runup areas, movable surfaces, personnel survival equipment (ejection seat), foreign objects, physiological hazards,

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and other hazardous areas peculiar to the particular aircraft shall be included. General safety information contain in standard safety manuals shall not be repeated herein.

**NOTE**

It is not the intent of this specification to require coverage of general safety requirements; only that safety information peculiar to the aircraft on which maintenance is to be performed.

3.4.3.2.4.1      Aircraft Walkways. - An illustration shall be included and shall depict all walkways and no-step areas.

3.4.3.2.5      Connecting External Equipment. - Instructions shall be provided for connecting electrical power, pneumatic and hydraulic power, air conditioning, and other equipment used in organizational maintenance functions.

3.4.3.2.6      Storage. - Instructions shall be provided for stowage of loose and emergency equipment, such as ground safety locks and pins, slings, jacks, ladders, tools, covers, anchors, life rafts, first aid kits, flares, and other items in these categories as well as loose electrical and electronic connectors which may be installed for specific missions.

3.4.3.3      Engine Operation, Ground Handling, and Servicing

3.4.3.3.1      Engine Operation. - Instructions shall be included for aircraft ground operation. The ground operation shall consist of engine start and runup required to perform the cockpit engine check, cockpit check of functional systems, such as flight control systems, cockpit climatic control systems, pressurization, etc. Normal and emergency engine shutdown procedures shall also be included.

3.4.3.3.2      Ground Handling Instructions. - Complete instructions shall be provided for ground handling. Instructions shall include concise and complete instructions and precautions required by such conditions as extreme cold, heat, humidity, dust, high winds, 'etc. Instructions for aircraft handling, mooring of

aircraft required for extreme wind velocities, aircraft evacuation, etc, shall be provided. This shall include specific wind velocities which could cause structural damage to the aircraft. Applicable instructions for folding and unfolding the aircraft nose, wings (including single wing fold), rotors, rudders, and stabilizers shall be included. The following information shall be included as applicable:

- a. Cockpit Entry and Safety Check. - Instructions for gaining access to and entering the cockpit, including information on opening and closing canopy, ladders, step areas, etc. An illustration showing specific items to be checked to indicate safe condition of ejection seats, canopies, etc.
- b. Towing. - Instructions for towing, giving locations of towing lugs, rings, etc. Towing instructions shall also include precautions, such as securing of stressed access panels, permissible external stores load while towing, aircraft turning radii, pivot point, stopping distance, etc.
- c. Pushing. - Information giving push and no-push areas and stating the number of persons required to push the aircraft shall be included.
- d. Parking. - Instructions for parking the aircraft, utilizing parking brakes, control locks, etc.
- e. Mooring Instructions. - Instructions, procedures, and diagrams for mooring the aircraft on standard 30-foot grid patterns and alternate, mooring requirements to include the following conditions:
  1. When wings, tail, radome, rotor blades, etc, are extended.
  2. When wings, tail, radome, rotor blades, etc, are folded with or without jury struts in place.
  3. When aircraft is on jacks.
  4. During high winds or seas.
- f. Jacking. - Instructions shall cover location of jacking points, pads, and methods to be used for jacking, ground-to-jack pad dimensions with flat tire (s); and instructions for any shoring or other precautions that may be necessary for safety. Instructions shall be included for jacking aircraft with wings folded and for securing aircraft while on jacks with wings folded to aid in checks of landing gear systems aboard aircraft carriers. Weight limitation and stress door requirements shall also be included.

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g. Hoisting. - Instructions for hoisting the complete aircraft sections by means of hoisting slings. Hoisting points and attachment of slings shall be illustrated. Information for hoisting aircraft in empty or loaded condition, crane capacities required, hoisting conditions, guidelines, safety precautions, etc.

h. Leveling. - Instructions for leveling the aircraft, including location of leveling lugs, reference points, and method of access.

i. Protective Covers. - Description and illustrations for the use of protective covers for aircraft under varied conditions.

j. Ground Safety Locks and Pins. - Instructions specifying the ground safety locks required, their location, type, and method of operation. Precautionary measures shall be included as appropriate, including installation of safety devices for personnel escape systems, explosive or other devices for ejection of external attachments from the aircraft, etc.

k. Preparation for Catapulting. - When applicable, instructions and procedures shall be provided for catapulting preparations, including final visual checking of doors for security, chock removal, nose gear extension, etc.

l. Arrested Landing Operation. - Instructions shall be provided for both land and carrier operations, listing any maintenance procedures that must be performed before and after arrested landings.

m. Carrier Deck Handling. - Instructions shall be provided for unique handling procedures of the aircraft aboard carriers, including spotting, spotting tolerances, etc, as applicable.

3.4.3.3.3 Servicing , - Instructions shall be provided for replenishment of fuel, oil, hydraulic fluid, other fluids, oxygen, tire and landing gear strut pressures required for complete servicing of the aircraft. Information shall be concise and presented in tabular or chart form to the extent practical. The table or chart shall include tank and reservoir capacities in US, Imperial, and metric measures and shall specify AN or other Government specification number(s) and grade(s) (as applicable) for fuel, oil, fluids, and other materials used. Specifications and grades shall be grouped to facilitate change or revision. Fuel and oil expansion volume, total capacity, sump capacity, and net capacity (as applicable) for each tank shall be given. Fuel and oil capacities shall not only be given in volume but also by weight.

a. The instructions shall clearly identify all precautions to be observed when servicing a particular tank, reservoir, etc, such as

grounding and prevention of fire hazards. Instructions concerning access to remote and emergency service points shall also be included.

be A graph showing the tire pressure versus airplane gross takeoff weight relationship for both main and auxiliary wheel tires shall be included. Tire pressure shall be plotted against gross takeoff weights, and the curve shall extend from the minimum gross weight condition to the maximum gross weight condition. If a change of tire pressure is required for specific operation, a statement to this effect shall be made, giving the correct tire pressure.

3.4.3.4 Emergency Procedures. - A brief description of the proper action to be taken by maintenance and crash rescue personnel and the safety precautions to be observed during and following emergencies shall be given. Instructions and appropriate illustrations shall include, but shall not be limited to the following:

- a. General identification of mission, crew, engines, armaments and ordnance, and ejection systems.
- b. Location and capacity of:
  1. Fuel, oil, hydraulic fluid, compressed air and liquid oxygen
  2. Armament and ordnance
- c. Danger Areas
  1. Engines - intakes and exhausts
  2. Wheels
  3. Canopies and ejection seats
  4. Weapons
- d. Cockpit for normal and manual conditions and forcible entry
- e. Prevention of crew suffocation
- f. Crew release from seats for automatic, manual and cut or emergency conditions

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- g. Deactivation of:
  - 1. Battery
  - 2. Engines
  - 3. Ejection seats
  - 4. Canopies
- h. Peculiar tools
- i. Hoisting, jacking and towing under normal and emergency conditions
- j. Procedures following double wire engagement of arresting cables
- k. Crash on land
- l. Crash on water
- m. Engine failure or explosion
- n. Fire (chemical and electrical)
- o. Overheated wheels
- p. Fuel tank rupture
- q. Air bottle explosion
- r. Oxygen overflow
- s. Wheel-up landing
- t. Collapsed main gear
- u. Barrier engagement
- v. Emergency wing folding
- w. Fluid and gases



3.4.4 System Integrated Maintenance Information. - The system integration information shall cover organizational maintenance information to identify or locate a malfunction occurring between aircraft systems during integrated system operation.

3.4.4.1 Introduction. - An introduction prepared in accordance with MIL-M-38784, shall be provided.

3.4.4.1.1 GSE. - The introduction shall also identify and establish the relationship of authorized GSE with the scope of system integrated maintenance. Information contained in separate GSE manuals shall not be repeated except as specifically required for continuity of purpose. Such separate GSE manuals shall be referenced herefrom.

3.4.4.2 GSE Maintenance. - When appropriate, information shall be provided in accordance with 3.3.2.

3.4.4.3 System Integrated Maintenance. - This coverage shall contain a description of the integrated systems. Text and illustrations shall contain basic information required to identify and locate integrated system malfunctions. The information furnished shall be based on the premise that each system has met the minimum performance standards required for the system operational checkout in the aircraft.

3.4.4.3.1 System Interconnected Functions. - This coverage shall also define the purpose of the system and its use, tabulate components comprising the system, and present operational theory pertinent to interconnect functions.

3.4.4.3.2 Aircraft Functional Checkout Procedures. - Specific procedures for testing the interconnected functions of the aircraft systems, and for troubleshooting when a malfunction is indicated during checkout shall be included. Flight line adjustments will be presented except where such adjustments are presented in another manual; in such event the applicable manual shall be referenced.

3.4.4.3.3 Aircraft System Trouble Analysis. - Information required to isolate flight squawks to the defective system shall be included.

3.4.4.3.4 System Checkout. - System checkout shall provide procedures required to determine that integrated systems meet operational performance standards. Procedures shall be keyed to simplified schematics and functional loops.

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3.4.4.3.5 Troubleshooting. - Instructions correlated with operational checkout procedures shall be provided to isolate, identify, and correct malfunctions in integrated systems that are within organizational maintenance capability.

3.4.5 System Organizational Maintenance. - Generally, system organizational maintenance shall be presented in volumes; a volume for each major system.

3.4.5.1 Introduction. - The introduction shall be arranged in accordance with MIL-M-38784.

3.4.5.1.1 GSE. - The introduction shall also identify and establish the relationship of authorized GSE with respect to the mission it is to accomplish in the maintenance program. Introductory data contained in separate GSE manuals shall not be duplicated herein; however, references to such separate manuals shall be included.

3.405.2 System Description. - The description shall include information on the purpose, type, contents, location, and main features of the system, such as characteristics, capabilities, and limitations. Primary component description shall be included in this section and will contain purpose of the system, type, controls, and location of the component. Detailed component descriptions shall not be included. An illustration locating each component, accessory, jack, or junction box within the aircraft shall be provided. Information shall be repeated from the General Aircraft Information section only as specifically required for system maintenance and general safety requirements.

3.4.5.2.1 Principles of Operation. - A discussion and explanation of peculiar operating principles shall be provided for practical understanding and application. This information shall provide a sequential explanation of how the system or subsystem functions. When required for clarity, illustrations shall be provided. Each schematic shall integrate electrical, hydraulic, pneumatic, and mechanical portions, as applicable.

3.4.5.3 GSE Maintenance. - When appropriate, information shall be provided in accordance with 3.3.2.

3.4.5.4 Systems Maintenance. - Maintenance procedures shall be provided for each system or group of systems. Where more than one major system is covered in the same manual or volume, each system shall be covered by a separate section. Contents of each section shall be arranged in the order of the following paragraphs, as applicable:

3.4.5.4.1 Operational Checkout. - Instructions shall be provided for a complete operational checkout of the system or equipment. Instructions shall include step-by-step procedures and identify the approved support equipment necessary to insure that a system or component meets acceptable operational performance standards. Test values and permissible tolerances shall be provided. Adjustments required during operational checkout, such as regulating system or component gain or signal level, shall be appropriately outlined.

3.4.5.4.1.1 Separate Tape Card Manuals. - When separate tape/card manuals have been procured to perform checkout, analysis, or alignment of system or components, such instructions shall be included in the manual by reference to the applicable tape/card manual(s).

3.4.5.4.2 Functional Troubleshooting. - Troubleshooting data correlated with operational and functional check procedures shall be provided and shall be centered around pictorial integrated maintenance diagrams (see figures 1 through 5) which provide in one place, all data required to isolate system (equipment) failure or malfunctions that are within the organizational maintenance capability. The task of troubleshooting major electronic systems shall be divided into three levels of activity, i.e., system level, subsystem level, and detail level, each requiring different skills and knowledge on the part of the maintenance technician as well as different test equipment and technical manual information. Data shall be provided for all equipment capable of being repaired on board the aircraft, regardless of what may be provisioned. Functional troubleshooting shall be provided to guide the technician in as practical a manner as possible using visual data in preference to conventional verbal tabular troubleshooting formats.

3.4.5.4.2.1 Diagrams. - The functional troubleshooting presentation shall use controls and indicators available to the operator/technician to rapidly isolate troubles to systems, equipment, or components during operation, either in flight or on the ground. Integrated maintenance diagrams shall be used in conjunction with, or in place of, special diagnostic programs or test equipment and shall be presented in a simple logical order which is suited to actual operation of the system itself.

3.4.5.4.2.1.1 System Level Diagrams. - The system level of troubleshooting (see figure 2) shall be a presentation of symptom collection and diagnosis with the system energized system displays, such as printers, plotters, CRT display tubes, etc, as the source of symptom information. The system level diagram shall delineate information that would lead to localization of a malfunction to a relatively small area and be designed for the following:

a. To give crew members a comprehensive view of the interface and dependency of major units,.

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b. To present complete equipment chains and signal flow, i.e., acoustic sensors, surface sensors, data handling, etc.

c. To include aircraft locations of all units shown on the diagram and the appropriate referencing to lower level publications.

d. To show all major signal paths with amplifying notes included as necessary for a clear understanding of signal flow.

3.4.50402.1.2 Subsystem Level Diagram. - The subsystem signal flow diagram (see figure 3) shall be the second phase of troubleshooting and shall provide fault localization. The diagram shall incorporate the following:

- a. Signal loop through the GSE.
- b. Expansion of portions of system level diagrams where necessary.
- c. Greater detail of the interface between the expanded portions of the system diagram.
- d. Retention of the source and termination of the data/signal flow
- e. Reference to lower level diagrams and/or publications.
- f. Fault localization information with key test points and functional decision points highlighted.
- g. Aircraft location of all units.
- h. Signal flow amplifying comments, of sentence or short paragraph length, presented in blocked text format.
- i. Associated information on power supply panels and circuit breaker locations, detailed cable fan-outs, and connector numbering.
- j. Signal nomenclature and titles.

3.4.5.4.2.1.3 Detail Level Diagram. - The detail signal flow diagram (see figure 4) shall be the third level and shall be designed to identify the individual faulty modules or subassemblies within the malfunctioning subsystem. This diagram shall incorporate the following:

- a. Functional signal flow in depth.

b. Retention of minimal references to the source and termination of the data/signal flow.

c. Expansion of module and submodule signal flow. Module data shall be presented to detail functional entities (oscillator, amplifier, AND gate, OR gate, etc) within the module or submodule. In order to reduce duplication, expanded module data (see figure 5) may be presented separately when the same module appears on more than one diagram. When a module appears more than once on the same diagram, expanded module data may be shown one time and referenced to the detail for additional applications using the words "Same as \_\_\_\_\_" (see figure 4).

d. Signal flow data down to detailed signal flow paths identifying test points, signal nomenclature, connector numbers, pin numbers, waveforms, voltage levels, tolerances, and other amplifying data where necessary.

e. A separate blocked test diagram presented on the same page as the signal flow diagram. Text blocks need not be the same size or shape as the signal flow blocks, but they shall follow the same arrangement of the signal flow blocks.

f. Blocked text description of the function of the unit rather than just a statement of the purpose or a hardware description.

3.4.5.4.3 Servicing. - Procedures applicable to the functional system and subsystem shall be provided, including cleaning, draining, etc, which must be performed during maintenance accomplishment.

3.4.5.4.4 Removal and Installation. - Instructions for the removal and installation of component, accessory, assembly, subassembly, cabling, plug-in unit, etc, authorized for removal by organizational maintenance personnel, shall not be included where the removal and installation procedure is obvious. Removal and installation instructions for rack/panel mounted components with self-contained locking or quick-disconnect type fasteners or standard mounting provisions, where no possibility of incorrect connections exists, do not require individual removal and installation instructions. However, reference shall be made to a general procedure to be provided as general information.

a. Removal. - Other components which must be removed to facilitate access must be included or referenced.

b. Installation. - Sequential steps required to install a component shall be provided. Instructions such as "Reverse the removal procedure" shall not be used.

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3.4.5.4.5 Rigging. - Step-by-step procedures shall be included for complete rigging of a system or subsystem.

3.4.5.4.6 Adjustment. - Step-by-step procedures shall be provided for any alignments or adjustments required as a result of replacement of any equipment or as required to determine that the system meets prescribed standards.

3.4.5.4.7 Extreme Environmental Conditions. - Specific instructions for any precautions to be observed or special maintenance required under extreme environmental conditions shall be included.

3.4.5.4.8 Engine Buildup Instructions. - The power plant manual shall include instructions for installing components on the nude or basic aircraft engine. These instructions shall be compatible with engine installation and removal procedures to assure that engines are built up to the proper point for engine installation in the aircraft.

3.4.5.4.8.1 Quick Engine Change (QEC) Units. - Engine buildup instructions shall contain information on applicability and interchangeability of QEC units, preparation for engine buildup and ground handling of engines.

3.4.5.4.8.2 Component Installation. - Step-by-step installation of components to build up a nude or basic engine for all aircraft configurations and all engine positions shall be provided and illustrated as necessary for clarity. The effect of engine position on component arrangement shall be provided for each component by nomenclature, quantity per assembly and installation sequence. The instructions shall be broken down into separate installations to facilitate buildup of an engine in the most logical sequence. (see figure 10 for an example of presenting step-by-step buildup instructions. )

3.4.6 Wiring Diagrams. - This coverage shall contain electrical and electronic wiring diagrams and data necessary for clarification of inter-component power, control, and signal circuits and for circuit tracing, continuity checks, and troubleshooting between components. Internal circuits of components shall not be shown when component circuits are included in separate manuals or the functional system schematic(s). When applicable and technically feasible, diagrams furnished shall be direct reproductions of engineering drawings for the installations and equipment concerned, and shall reflect the delivered equipment. Any data not required by the contract drawing specifications which may have been included on the drawings for the contractor's own purposes shall be deleted.

3.4.6.1 Introduction. - An introduction prepared in accordance with MIL-M-387M shall be provided

3.4.6.2 General Information. - General information required to assure fulfillment of the mission of wiring diagram manuals shall be provided. It shall contain a terse narrative description stating the purpose of each system and its functional characteristics and relationship (if any) to other systems. Information contained in the general aircraft information, system integration or other manuals shall not be repeated herein but shall be referenced as required.

3.4.6.2.1 Symbol Chart. - Graphic symbols not shown in military standards shall be presented in chart or tabular form. A figure number shall be assigned.

3.4.6.2.2 Index of Wiring Diagrams - The index of wiring diagrams shall contain a list of the wiring diagram titles arranged in alphabetical order by system including the following:

- a. Figure number and title of each diagram.
- b. Aircraft applicability by serial or Bureau number or equipment (system) serial number affectivity.

3.4.6.3 Arrangement of Diagrams. - Wiring diagrams shall be arranged in the same order as the related systems or equipment in the fictional system manuals.

3.4.6.4 Wiring Diagrams. - Wiring diagrams shall be prepared for each circuit and equipment installation to identify all intercomponent wiring and connections.

- a. Wiring diagrams for each configuration of the same model aircraft shall be shown in separate figures.
- b. All bus bar connections shall be identified, showing electric power source, voltage, frequency and phase, as applicable.
- c. Connectors shall be shown complete on at least one wiring diagram or illustration. Where parts of a connector appear on individual diagrams, the illustration showing the complete connector shall be referenced.
- d. When it is necessary to continue a diagram on a following page(s), the break shall be made in aircraft wiring. When necessary, the circuit may be broken at an item of equipment but not when internal wiring of equipment is illustrated. All circuit breaks shall be identified by wiring number or reference designator on both the basic and continuing page and referenced to and from the figure title or designation which continues or completes the circuit.

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Explanatory material shall be added in the introduction so that maintenance personnel are guided to the proper continuation diagram. This explanation shall cover both serialization and figure designator information. The sheet number shall be included when the referenced figure is a multiple sheet illustration.

e. Electric cable and wire shall be identified on the wiring diagram exactly as identified in the aircraft, except that the wire size numbers need not be shown on wires included for reference purposes only.

f. Part number, nomenclature, and location of each part, as required for clarity, shall be shown on the diagram immediately adjacent to related equipment. When inclusion of part numbers, nomenclature, or location creates excessive congestion on the face of the drawing, one or more of these items may be deleted and furnished in a separate listing(s). This listing shall immediately precede the diagram when space does not permit it to be located on the diagram itself.

3.4.6.4.1 A wire list cross-reference table shall be included which will identify all intercomponent wiring and connection points for each component or subgroup of components which terminates with a plug, terminal strip, switch, etc. The junction points shall be labeled to indicate the necessary designator of the first connection within the other component or other significant point of termination.

3.4.6.5 Terminal Arrangement Diagrams. - Diagrams shall illustrate each terminal panel or block installed in the aircraft, with individual terminal designators arranged in the same sequence in which they appear in the aircraft. Wire segments shall have the wire code indicated.

3.4.6 .5.1 Separate diagrams and drawings for each different electric or electronic configuration of the same model aircraft shall be provided. Application shall be noted by aircraft serial or Bureau number. Where a group of terminal blocks are installed in junction box fashion, there shall be at least one drawing identifying the contents, connectors and connections.

3.4.6.6 Table of Critical Wire Lengths. - A "Table of Critical Wire Lengths" shall be included on a diagram when necessary to indicate the allowable length and splicing limitation: for a given size of wire, power cabling or cabling in circuits handling heavy current loadings, balanced circuits, etc.

3.4.6.7 Wire Repair. - Instructions for the repair and replacement of compact wire bundles shall except that information contained in the IPB shall not be repeated.



### 3.5 TYPE II - INTERMEDIATE MAINTENANCE MANUALS

3.5.1 Content Requirements for Type II Manuals. - Type II manuals shall contain intermediate level maintenance instructions required for maintenance of components of aircraft (or end item) systems, groups of systems, or equipment when separate coverage (manuals) is not provided (See 3.5.1.1.) Equipment grouping in the intermediate manuals shall correspond to that in the applicable organizational maintenance manuals. Instructions for checkout, troubleshooting, repair, replacement, adjustment, test, recalibration, and preparation for installation or shipment of components within a system shall be provided. Equipment and its components shall be treated functionally.

3.5.1.1 Type II Component/Equipment Manuals. - When the complexity of a component(s) or equipment is such that the procuring activity procures a separate intermediate maintenance manual(s) for such component(s), or equipment the manual(s) shall be prepared in accordance with 3.5.4.

3.5.1.2 Referencing Component Manuals. - Information contained in component or equipment manuals shall not be repeated in other maintenance manuals but shall be referenced as applicable.

3.5.2 Content Arrangement for Type II Manuals. - In addition to, and to supplement the applicable content requirements specified in 3.3 through 3.3.3, the following shall be included in the order listed:

NOTE
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To facilitate maintenance, content arrangement for system or subsystem maintenance and repair data shall be located insofar as practicable within a given manual section or volume.

- a. Introduction
- b. System or component description
- c. GSE maintenance
- d. Intermediate maintenance
  1. Systems maintenance
  2. Component maintenance
    - (a) Difference data sheets

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3.5.3 System Intermediate Maintenance Manual

3.5.3.1 Introduction. - An introduction shall be prepared in accordance with MIL-M-38784. The introduction shall briefly state physical and functional characteristics of the system(s) and subsystem(s). Information shall be repeated from other manuals only as specifically required for system(s) maintenance and general safety.

3.5.3.1.1 Ground Support Equipment (GSE). - The introduction shall also identify and establish the relationship of authorized GSE with respect to the mission it is to accomplish in the maintenance program. Data contained in separate GSE manuals shall not be repeated herein; however, references to such separate manuals shall be included.

3.5.3.2 System Description. - A brief description of the system, function of its basic elements, and general explanation of method for accomplishment of system's mission shall be provided. Technical characteristics and other general information essential for the intermediate level of maintenance shall be included. Condensed factual data shall be presented in a manner (tabular form when possible) that will readily portray the system's design characteristics and physical makeup. Technical data contained in general engineering series manuals shall be included by reference only.

3.5.3.3 GSE Maintenance. - When appropriate, instructions shall be included for GSE maintenance and fabrication in accordance with 3.3.2.

3.5.3.4 Intermediate Maintenance Instructions. - Authorized maintenance and repair instructions for systems and components at intermediate level shall be provided. When possible, each component shall be covered individually and shall include the following elements:

- a. Checkout
- b. Troubleshooting
- c. Disassembly
- d. Cleaning
- e. Inspection
- f. Repair
- g. Tolerances and limits

- h. Assembly
- i. Alignment and adjustment
- j. Test
- k. Calibration

3.5.3.4.1 Checkout. - Instructions shall be provided for identifying the cause of malfunctions and shall include the following, when applicable:

3.5.3.4.1.1 Bench Test Setup. - Suggested bench test setup shall be provided and illustrated as necessary to portray:

- a. Details of intercomponent cabling
- b. Cabling or plumbing between test equipment and system or component under test for each procedure

3.5.3.4.1.2 Identical Bench Test Setups. - Where a number of separate performance procedures utilize identical setups, one illustration of the setup will be presented and will be referenced thereafter as necessary.

3.5.3.4.1.3 Checkout Instructions. - Checkout instructions shall be provided to determine that a component meets operational performance standards. Adjustments and alignments which should be performed during operational checkout shall be included. Test values and permissible tolerances shall be given when applicable. Equipment necessary to perform checkout shall be identified. Checkout instructions shall be provided in logical sequential step-by-step procedural text or in tabulated form.

3.5.3.4.1.4 Tape/Card Manuals. - When separate tapes/cards and tape/card manuals have been procured to perform checkout, analysis, or alignment of system or components, such instructions shall be identified by reference only.

3.5.3.4.2 Troubleshooting. - Detailed instructions for the determination and isolation of component and system malfunctions shall be included. These instructions shall parallel the requirements in 3.4.5.4.2 as they apply to intermediate maintenance. Troubleshooting instructions shall be presented in sequential steps and shall be supplemented by necessary illustrations to define test points, bench connections, schematics and other pertinent information. Troubles of common, infrequent or complex nature and troubles caused by interaction of integrated components shall be included. Troubles for which remedies

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are well known shall not be included. When the repair procedure for a specific malfunction is included in a separate instruction or manual and is of such length to be more appropriately referenced than repeated, reference to the procedure shall be made in lieu of repetition.

3.5.3.4.3 Disassembly. - Instructions for disassembly of components, in detailed step-by-step procedures, to the extent authorized for intermediate level maintenance shall be provided. They shall present, by text and illustrations, any special procedures preliminary to inspection, repair, and replacement of parts. These special procedures consist of removal from shipping container, dismantling into major assemblies, subassemblies, and component parts. The text shall contain statements keyed to the index numbers of the illustration, explaining special precautions to be observed and mentioning the peculiar tools to be used to remove or replace certain parts or assemblies. Critical dimensions to be taken during disassembly should be specific.

3.5.3.4.4 Cleaning. - Brief instructions for peculiar cleaning methods specifying use of service materials and procedures shall be provided as applicable. Precautions to be observed shall be listed. Instructions for after cleaning relating to the preservation of metal parts and surface treatment (such as paint touch-up) shall be provided. Cleaning instructions in connection with nondestructive inspection methods shall be included. Special tools, *jigs*, fixtures, necessary during cleaning shall be indicated. General cleaning instructions shall be omitted.

3.5.3.4.5 Inspection. - Inspection methods, equipment and instructions for complete inspection of component parts shall be provided. Allowable service limits and adequate standards for determining when parts should be repaired or replaced shall be included. When a separate inspection manual is not being procured, all regularly required inspections of the equipment shall be listed according to calendar or operating time periods. The list shall itemize, preferably in tabular form, what is to be inspected and the specific condition to be sought. This portion of the section shall include inspection instructions that may be classed as special. This means inspections that may be peculiar to a certain part of the equipment and for which maintenance personnel are likely to have little or no knowledge. Inspection instructions shall encompass failures, wear, damage, corrosion, leakage, aging, burning, malfunctioning, deformation and deterioration that can be expected to occur during normal service of the unit. They shall not include inspections that would only be applicable to detection of manufacturing defects. Each subassembly or the parts thereof, shall be treated as a separate unit in any discussion of inspection procedure. Each inspection check shall be described as the sequence of repair is required. All parts and subassemblies shall be listed that require special inspections by nondestructive methods, such as magnetic particles

ultrasonic, eddy current, x-ray, and liquid penetrants. Particular attention shall be given to all critical areas. A chart shall be used to summarize conditions for checking individual parts. This chart shall include material specifications for metals when pertinent to making repairs.

3.5.3.4.6 Repair - Instructions for repair, including kitted parts, to the extent authorized for intermediate level maintenance shall be provided. Reference shall be made to the IPB for repair kit details.

3.5.3.4.7 Limits. - A table of acceptable service tolerance limits and fits shall be provided. The table of limits and fits will serve as a standard and shall give the plus (+) or minus (-) tolerances that are acceptable to allow continued operation without affecting the reliability of the component.

3.5.3.4.8 Assembly. - This section shall give essential instructions for the assembly of component parts into major subassemblies and final assembly of subassemblies to form a complete end item. Assembly instructions to include all pertinent assembly criteria such as clearances, backlash dimensions, special torque values, peculiar safety wiring, end play and similar data, shall be provided. Instructions for rigging, adjustment and alignment, when required, shall be included in logical sequence. Approved corrosion-preventive compounds, special lubricants, gasket pastes, shall be specified. Instructions for required assembly lubrication shall be included. Maintenance check requirements (3. 2.4) shall be integrated into the procedure, as applicable. Assembly instructions such as "Reverse the disassembly sequence" shall not be used. Reference to the applicable procedure, for checkout of the item, shall be made at the end of the assembly instructions.

3.5.3.4.9 Alignment and Adjustment. - Step-by- step procedures describing required alignment and adjustment resulting from replacement of parts or assemblies or as required to determine if the component or equipment meets operational performance standards shall be provided.

3.5.3.4.10 Testing. - Procedures shall contain the intermediate level instructions for conducting tests of the complete system, component and equipment. Test data pertaining to specific testing conditions, test setup and operating procedures of applicable GSE shall be included.

3.5.3 .4.10.1 Testing procedures may be omitted if they are identical to the checkout procedures required in 3.5.3.4.1. In this event, the checkout

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procedures in 3.5.3.4.1 shall be referenced as a requirement following assembly of a repaired unit or system. This section shall include the following, as applicable:

- a. Safety precautions
- b. Preparation for test
- c. Instrumentation requirements
- d. Static test procedures
- e. Starting, operating and shutdown procedures
- f. Operating parameters
- g. Level of testing following specific repairs
- h. Functional test and performance evaluation
- i. Test schedule (and references to alternative, if available)
- j. Fluid and electrical supply requirements
- k. Drainage requirements
- l. Preservation requirements

3.5.3.4.10.2 When GSE has been provided for testing and is covered in a separate manual, this section shall be organized to insure compatibility with the manual covering the special test equipment.

3.5.3.4.10.3 Environmental Conditions. - Allowable performance data corrected to standard day atmospheric conditions shall be included.

3.5.3.4.10.4 Charts or Curves. - Performance evaluation charts or curves shall be provided. Correction charts shall be included to show correction factors for performance evaluation.

3.5.3.4.10.5 Table of Operating Limits. - A table of operating limits shall be included with the following column headings:

Table (Number).

Operating Limits

Item	Limit	Remarks
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3.5.3.4.10.6 Test Schedules and Test Procedures. - A description of the sequence and manner of accomplishing a functional test or performance evaluation of the components shall be included. All checks and adjustments shall

be described in detail with appropriate references to charts or curves. For performance evaluation, a test schedule shall be presented in tabular form.

3.5.3.4.10.7 Test Requirements. - A table shall be included listing the specific test requirements for components repaired within the scope of the manual. The table shall be prepared with the following column headings:

Table (Number).			
Test Requirements			
Parts Replaced or Repaired	Functional Test	Performance Test	Comments

3.5.3.4.11 Calibration. - Calibration procedures, as required, shall be provided in accordance with MIL-M-38793.

3.5.3.4.12 Difference Data Sheets. - Difference data sheets shall be prepared as specified in 3.5.4.4.

3.5.4 Component/Equipment Intermediate Maintenance Manual. - When directed by the procuring activity, individual intermediate maintenance manuals (separate coverage) shall be prepared for specified components or equipment in lieu of coverage in system maintenance manuals outlined in 3.5.3. These manuals shall provide instructions for authorized maintenance and repair of components or equipment at the intermediate maintenance level in accordance with the procuring activity maintainability plan.

3.5.4.1 Arrangement. - The general arrangement of component/equipment manuals shall follow the requirements outline for system manuals as specified in 3.5.2. The technical content shall be arranged as outlined in 3.5.3 through 3.5.3.4.12 and shall include (but not limited to) the following additional items:

- a. Preservation requirements.
- b. Preparation for installation, use and shipment,

3.5.4.1.1 When difference data sheets are used (see 3.5.4. 4)., a statement shall be included in the introduction indicating that certain sections (identify by number) contain instructions for \_\_\_\_\_ (nomenclature and model, type or part number). Instructions for additional models are (or "will be" whichever is applicable) provided in Section (identify by number) by the use of difference data sheets. The additional models included in Section (identify by number) are

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(or "will be" whichever is applicable) listed in Section (identify by number) by difference data sheets. Instructions for models included in the difference data sheets section are the same as the procedures given in Sections (identify by number), except for the specific differences noted by the applicable difference data sheets.

3.5.4.1.2 A table of leading particulars shall be included to provide information of the following type: minimum, maximum and mean operating voltage, current and temperature; capacity, length of stroke, operating pressure and displacement; duty cycle; uncrated weight and dimensions and air shipment weight by major assemblies etc, applicable to the model covered.

3.5.4.2 Preservation Requirements. - Procedures and prescribed materials to be used by intermediate level maintenance activities for proper preservation of components/equipment for temporary through long term storage shall be provided. Information shall be specific for the component/equipment involved and shall be compatible with, but shall not duplicate, information contained in general preservation manuals.

3.5.4.3 Preparation for Installation, Use, Storage and Shipment.

3.5.4.3.1 Installation and Use. - This coverage shall describe all work required to make the component/equipment ready for installation and use including any precautions to be observed.

3.5.4.3.2 Shipment. - This coverage shall give any special instructions or precautions relative to corrosion prevention or other storage procedures which are peculiar to the component/equipment.

3.5.4.3.3 Shipment. - Coverage shall give any special instructions or precautions relative to protective packing and handling which are peculiar to the component/equipment. Detailed packaging instructions, such as box constructions, are not required.

3.5.4.4 Difference Data Sheets. - Difference data sheets shall be prepared for each additional model or part and shall specify, in the briefest practical form, the difference in maintenance procedures from those covering the representative model or part. The representative model or part covered in the manual may be changed, provided the total number of difference data sheets is reduced and the most economical/usable presentation results. The aggregate number of difference data sheets for any model or part shall not exceed five percent of the number of pages of the parent section of the manual. Difference data sheets shall form the last section of the manual.



3.5.4.4.1 Introduction. - The first page of each difference data sheet shall be worded substantially as follows: "Maintenance instructions for the model in this difference data sheet are the same as the procedures for \_\_\_\_\_ (insert model, type or part designation), except for the specific differences noted."

3.5.4.4.2 Form. - Difference data sheets shall be prepared in the following form:

#### DIFFERENCE DATA SHEET

(A heading in boldface type shall consist of the nomenclature and model type, serial, number and manufacturer's part number of the component/equipment covered.)

3.5.4.4.3 Page Numbers. - Page numbers shall run consecutively following the last page of the manual pertaining to the component/equipment for which the difference data sheets are being issued.

3.5.4.4.4 Content of Difference Data Sheet(s). - Illustrations and text shall be assembled in the briefest possible form to clearly explain the difference between maintenance procedures for the new model and the maintenance procedures for original components/equipment covered in the manual. It shall not be permissible to cross-reference information between difference data sheets.

3.5.4.4.5 Manner of Presentation of Text. - The text of the difference data sheets shall be in the same order of arrangement as the affected manual. Appropriate statements shall be used to convey the similarity or explain the differences in the maintenance procedures. Sentences shall be in short, telegraphic style.

3.5.5 Component/Equipment Operation and Intermediate Maintenance Manual. - When directed by the procuring activity, individual manuals shall be prepared providing instructions for operation and authorized maintenance of components/equipment at the intermediate level, in accordance with the using service maintainability plan. This coverage shall be used in lieu of component intermediate maintenance manuals outlined in 3.5.4 when the information on the component/equipment operation is not covered in any other manual.

3.5.5.1 Coverage. - Component/equipment operation and intermediate maintenance manuals shall include, as applicable, the requirements specified for component intermediate manuals in 3.5.4. In addition, operation information shall be included.

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3.5.5.2 Arrangement. - The general arrangement of the component/equipment operation and intermediate maintenance manuals shall follow the requirements outline for component manuals as specified in 3.5.4. The information pertaining to operation shall be arranged to precede the maintenance instructions.

3.5.5.3 Operation. - Technical information for operation shall include instructions for preparing the component/equipment for initial use and its operation.

3.5.5.3.1 Preparation for Use. - This coverage shall describe the work required to make the component/equipment ready for use, including special procedures, installation, power source, servicing, etc.

3.5.5.3.2 Operating Instructions. - This portion of the manual shall contain essential operating instructions for the component/equipment, for a complete start-to-stop cycle, including safety precautions to be observed covering the following, as applicable:

- a. Preliminary adjustment, alignment, positioning, and warm-up procedure, including preventive maintenance or minor maintenance such as oiling, dusting, etc, to be accomplished by operation personnel.
- b. Means of connection between equipment and equipment being tested, maintained, handled, processed, etc.
- c. Purpose and use of all operating controls and auxiliary equipment, or attachments furnished with the equipment.
- d. How to start the equipment.
- e. Operation of the equipment in normal sequence of operation.
- f. Purpose, use, and interpretation of readings of all indicating instruments.
- g. Means of self-testing the equipment when purposely built-in-test (BIT) feature or self-test capability is provided.
- h. How to stop the equipment - shutdown procedures.
- i. Precautions to be observed. These shall include as applicable, warning as to safety of operations, and precautions which may be necessary to prevent injury to operating personnel.

3.5.5 .3.2.1 A list of all controls and indicators, and an explanation of the function of each shall be given. When applicable, typical instrument readings (with acceptable upper and lower limits stated) and indicator presentations, to inform the operator what recognizable results he should expect shall be provided. This shall include information such as:

- a. Sequence or series of proper scope views or instrument readings during operation.
- b. Typical instrument readings and indicator presentations for various uses of the equipment.

- c. Comparison of scope indications, when possible, with actual maps of area indicated.
- d. Scope and instrument views illustrating proper and improper indications.

3.5.5.3.2.2 As appropriate, procedures for emergency operation, such as under "jamming" interference, or when the equipment is partially disabled, shall be included. Instructions pertaining to substitute methods of operation when there is failure of circuits, or improper functioning of components, shall be provided.

### 3.6 TYPE III - DEPOT MAINTENANCE MANUALS

3.6.1 Content Requirements for Type III Manuals. - Type III manuals shall provide depot level overhaul and repair instructions for aircraft components, accessories, and equipment as directed by the procuring activity. Depot maintenance manuals shall supplement the applicable intermediate maintenance manuals (and engineering drawings) to the extent necessary to assure complete coverage for support of depot overhaul and repair requirements. Information presented in intermediate and other manuals shall not be repeated in depot manuals unless such duplication is essential for clarity and continuity, and then such duplication shall be held to the minimum.

3.6.1.1 Simple Items. - Engineering drawings shall be given consideration as being adequate coverage for simple items (components, etc). When it is considered that engineering drawings are not adequate for depot level maintenance, coverage shall be as provided herein.

3.6.1.2 Skill Level. - Information presented shall be prepared to applicable skill levels of depot maintenance personnel. Redundant information and procedures that are readily understood by observation of the equipment shall not be included.

3.6.2 Content Arrangement For Type III Manual - In addition to, and to supplement the applicable contents requirements specified in 3.3 through 3.3.3, the following shall be included in the order listed:

Section I	Introduction
Section II	Characteristics
Section III	GSE Maintenance
Section IV	Depot Maintenance Instructions
Section V	Difference Data Sheets

3.6.3 Introduction. - This section shall contain an introduction in accordance with MIL-M-38784 and shall briefly state the physical and functional characteristics of the component/equipment or accessory. However, data contained in associated manuals covering the components/equipment or accessories shall not be repeated except as specifically required for clarity or safety. In addition, the requirements in 3.5.3.1.1 shall be included.

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3.6.3.1 If the manual will include an illustrated parts breakdown, and repair parts for the equipment are to be supplied in the form of kits, the introduction of the manual shall contain the following statement: "Some repair parts for the equipment covered by this manual are provided in the form of kits. The Illustrated Parts Breakdown section hereof identifies these parts. Activities shall replace all parts, regardless of condition, which are removed in the process of disassembly with all like parts furnished in the kit. Therefore, instructions for cleaning, inspecting, and reworking such used parts have been omitted. If parts in the kit must be cleaned, inspected, or tested prior to installation, instructions for performing these requirements are included in this manual. Naturally, all defective parts are to be replaced; but a part unnecessary to be removed in the process of disassembly, shall not be removed solely for the purpose of replacement by a corresponding kitted part. "

3.6.3.2 If applicable, environmental control (clean room) information required for overhaul of the equipment shall be specified.

3.6.4 Characteristics. - This section shall contain a brief account of peculiar characteristics essential for depot maintenance. Reference shall be made to applicable organization and intermediate maintenance manual(s).

3.6.5 GSE Maintenance. - GSE maintenance shall be included in accordance with 3.3.2. However, fabrication instructions for local manufacture items are not necessary.

3.6.6 Depot Maintenance Instructions. - The manual shall contain essential repair and overhaul information required to support a depot level maintenance effort. This data shall supplement, and be compatible with, information contained in associated intermediate maintenance manual(s). Information shall be provided to the authorized depth, as determined by the procuring service.

3.6.6.1 Data shall be included to enable depot facilities to analyze trouble and to effect repair of components/equipment, assemblies, subassemblies, etc, which are beyond the capabilities of intermediate activities, even though technical data, test equipment parts, etc, have been provided that level; or upon which no technical data, test equipment, etc, was provided to the lower levels because the item could not be economically maintained or repaired at those levels.

3.6.6.2 Data shall be included to enable depot activities to determine when components/equipment, assemblies, and subassemblies require only maintenance or repair or when they should be completely overhauled. Processing instructions shall be included to reflect detailed mandatory parts replacement information applicable to time replacement and forced removal components.

3.6.5.3            Checkout. - Depot checkout shall parallel the requirements stipulated for intermediate maintenance (See 3.5. 3.4.1.)

3.6.6.4            Disassembly. - Instructions shall parallel the requirements stipulated for intermediate maintenance (3. 5.3.4. 3) and shall include instructions necessary to disassemble to the extent authorized for depot maintenance.

3.6.6.5            Cleaning. - Depot cleaning shall be limited to peculiar cleaning requirements and shall parallel the requirements outlined in 3.5.3.4.4.

3.6.6.6            Inspection. - Instructions shall parallel the requirements of 3.5.3.4. 5; however, overhaul limits and standards shall be reflected.

3.6.6.7.            Repair. - Repair instructions shall be provided to cover the complete repair capability authorized by the procuring activity. Text will be supplemented with illustrations as necessary to describe complex procedures. Repair methods shall be specified for the correction of all deficiencies and conditions considered repairable when inspected but shall not cover assemblies replaced as units because they cannot be economically repaired or overhauled. Description of common procedures shall be omitted. Specific data shall be provided to adequately describe acceptable repairs. When applicable, these instructions shall supplement the requirement outlined in 3.5.3.4.6.

3.6.6.8            Tolerance and Limits.- Presentation of tolerances and limits shall be in accordance with 3.5.3.4.7; however, they shall reflect the requirement of depot level maintenance. This section shall consist of introductory material, the Table of Limits, a miscellaneous table, and charts showing the limit points and lubrication system.

3.6.6 .8.1            The introductory material shall include definitions of unusual terms and abbreviations; also, a statement to the effect that a minimum and maximum are set up as ideal limits and that measurements not exceeding the replacement maximum permit the part to be continued in service.

3.6.6 .8.2            The Table of Limits shall be supported by illustrations (charts) to show clearly all points of limits. Illustrations shall not show limit values but only index or reference numbers with leaders to the point of clearance. The illustrations shall also show lubrication information. Pressure oil, return oil, scavenge oil, propellants and pump fluids shall be differentiated by cross-hatching or other drafting means or by colors, with a legend explaining the coding.

3.6.6 .8.3            The miscellaneous table shall include spring pressures and torque limits.

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3.6.6.9 Assembly. - Instructions shall parallel the requirements outlined in 3.5. 3.4.8 and shall include special instructions, such as lapping, fitting, sealing, etc, as applicable for depot maintenance.

3.6.6.10 Alignment and Adjustment. - Instructions shall parallel the requirements, as outlined in 3.5.3.4.9, amplified to prescribe the critical tolerance requirements for depot level maintenance.

3.6.6.11 Calibration. - Depot level calibration instructions shall be provided, as required in accordance with MIL-M-38793.

3.6.6.12 Test Procedures. - Procedures shall contain essential instructions for conducting tests of the component or equipment after reassembly. Preliminary data pertaining to specific testing conditions, test setup and general operating procedures of peculiar test equipment shall be included. If applicable, test equipment hook-up instructions shall be included for fabricating interconnecting cable assemblies, etc, required for bench test set-ups and not normally supplied with the equipment.

3.6.6 .12.1 Complete procedures, test values and acceptable tolerances shall be provided for each test. When adjustments can be accomplished during a test, without disassembling the equipment, those adjustment instructions shall be integrated into the procedure in the proper sequence.

3.6.6 .12.2 When the equipment requires a run-in test prior to placing in service, complete instructions shall be incorporated.

3.6.6.13 Trouble shooting - Data shall be provided identifying each malfunction or symptom of malfunction; giving instructions for isolating the cause to a specific component assembly, accessory or subassembly; and specifying the remedy by replacement or adjustment, etc. When the test setup for troubleshooting is different from that used during checkout, directions shall be given for changing the test setup.

3.6.6.14 Preservation Requirements. - Instructions shall specify Military approved methods and materials used to preserve the equipment during storage. If the method utilized is the same as specified for reshipment, a statement to that effect shall be included.

3.6.6.15 Preparation for Shipment. - This section shall contain the following instructions explaining the use of any GSE, such as cradles, slings, hoists, jigs, fixtures, etc, as required. The instructions shall be supported by the necessary illustrations and shall include all precautions necessary to prevent damage to the equipment or injury to personnel.

3.6.7 Difference data sheets. - Instructions shall be provided in accordance with 3.5.4.4.

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Quality assurance provisions shall be in accordance with MIL-M-81203 and NAVAIR 00-25-600.

#### 5. PREPARATION FOR DELIVERY

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

#### 6. NOTES

6.1 Intended Use. The technical manuals are intended for use in accomplishing organizational, intermediate and depot levels of maintenance for aircraft systems, components accessories, and GSE.

6.2 Ordering Data. - Procurement documents shall specify

- a. Title, number and date of this specification
- b. Type(s) of manuals required (see 3.1.3)
- c. Extent and method of coverage (see 3.1.3.1)

6.3 Definitions. - Maintenance, GSE, accessory, part, etc, used in this specification are defined in NAVAIR INST 4700.2.

6.4 Identification of Changes. - Asterisks are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

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PREPARING ACTIVITY

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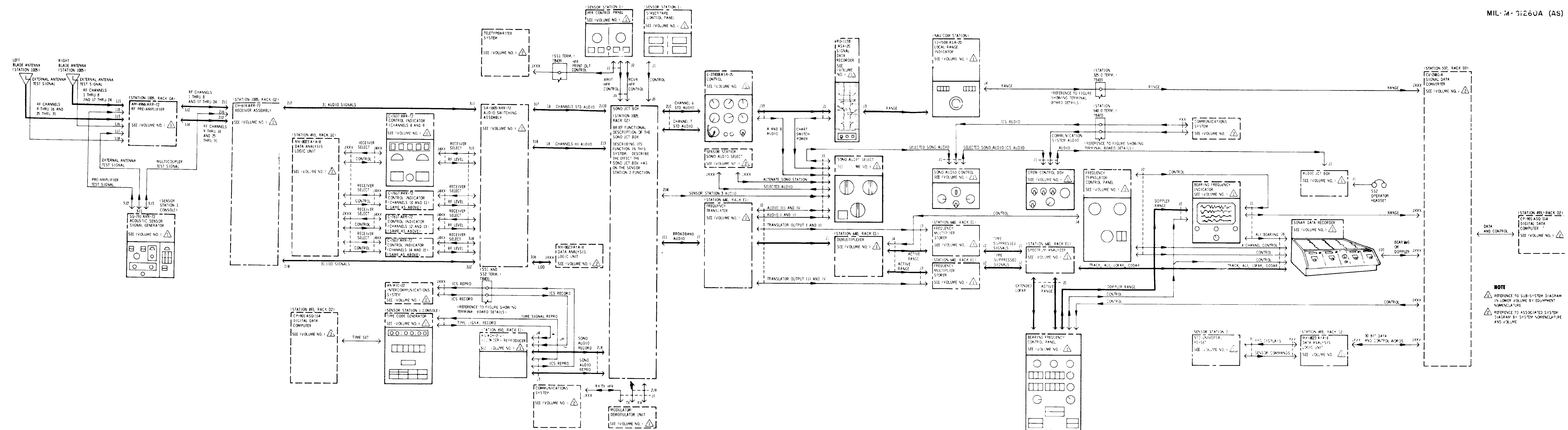
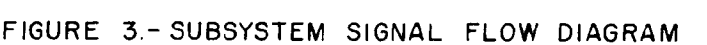


FIGURE 2.-SYSTEM SIGNAL FLOW DIAGRAM





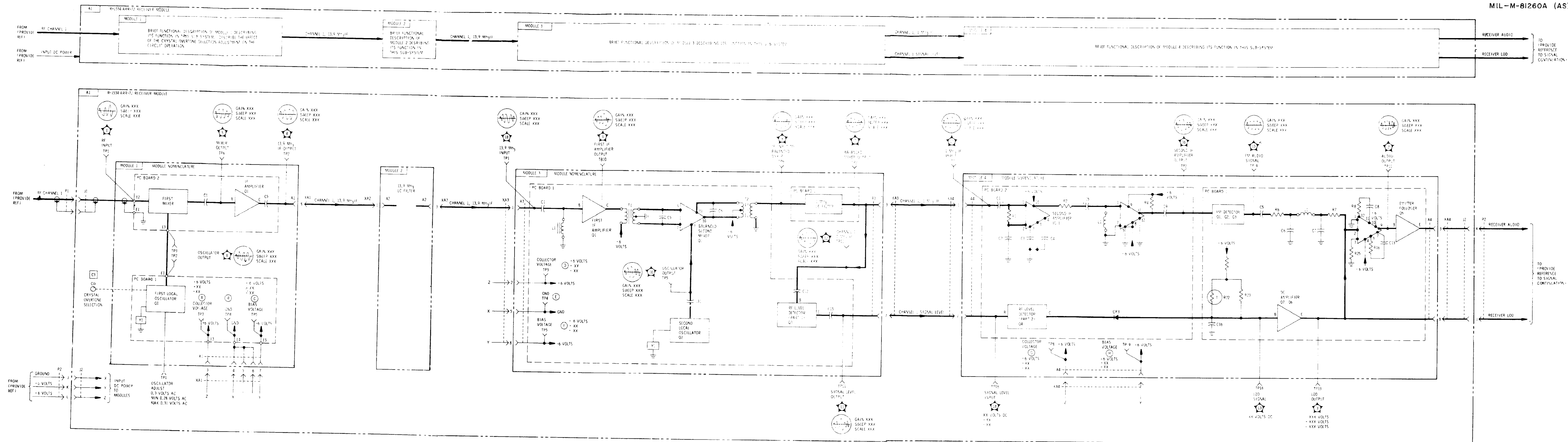


FIGURE 4 (1 OF 2) - DETAIL SIGNAL FLOW DIAGRAM

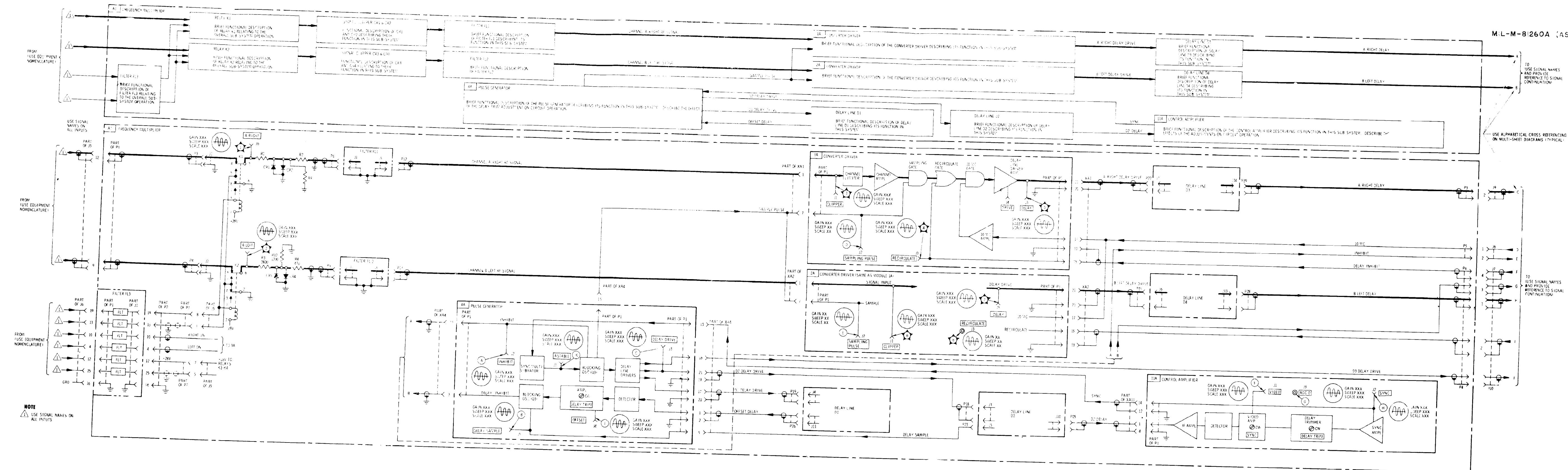
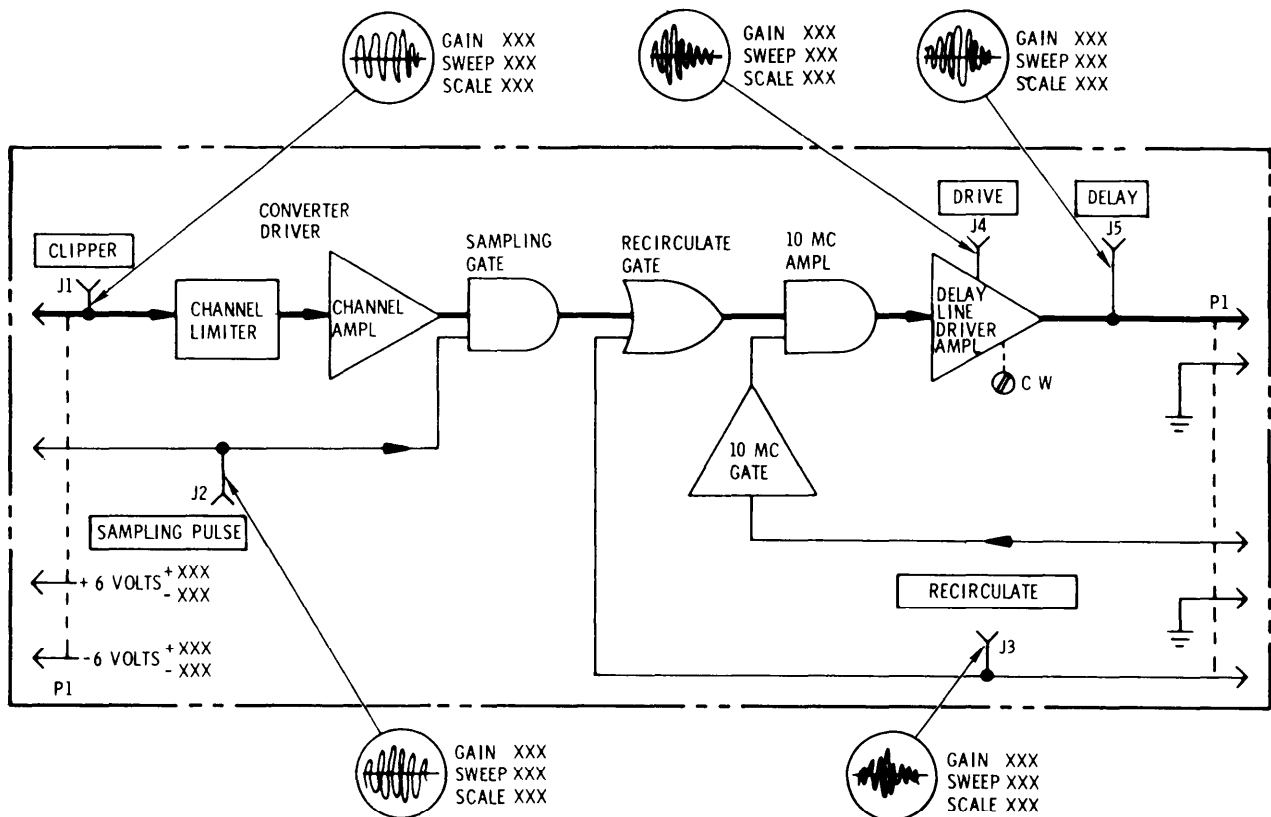


FIGURE 4-(2 OF 2) DETAIL SIGNAL FLOW DIAGRAM

PROVIDE A LINE DRAWING OF THE  
MODULE SHOWING TEST POINT LOCATIONS  
AND ADJUSTMENT LOCATIONS



PROVIDE A BRIEF FUNCTIONAL DESCRIPTION OF THE MODULE.  
DESCRIBE EFFECTS ON CIRCUIT OPERATION RESULTING FROM  
ANY MODULE ADJUSTMENTS.

PROVIDE A TABLE LISTING ALL  
OF THE EQUIPMENTS IN WHICH  
THIS MODULE IS USED.

EQUIPMENT	MODULE LOCATION

FIGURE 5-EXPANDED MODULE DATA DIAGRAM



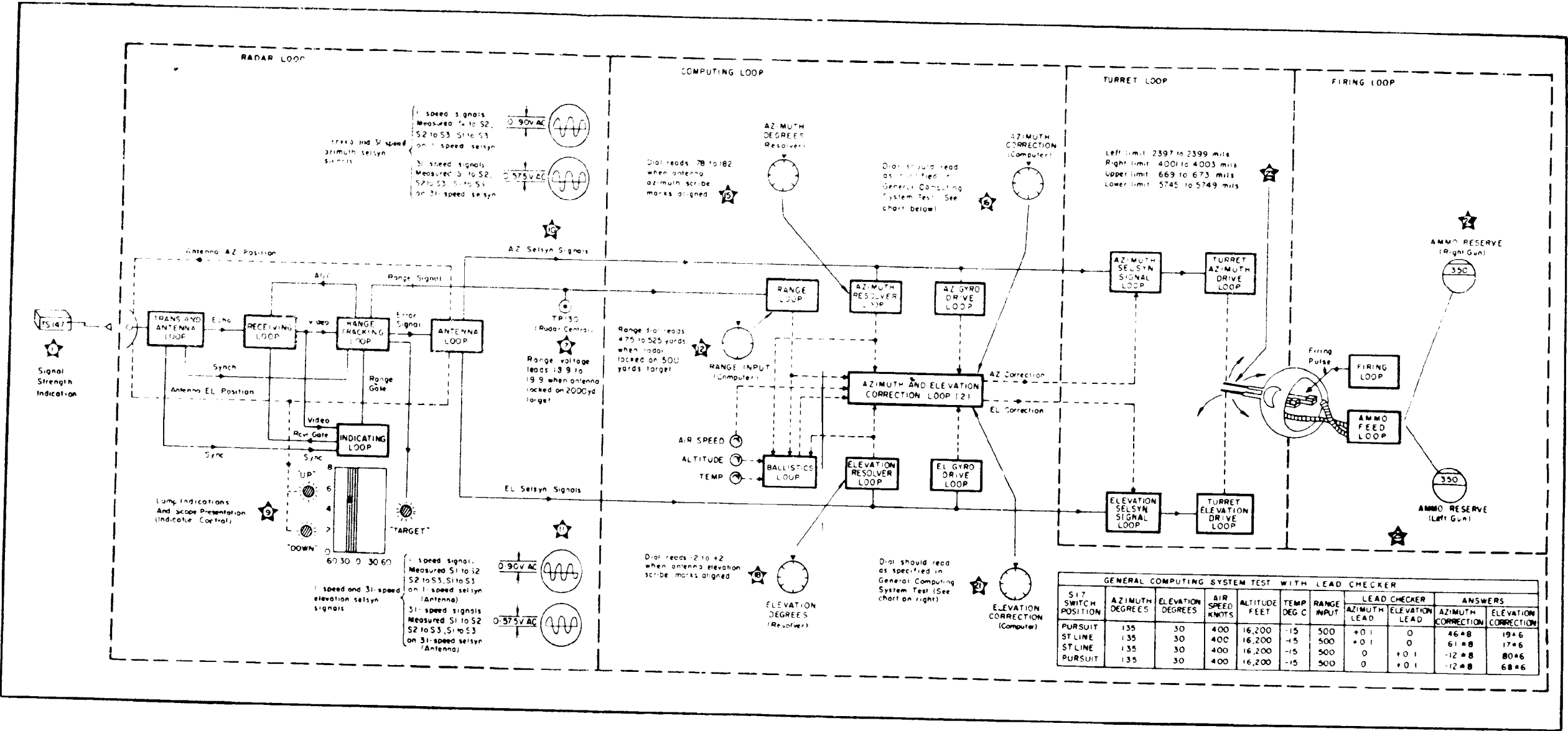


FIGURE 6-EXAMPLE OF COMPLETE FUNCTIONAL SYSTEM DATA FLOW



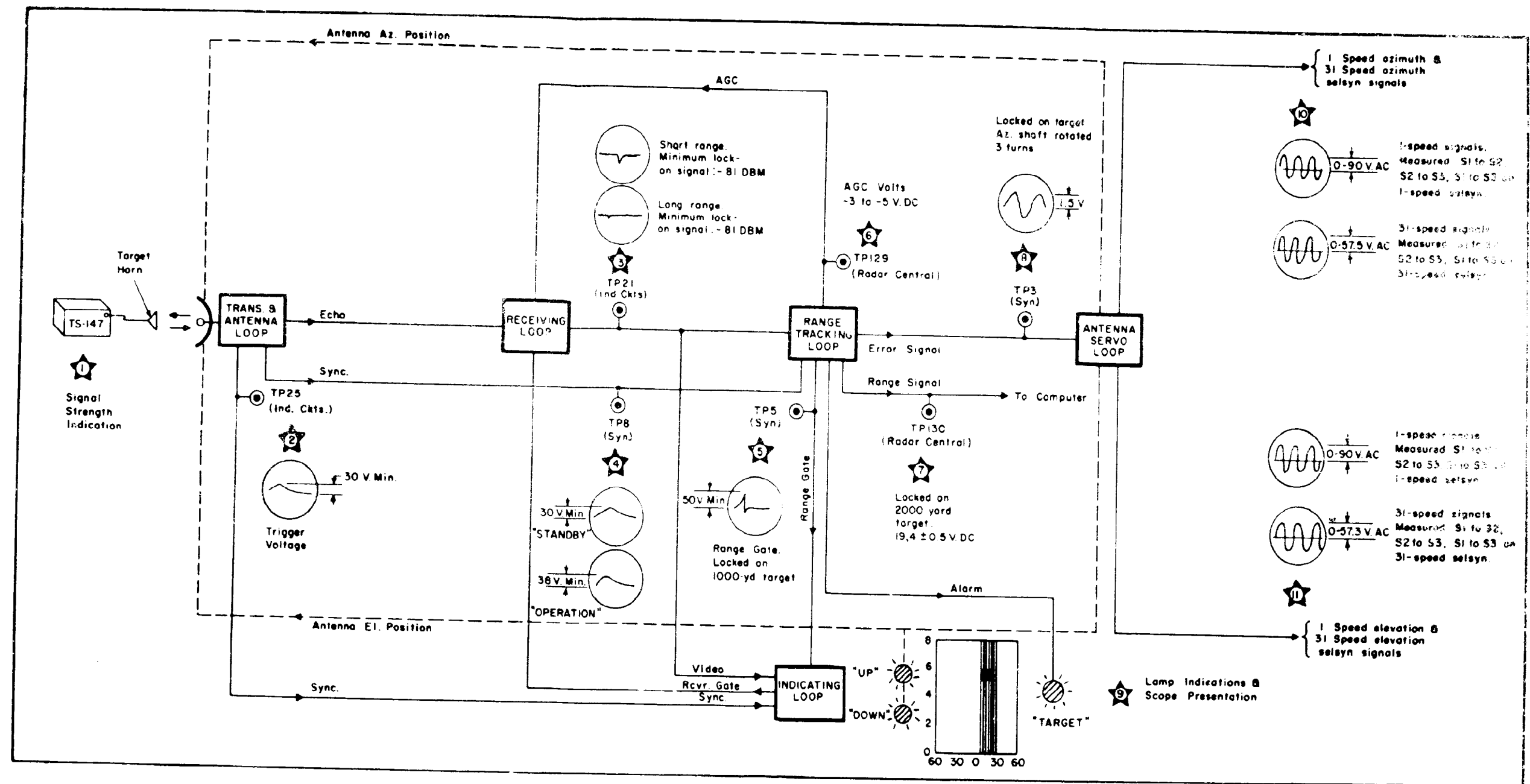


FIGURE-7 EXAMPLE OF FUNCTIONAL PARENT LOOPS

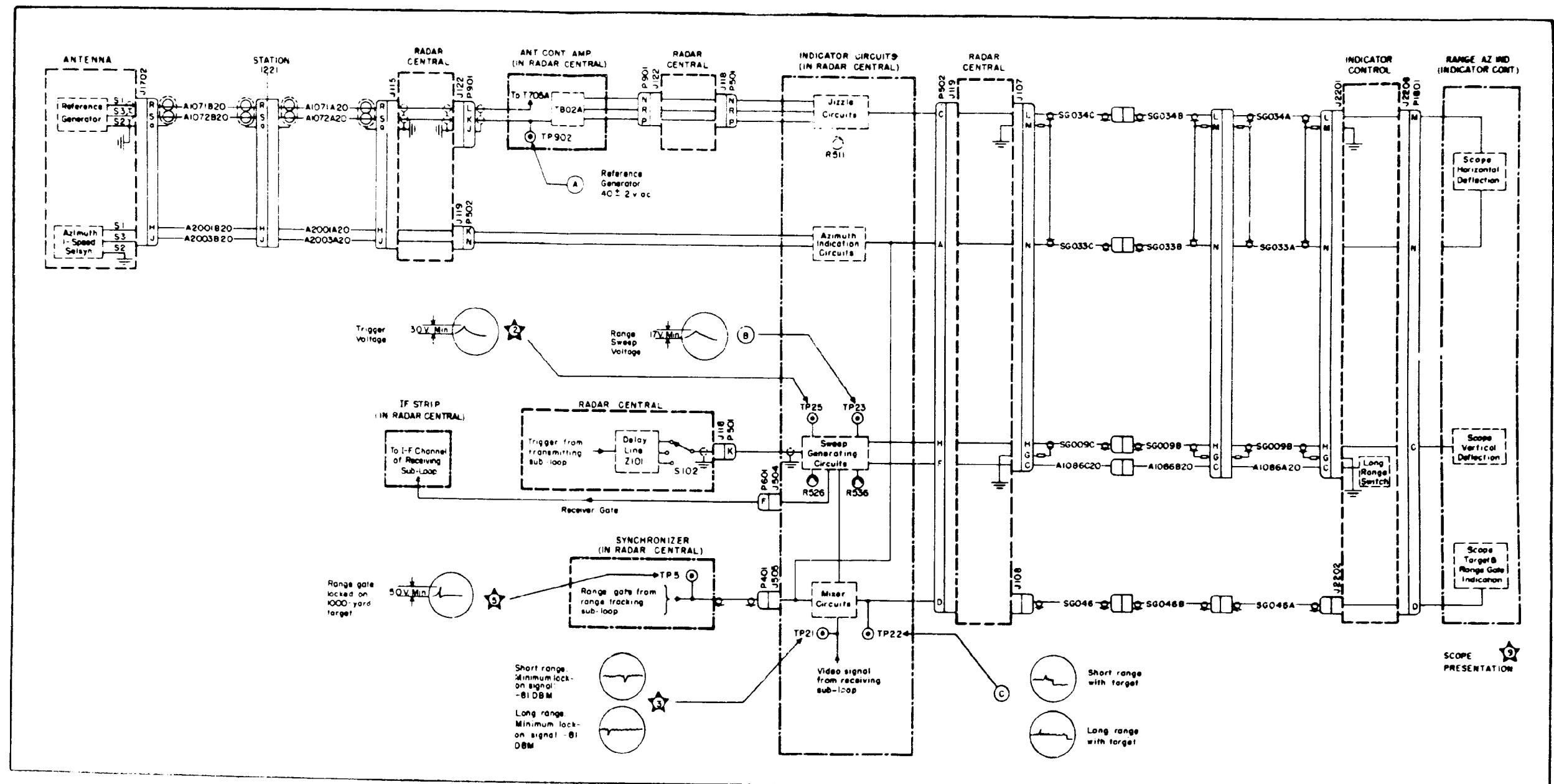
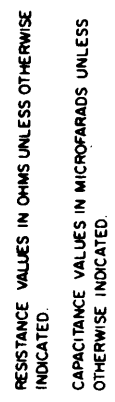


FIGURE 8-EXAMPLE OF FUNCTIONAL SUB-LOOPS



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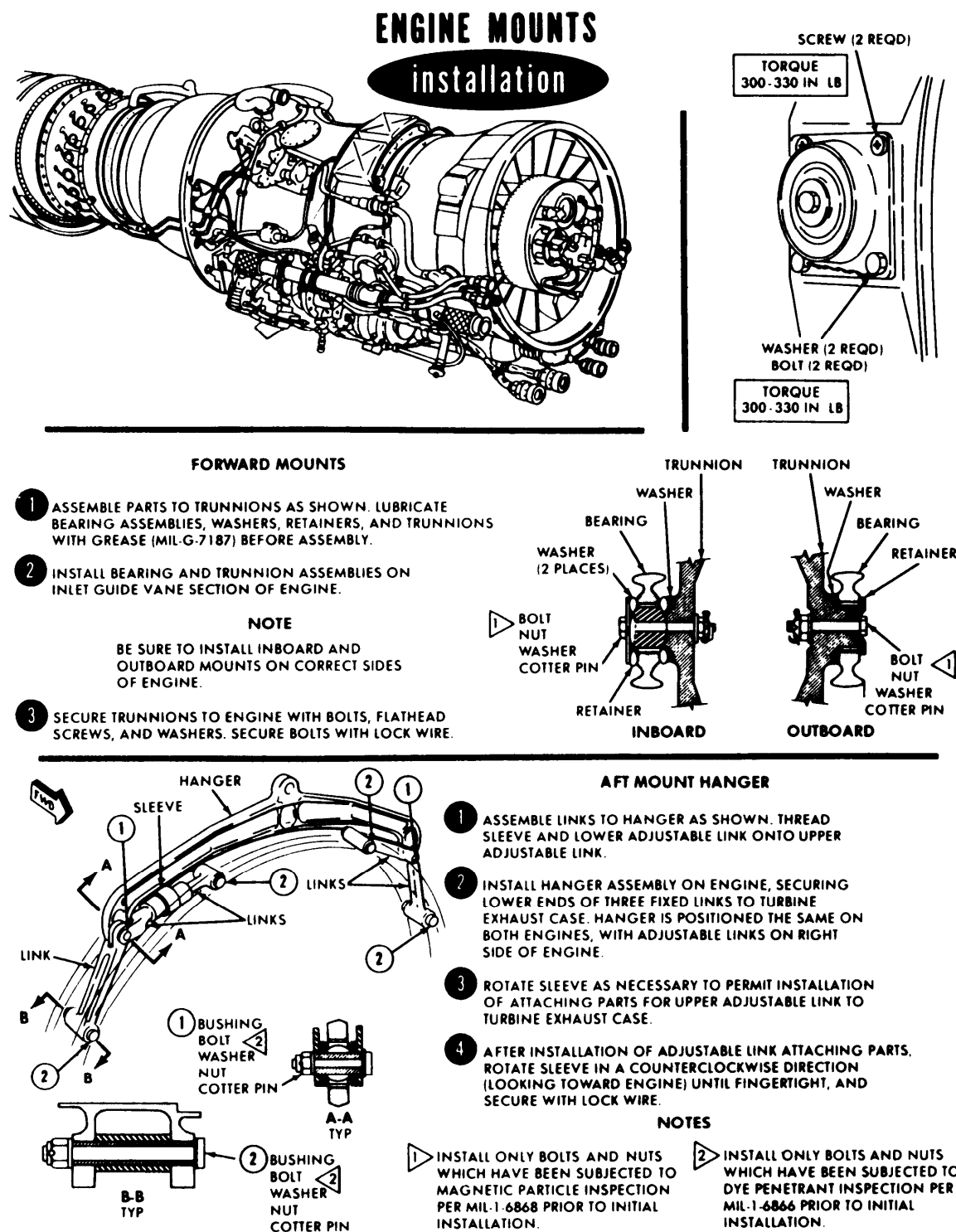


FIGURE 10. EXAMPLE: ENGINE BUILDUP INSTRUCTIONS

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