

INCH-POUND

MIL-DTL-24784/19B (SH)

15 February 2002

SUPERSEDING

MIL-DTL-24784/19A(SH)

15 March 1999

ASSOCIATED DETAIL SPECIFICATION

SURFACE MISSILE SYSTEM MANUAL REQUIREMENTS

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

1. SCOPE

1.1 Scope. This specification sets forth content requirements for the preparation of technical manuals covering the installation, operation, maintenance, and parts support (without services of manufacturer's representatives) of surface missile systems.

1.1.1 Scope of coverage. Unless otherwise specified in the technical manual contract requirements (TMCR) (see 6.2), the manuals should include all information necessary to perform all (organizational, intermediate, and depot-level) maintenance on surface missile systems. No manual should omit maintenance or logistics information for any system thereof designated repairable, regardless of the location of the designated repair point (ship, tender, or shore facility) unless the contract requires that the information be included in a separate document to be provided to the Government and reference is made thereto.

2. APPLICABLE DOCUMENTS

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

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, ATTN SEA 05Q, 1333 Isaac Hull Ave SE Stop 5160, Washington Navy Yard DC 20376-5160 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

AREA TMSS

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

DEPARTMENT OF DEFENSE

MIL-DTL-24784	Manuals, Technical: General Acquisition and Development Requirements.
MIL-DTL-24784/7	Technical Repair Standard (TRS) Requirements for Ordnance Equipment.
MIL-DTL-24784/18	Surface Missile Subsystem or Equipment Manual Requirements.

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Standardization Documents Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

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

DEPARTMENT OF THE NAVY

OPNAVINST 4790.4	Ship's Maintenance and Material Management (3-M) Manual.
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NAVAL SEA SYSTEMS COMMAND (NAVSEA)

NAVSEA OP 1700	Standard Fire Control Symbols.
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(Application for copies should be addressed to the Standardization Document Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094).

2.3 Non-Government publications. The following document(s) form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are the issues of the documents cited in the solicitation (see 6.2).

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 991

Standard for Logic Circuit Diagrams. (DoD adopted)

(Application for copies should be addressed to the Institute of Electrical and Electronics Engineers, Inc., 445 Hoes Lane, P.O. Box 1331, Piscataway, N.J. 08855-1331.)

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

3. REQUIREMENTS

3.1 General. The requirements for acquiring the product described herein shall consist of this document and MIL-DTL-24784.

3.2 Security classifications, distribution statement and destruction notice. Security classification, distribution statement and destruction notice shall be in accordance with MIL-DTL-24784.

3.3 Deliverable products and data items. Deliverable products and data items shall be in accordance with MIL-DTL-24784 (see 6.2).

3.4 Arrangement. Unless otherwise specified in the TMCR (see 6.2), the manual shall be arranged in a standardized format [that is front matter, technical content, appendices, glossaries, indices and Technical Manual Deficiency/Evaluation Report (TMDER)] and appropriately divided by volume, part, chapter and section in accordance with the requirements of MIL-DTL-24784 and the following.

3.5 Format and development instructions. Unless otherwise specified in the TMCR, the writing style, safety precautions, tabular material, graphics, and numbering shall be in accordance with MIL-DTL-24784 (see 6.2).

3.6 Technical content for surface missile system manuals. Surface missile system manuals shall be addressed to the class of ship aboard which the missile weapon system is installed, and shall bear the main title of the ship class number and the officially established name of the weapon system. Hereafter "system" shall be construed to mean "surface guided missile weapon system" in this manual type unless otherwise indicated.

3.6.1 Chapters. The manual shall be arranged in chapters and sections in accordance with the approved manual outline. Typical chapters include:

- a. Chapter 1 - Introduction to Description and Operation
- b. Chapter 2 - System General Description
- c. Chapter 3 - System Functional Description

- d. Chapter 4 - System Operation
- e. Chapter 5 - Introduction to Planned Maintenance System (PMS)
- f. Chapter 6 - System Test Synopsis
- g. Chapter 7 - Introduction to Fault-Isolation
- h. Chapter 8 - System Fault-isolation
 - 1. Section 1 - Indicator Fault Directory
 - 2. Section 2 - System Fault-Isolation Procedures [Including fault logic diagrams(FLDs)]
- i. Chapter 9 - System Functional Diagrams (SFDs)
 - 1. Section 1 - System Functional Directory
- j. Chapter 10 - Introduction to Corrective Maintenance
- k. Chapter 11 - System Corrective Maintenance Procedure Synopsis
- l. Chapter 12 - System Corrective Maintenance Procedures

3.6.2 Chapter 1 - Introduction to description and operation. The introduction shall provide information sufficient for a general understanding of the system and associated systems.

3.6.2.1 Introduction. The introduction shall define the system and its relationship with other systems. The mission of the system shall be stated. The text shall be supported by a diagram(s) (see MIL-DTL-24784) showing the interrelationships of the system equipment (see figure 19-1). The major functional relationship and inputs and outputs to related systems shall be indicated.

3.6.2.2 Physical arrangement. System areas and compartments shall be described and the system equipment and units contained in the areas shall be listed. The physical arrangement description shall be supported by the following illustrations:

- a. An inboard profile drawing of the ship or stations showing compartment locations and identifying topside equipment and equipment units comprising the system (see figure 19-2).
- b. Separate illustrations of each compartment and area, identifying listed system equipment (see figure 19-3). Other equipment, which installed in the subject system compartments and areas, need not be listed in the text or called out in the illustrations if they do not directly affect the operation or maintenance of the subject system.

3.6.2.3 System equipment. Each of the equipments comprising the system shall be identified and described. Descriptions of operator-attended equipment shall include general statements as to the nature and purpose of units and indicators. The text shall be supported by illustrations. All equipments shall be shown, whenever possible, in relative-scale proportion. An equipment may be separately illustrated with significant features called out, if such details are necessary for proper support of the text.

3.6.2.4 Associated system equipment. When required, descriptions and illustrations of associated system equipment shall be limited to the major units thereof. The descriptions shall be

more condensed than those of subject system equipment; otherwise, the same requirements are applicable. In the descriptions, emphasis shall be placed on those associated systems equipments that constitute operational or functional interfaces with the subject system. Such units shall be included in the system illustrations.

3.6.2.5 System capabilities. This portion of the manual shall describe the system capabilities and how these enable the ship to perform the primary mission. Subsystem and equipment capabilities shall be described only to the extent necessary to describe system capabilities. Capabilities of associated systems shall be described as applicable. Data such as search radar detection ranges, fire control radar acquisition and tracking ranges, number of targets that can be simultaneously evaluated, number of targets that can be simultaneously engaged, and minimum and maximum effective ranges of missiles and guns shall be included, preferably in tabular form. Envelope drawing(s) shall be developed to illustrate system capabilities. Such drawing(s) shall meet the requirements for training documents, and shall also be technically accurate for use as a guide for system evaluation training exercises. See figure 19-4 for examples of system capability envelope drawings.

3.6.2.6 Presumptions. Presumptions relative to system status at specified times shall be described. (For example, from watch condition to general quarters condition, or from general quarters condition to emergency condition).

3.6.2.7 Reference data. Reference data shall include a list of the equipment comprising the system, and its official designations. A list of common names and abbreviated or informal nomenclature, and system characteristics together with a list of referenced publications shall be included as follows:

- a. System capabilities. A summary of system capabilities shall be provided. The summary shall include data such as gallons per minute, transfers per hour, boom capacity, related ranges, resolution, accuracy, data handling capability, and number of channels. Such data shall be presented in tabular form.
- b. Reference publications. A list of the manuals that pertain to system and subsystem equipments, and other documents of interest or use to operating or maintenance personnel, such as basic training manuals, special directives, NAVSUPPUB 2002, NAVSEA OP 1700, and manuals for associated systems equipment shall be included. The list of publications shall include the title and publication number of the referenced publications.
- c. Tools and test equipment. A list of all special tools and test equipment for system maintenance shall be included. Special tools are defined as those tools not listed in the Federal Supply Catalog. An illustration and description of special items required shall be provided for identification. Information shall be presented in tabular form. For each item the description or table shall include:
 1. The official name or nomenclature
 2. Identifying number
 3. A brief description of the use of the item with a reference to the procedure(s) requiring its use.

3.6.3 Chapter 2 - System general description. The information contained in this portion of the manual shall briefly describe the weapon system and associated systems by combining physical and general aspects of the respective equipment contained therein and their interdependencies and interactions.

3.6.3.1 Weapon systems equipment. The general description shall identify each subsystem group of weapon system equipment and each unit equipment in a group by composite illustrations of the subsystem group of the first ship of the class, for example, the fire control subsystem. The text shall only describe significant features of a particular component of an equipment in a group. Significant features would comprise such items as console panels, subpanels, control and indicator groups. Each component of an equipment in a group shall be called out as shown in figure 19-5.

3.6.3.2 Associated systems equipment. Associated systems equipment shall be shown in separate group operational and functional interfaces with the weapon system. Examples of such components include search radar distribution switchboard and radar order switches that control the availability of weapon system planned-position indicator (PPI) displays, and units of the naval tactical data system that control the transmission of target data to and from the weapon system.

3.6.4 Chapter 3 - System functional description. This chapter shall identify and define the major weapon system functions. The highest threat level shall be considered the primary mode of weapon system operation. Other modes shall be treated as secondary and, insofar as feasible, as modifications of the primary mode. Thus, functions that are common to all modes shall be described under the primary mode and referred to under the secondary mode, with such modifications as may be necessary. Each function shall be analyzed by describing the origin of the function and by stating how each pertinent equipment contributes to the purpose of the function. Functions shall be covered in terms directly related to the system troubleshooting procedures and diagrams in Chapters 7 through 9. Each functional analysis shall be presented in two levels, simplified and detailed, so that personnel training based on this approach can adequately support the concept. Descriptions shall be supported by illustrations which may include block diagrams, geometrical diagrams, and functional diagrams.

3.6.4.1 Introduction to functional description. This portion shall briefly describe the system interfaces and explain interrelationships between the subject system and associated systems and equipment. The major system functions shall be introduced briefly, and the general approach used in the description and analysis of the major function shall be explained.

- a. Weapon system interfaces. The descriptions of system interface relationships to associated systems and equipment shall be supported by interface functional block diagrams that illustrate system integration (see figure 19-6).
- b. Major system functions. All major system functions shall be listed and defined. Major functions shall reflect the operational phases or events of the primary mode of system operation. Secondary system modes, integration with associated systems, multiple-radar synchronizing systems, evaluation instrumentation systems, and other such miscellaneous but primary subjects, shall be treated separately as related functions.

- c. General approach to functional description. The general approach taken in preparing the functional description shall be described in terms of objectives and method. The objectives shall be to describe the weapons system in a manner suitable for progressive training and support of the system troubleshooting procedures, and the text shall so state. The method of presentation shall be to introduce all major system functions and physical interfaces in the introduction section. Subsequent sections shall contain a description and analysis of major system functions. The introduction shall inform the reader that each major function is separately analyzed on at least two levels of progressively increased detail, as follows:
1. The first level shall be a simplified description of the function supported by simplified functional diagrams.
 2. The second level shall be a detailed description of the function supported by the SFDs. Understanding of the simplified description shall be considered a prerequisite to comprehension of the detailed description.

3.6.4.2 Major functional descriptions and analysis. Each major function shall be thoroughly analyzed from generation to output on the basis of concurrent or sequential subfunctions such as data and control functions. The analytic levels in order of increasing complexity are from simplified to detailed. The detailed level shall be an expansion of, and correlate to, concepts introduced at the simplified level. Each level shall be complete within itself. The selected levels of presentation shall be adequate to indoctrinate the reader in weapon system technology to ensure the training required for support of the PMS.

3.6.4.3 Simplified level of functional analysis. The objective of the simplified level shall be to describe the major functions in terms understandable by a person possessing fundamental technical knowledge, and thus provide this person with a basis for better understanding of the detailed analysis. The simplified functional analysis shall explain the generation, transformation, interrelation, and use of the data and control functions that constitute the major function. The analysis shall cover essentials such as origin of the function at an equipment control or sensor; transmission of the function via intermediate equipment such as switchboards, relay transmitters, coordinate converters, and distribution boxes; and manifestation of the function at the terminal equipment. Data and control functions essential to the development of a major function shall be introduced and briefly described in terms of contributory purpose. Primary emphasis shall be placed on the development of functional concepts in the geometrical reference frame provided by NAVSEA OP 1700 or other official manuals. Only secondary consideration need be given to the mechanization of functions. Functions involving computations may be explained in mathematical terms, but at a level no higher than high school mathematics; that is, algebra, plane geometry, and trigonometry (through sine, cosine and tangent). Explanations requiring advanced mathematics higher than that expressed on a high school level shall not be presented. The simplified analysis shall be supported by one or more simplified geometric diagrams, as appropriate, for the nature and complexity of the function (see figures 19-7 and 19-8).

3.6.4.4 Detailed level of functional analysis. The objective of the detailed level shall be to describe the major functions in terms directly related to the system troubleshooting procedures and diagrams in the Fault-Isolation portion of the manual. Accordingly, a detailed functional

analysis shall examine the mechanization of data and control functions down to the level of particular and essential circuit components or functional modules. Essential circuit components and functional modules are those that transform data or control the transmission of data and orders. Nonessential circuit components, such as in-line amplifiers, are a practical necessity but do not require detail analysis. Illustration support shall be provided by reference to SFDs in the SFD portion of the manual.

3.6.5 Chapter 4 - System operation. This chapter shall provide all the information necessary to operate the system effectively. It shall contain step-by-step system operating procedures for each tactical mode, including emergency procedures for system operation under limited capability. Other available modes, such as shore, surface and casualty, shall be treated as modifications of the primary mode. Thus, operating procedures that are common to all modes (for example, launcher loading and assignment) shall be detailed under the primary mode and referred to under the secondary modes with such modifications of procedure as may be necessary. Equipment operating instructions in the system manual shall be general in nature, since the detailed operating instructions in the equipment manuals are required to be complete in every available mode or condition, both system interfacing and independent.

3.6.5.1 Preoperational conditions and setup. Specific preoperational conditions presumed to be in effect prior to system operation shall be established. A system readiness checkoff list of significant switch positions and indicator status shall be tabulated. For indicators such as dials, where a band of readings are possible, upper and lower limits shall be delineated. The initial conditions of associated system equipment that directly affect system operation shall be treated in a similar manner.

3.6.5.1.1 Initial loading instructions. This portion shall also provide instructions for the initial loading of the computer program into the computer if the system includes a general purpose digital computer. All required instructions covering operation of the peripheral input equipment and controls on the computer maintenance panel shall be included to ensure that the applicable program and routine are correctly loaded.

3.6.5.1.2 Unique parametric instructions. The instructions and data required to load or to set any specific parametric values, modes, or sequences into the equipment that are unique to the facility and that are not included in the computer program shall be included. This material may include the setup of items such as program constants and parallels, into specific memory locations, and the setting of controls that modify equipment interfaces in readiness for tactical system operation at the specific facility.

3.6.5.2 System modes operating procedures. Beginning with the primary mode, each available mode of weapon system operation shall be described in the normal and characteristic sequence of major phases, events, tactical options, supervisory commands, and responsive actions of system equipment operators. A mode description shall begin with initial target detection such as anti-aircraft and surface modes, or prebombardment planning, shore mode, as applicable, and shall end with target destruction and system reset.

3.6.5.2.1 Identification of system equipment, controls, and indicators. All system equipment, controls, and indicators having operational and tactical significance in the primary mode shall be identified and their uses explained at appropriate points in the description. Particular emphasis shall be placed on explaining the proper interpretation of displays. Emphasis shall also be placed on the proper operation of system controls, which, if operated improperly, could result in hazards to personnel and damage to equipment in adjacent or remote areas of the ship. Significant nonsystem controls, for example, the missile salvo warning control, shall also be introduced where appropriate. Brief descriptions of emergency procedures with appropriate CAUTIONS for bypassing equipment malfunctions, except those procedures involved in the casualty mode, shall be placed at the end of the description of the mode.

3.6.5.2.2 Statement of the end effect. The initial operation of a designated control shall be followed by a brief statement of the end effect, equipment actuation or display indication, or both, appearing at the operator's station and at remote stations.

3.6.5.2.3 Primary mode narrative. The primary mode narrative shall be supported by either a block or logic illustration of operational sequence. The block diagram form (see MIL-DTL-24784) shall be used when the operator has no choice of action. However, when an operational phase involves any operator's judgment, the narrative shall be illustrated by an operational sequence logic diagram that indicates the factors which must be favorable prior to operator's action; or, if unfavorable, indicates an alternate optional action.

3.6.5.2.4 Conditions coverage. An orientation of system personnel shall be covered. The condition of readiness shall include watch condition, general quarters condition and emergency condition. Block diagrams and descriptions of interior communication links between compartments and areas, including sound-powered telephone circuits, announcing systems, and closed-circuit television.

3.6.5.3 Nontactical operations. This section shall provide, but not be limited to, such nontactical operations as training exercises using dummy missiles and simulated targets, training and evaluation exercises using telemetering missiles and recording equipment. The procedures shall not duplicate information contained in a subsystem or equipment manual (see MIL-DTL-24784 and MIL-DTL-24784/18).

3.6.6 Chapter 5 - Introduction to PMS. The introduction shall describe the principles and objectives of planned system maintenance, and explain how it supports the surface missile programs. The description shall include an explanation of how PMS is part of the standard Navy Maintenance and Material Management Program. Reference shall be made to OPNAVINST 4790.4, as applicable. Unless otherwise specified in the TMCR (see 6.2), the introduction shall explain system maintenance requirement cards, system maintenance index pages, and how they are used on a particular ship. The description shall include but not be limited to the major factors contributing to weapon system availability by increased maintainability obtained through system-oriented rather than equipment-oriented maintenance, and the documentation essential for implementing the plan. Those areas of shipboard maintenance related to but not part of system areas of shipboard maintenance related to but not part of system documentation shall be identified

and briefly presented. The presentation shall cover such areas as the interface between system maintenance and search radar maintenance that create mutual dependencies when maintenance events are to be scheduled. The introduction shall explain the types of test procedures, manner of monitoring tests, and use of test related fault directories. When a separate depot-level manual is required (see 6.2), it shall include the information required by MIL-DTL-24784 and MIL-DTL-24784/7.

3.6.7 Chapter 6 - System test synopsis. This chapter shall contain a synoptic description of each system test. Each synopsis shall state the objectives of the test and list the significant parameters and functions to be checked. The synopsis shall highlight major test indications and procedures to provide test personnel with the background information necessary for understanding the test and what it is to be achieved by a satisfactory conclusion of the test. The text shall correlate any specific test methods and scope with operational requirements. Any limitation of a given test with respect to assurance of complete operability of the functions involved shall be pointed out. They shall describe briefly how the system shall be manned and what is expected of each participant for efficient conduct of the test.

3.6.7.1 System test data usage. This portion of the manual shall contain and explain the methods for determining and recording system performance on the basis of test results. For tests whose results do not immediately indicate system performance as determined by engineering analysis requirements, there shall be text and illustrations sufficient to permit data to be reduced, analyzed, and evaluated. For test data requiring conversion into a form compatible with fleet reporting requirements, the appropriate procedures shall be included and explained or referenced. Procedures for evaluating tests and test scoring shall be supported by data sheets, charts, graphs, and any other information needed to evaluate the test or perform data reduction. All procedures that are needed for supervisory personnel shall be included. Figure 19-9 is an example of a typical test data sheet used for data reduction. The left half of the sheet shall be used to enter observed information. The right half shall be used for data reduction and shall contain information needed for evaluation of data.

3.6.8 Chapter 7 - Introduction to fault-isolation. The introduction shall explain the concepts and techniques underlying all the types of system fault-isolation material contained in the manual and shall correlate their use with equipment-level troubleshooting diagrams. The introduction shall describe each type of system fault-isolation material and shall provide a sample problem using more than one type to isolate a fault. Legends or explanations of nonstandard symbols, line coding, and block coding used on the diagrams shall be included. An alphabetical system functional directory shall be included.

3.6.9 Chapter 8 - System fault-isolation. This chapter shall contain system fault-isolation procedures, test, or logic diagrams (see MIL-DTL-24784) to provide rapid isolation of a system fault to a specific functional area within an equipment. To facilitate solutions of problems encountered during normal operation or system exercises other than scheduled testing, an Indicator Fault Directory shall be provided. Fault-isolation procedures shall be generated for fault indications that cannot easily be traced back to their source using functional diagrams. FLDs shall be used for this purpose when feasible. In other situations, narrative text or a combination of

logic diagrams and text may be used. If functional explanations are needed to support the procedures, specific references shall be made to the functional description rather than repeating such material.

3.6.9.1 Section 1 - Indicator fault directory. This directory shall relate system fault indications encountered during normal operation or system exercises to the most appropriate documentation for isolation of faults shown by each indicator. The directory shall be presented in tabular form with the system fault indicators arranged by operational modes and by pertinent equipment for each mode, by cross-referencing from equipment output functions in an FLD or an SFD. Every applicable equipment output that is required for system operation shall be listed (see figure 19-10).

3.6.9.2 Section 2 - System fault-isolation procedures. Fault-isolation procedures shall be developed for fault indications observed during system operation or system tests that cannot easily be isolated using the SFD. The procedures should be in the form of FLD, but can be in the form of narrative text or a combination of diagrams and text. Functional descriptions in the description and operation portion of this manual type shall be referred to, as needed, rather than being repeated. This portion shall explain the use of the FLD in terms of relationship and use with other system maintenance documentation. Each FLD shall be preceded by an explanatory description of the isolation procedure involved. This description shall include mention of the functions or conditions leading up to and influencing the initial element of the isolation procedure.

3.6.9.3 System fault logic and troubleshooting-maintenance dependency-matrix diagrams. System FLDs shall be prepared for fault indications observed during either scheduled tests or operation. These diagrams shall isolate the functional area of the equipment at fault and then refer the user to the equipment technical manual containing the information needed to complete the fault-isolation and repair. Each diagram shall include or make reference to information necessary to establish the system test or operating conditions required for starting the fault-isolation procedure. The conclusion boxes shall list the equipment or functional area within a equipment that is the probable source of malfunction and the technical manual reference or references for further isolation and repair of the fault. Troubleshooting-matrix diagrams in accordance with MIL-DTL-24784 may be substituted for or augment FLDs.

3.6.10 Chapter 9 - SFDs. SFDs shall be developed to provide complete coverage of a system in all modes of operation (see figure 19-11). They are to serve as illustrations supporting the detailed functional description and as system troubleshooting reference drawings. Each diagram shall show the generation, transmission, switching, and use of one or more functions on a system basis. An SFD shall show signal flow across equipment interfaces and include those circuits that significantly modify the signal. One-lining, which is the superimposition of two or more wires or circuit elements, shall be used where no loss of clarity is involved. All test points needed for system troubleshooting and all devices such as dials and indicators that are monitored during system testing shall be shown. The correct voltage, waveform, reading, or other condition for each shall be indicated as appropriate. When space on the diagram is insufficient, particularly in the case of test point data for multiple problems or setups of a system test, these data may be provided on associated tabulation sheets. Wiring tabulation sheets that are keyed to the diagrams

shall be used when necessary to list ship's cable and associated wire designations, plus all pertinent terminal board, terminal, and pin and jack numbers entering and leaving subsystems and equipment. An SFD, such as a data functional and control functional, which schematically portray data-gathering paths and control paths through the system, will be largely redundant with the content of equipment manual diagrams, but somewhat greater detail is expected in the individual equipment diagrams. Figure numbers, titles, and sheet numbers are required for SFDs. The tabulation sheets associated with each SFD shall be compiled as a table and appropriately located to enable the best possible use of the SFD. Tabulation sheets may also be identified as sheets of an SFD, bearing the same figure number and title of the SFD. In this case, tabulation sheets shall be located immediately ahead of the associated SFD and shall be the first, second, in sequence, sheet of the SFD.

3.6.10.1 Power distribution SFDs. Power distribution SFDs shall be provided for each power system used to supply power to subsystems or equipment. These SFDs shall show ships power from the generators, or other originating source, through the interconnecting switchboards and weapon control switchboards to the subsystems and equipment. Distribution of each control or reference power system shall be illustrated from source to the equipment and to subunits of the equipment. Depict such signal flow as receive, transmit, RHI display, PPI display, bearing data, antenna rotation, and elevation data. The diagrams shall show all circuit breakers, control relays, transformers, meters, fuses, indicators and lamps. Interconnections between sheets or zones shall be cross-referenced. Wiring tabulation sheets shall list initiating and receiving units, terminal numbers, interconnecting cables, and wire numbers for each diagram. Junction box or connection box numbers shall be listed as required (see figure 19-12).

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

3.6.10.3 Section 1 - System functional directory. A system functional directory shall be developed and located to precede the SFDs (see figure 19-13). The directory shall be an alphabetical tabulation of all system data and control functions. Each entry shall include the following information as applicable for the function.

- a. Name of function.
- b. Fire control symbol derived from NAVSEA OP 1700 (if applicable).
- c. The origin and termination of the function.

- d. Section number in the description and operation portion of this manual type that describes the function.
- e. Test number in the planned maintenance system portion of this manual type that tests the function.
- f. Figure number of SFD that shows the function. Where system functions are identified on SFDs by a number, a numerical system functional directory may be prepared. This directory shall include information contained in this paragraph, items a through f, for the alphabetical directory plus the function number.

3.6.11 Chapter 10 - Introduction to corrective maintenance. The introduction shall describe the principles of test-based system alignment in terms of its vital contribution to system effectiveness, the subsystem interdependencies involved, and the test and troubleshooting documentation required to maintain system alignment. To promote a better understanding of system alignment, the description should point out the distinction between alignments and adjustments. The alignment interdependencies among the various equipment shall be illustrated by a classification chart arranged in a diagrammatic sequence to fully depict the dependency relationships of all alignments affected or related.

3.6.12 Chapter 11 - System corrective maintenance procedure synopsis. This chapter shall contain a synoptic description of each system alignment. Each synopsis shall state the objectives of the alignment and list the initial requirements and the significant parameters or functions to be considered. The synopsis shall highlight major alignment procedures to provide maintenance personnel with the background information necessary for understanding the alignment and what is to be achieved by a satisfactory conclusion of alignment procedures. The text shall identify any additional system alignment procedures to be accomplished prior to, in conjunction with, or subsequent to the subject system alignment.

3.6.13 Chapter 12 - System corrective maintenance procedures. This chapter shall contain the system corrective maintenance (alignment) procedures prepared as textual step-by-step procedures.

4. VERIFICATION

4.1 Quality assurance requirements. The quality assurance requirements for delivery of book plans, review draft copies, preliminary technical manuals, final reproducible copy, technical manuals, replenishment materials, changes and revisions shall be in accordance with MIL-DTL-24784.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military

Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

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

6.1 Intended use. The information and data collected, developed and validated under this specification must be used in the preparation of surface missile system manuals which will provide personnel with the required training and procedures necessary for the operation and maintenance of complete surface missile systems.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of the specification (or any TMCR referencing this specification).
- b. Scope of coverage if other than as specified (see 1.1.1)
- c. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.2.1 and 2.3).
- d. Deliverable products and data items (see 3.3).
- e. Arrangement if other than standardized format (see 3.4).
- f. Format and development instruction if other than as specified in MIL-DTL-24784 (see 3.5)
- g. When other PMS introductory material is required (see 3.6.6)
- h. When a separate depot-level manual is required (see 3.6.6).
- i. Packaging requirements (see 5.1).

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

6.4 Definitions. The words or phrases used throughout this specification are defined in MIL-DTL-24784.

6.5 Subject term (key word) listing.

Installation.
Maintenance.
Operation.
Parts support.
Technical manual.

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

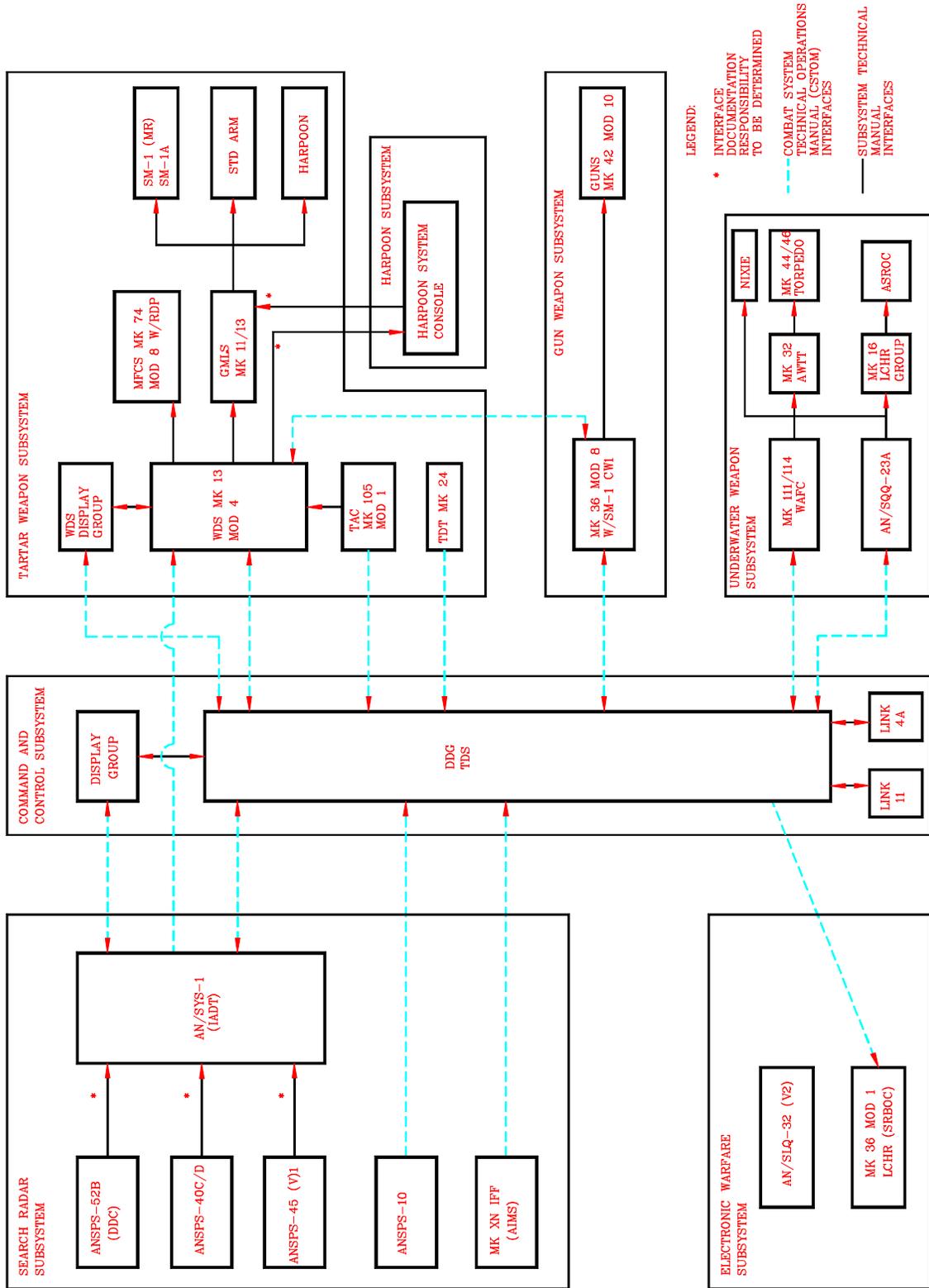
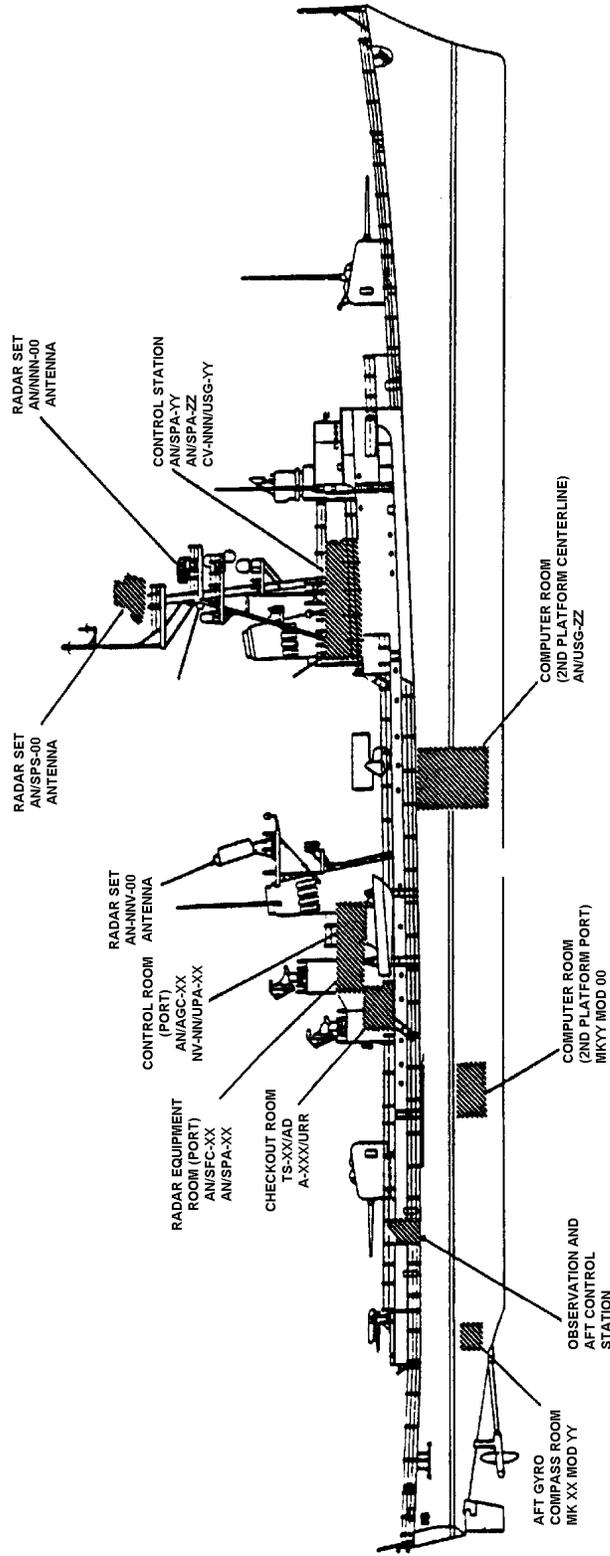


FIGURE 19-1. System block diagram interface documentation.



Sample arrangement only. Type size does not conform to minimum specification requirements.

FIGURE 19-2. System compartments

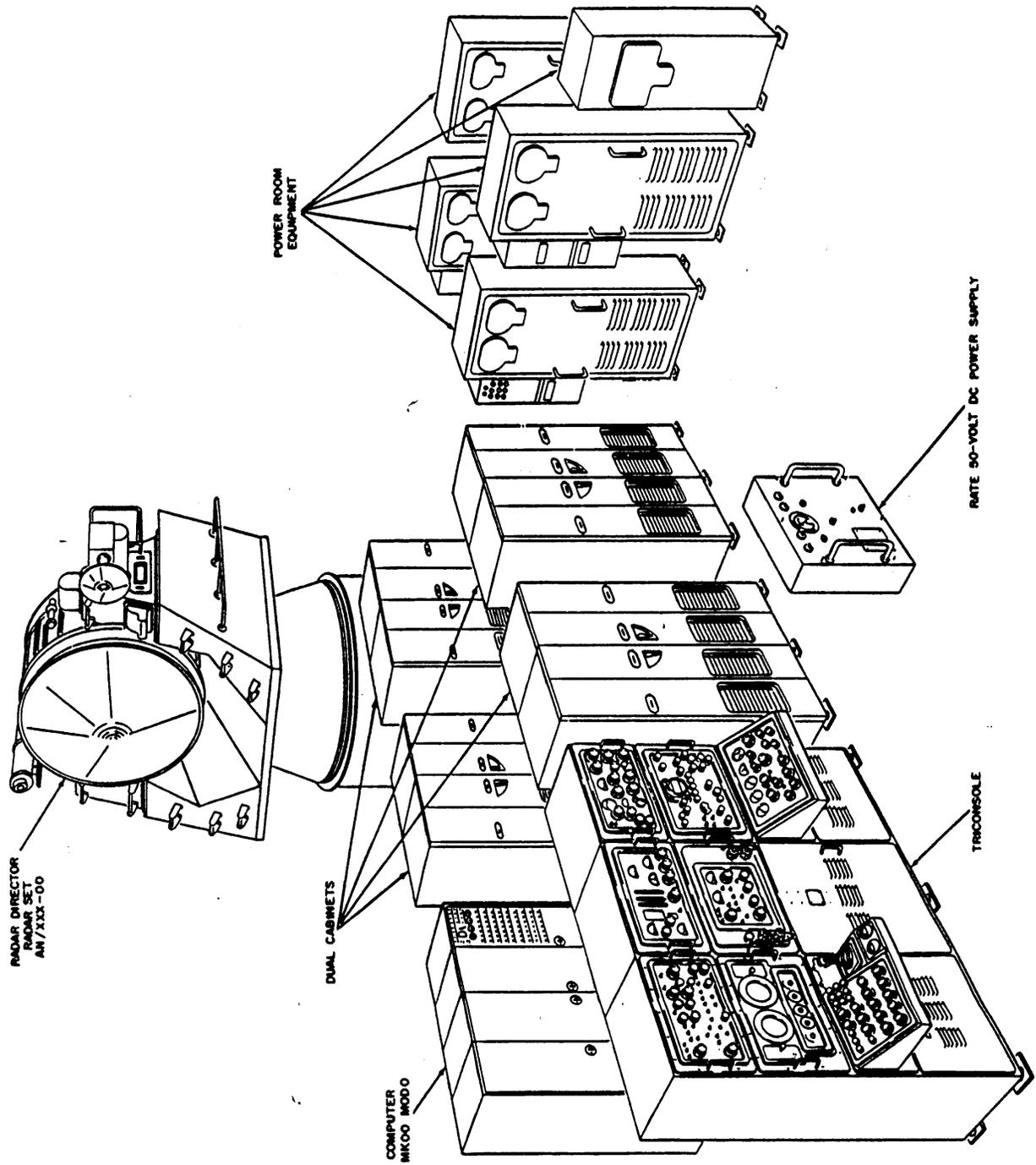


FIGURE 19-3. Compartment areas.

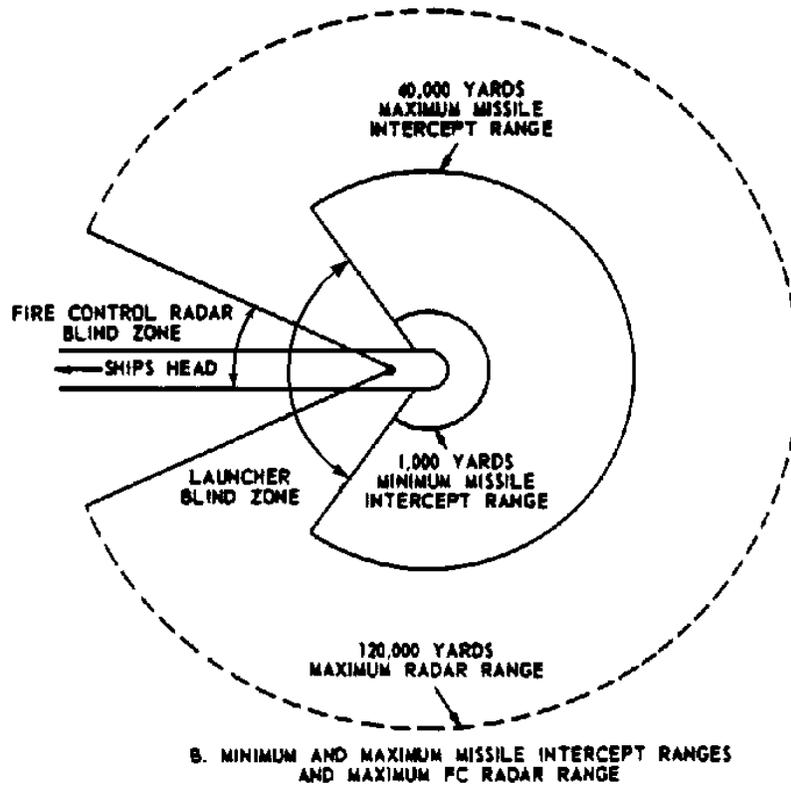
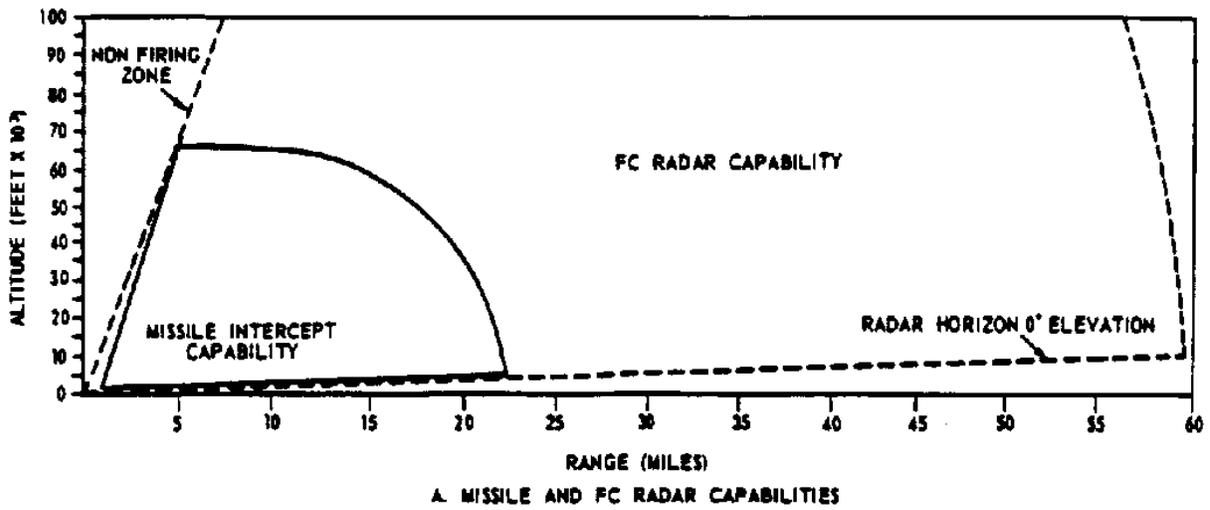


FIGURE 19-4. System capability envelope drawing.

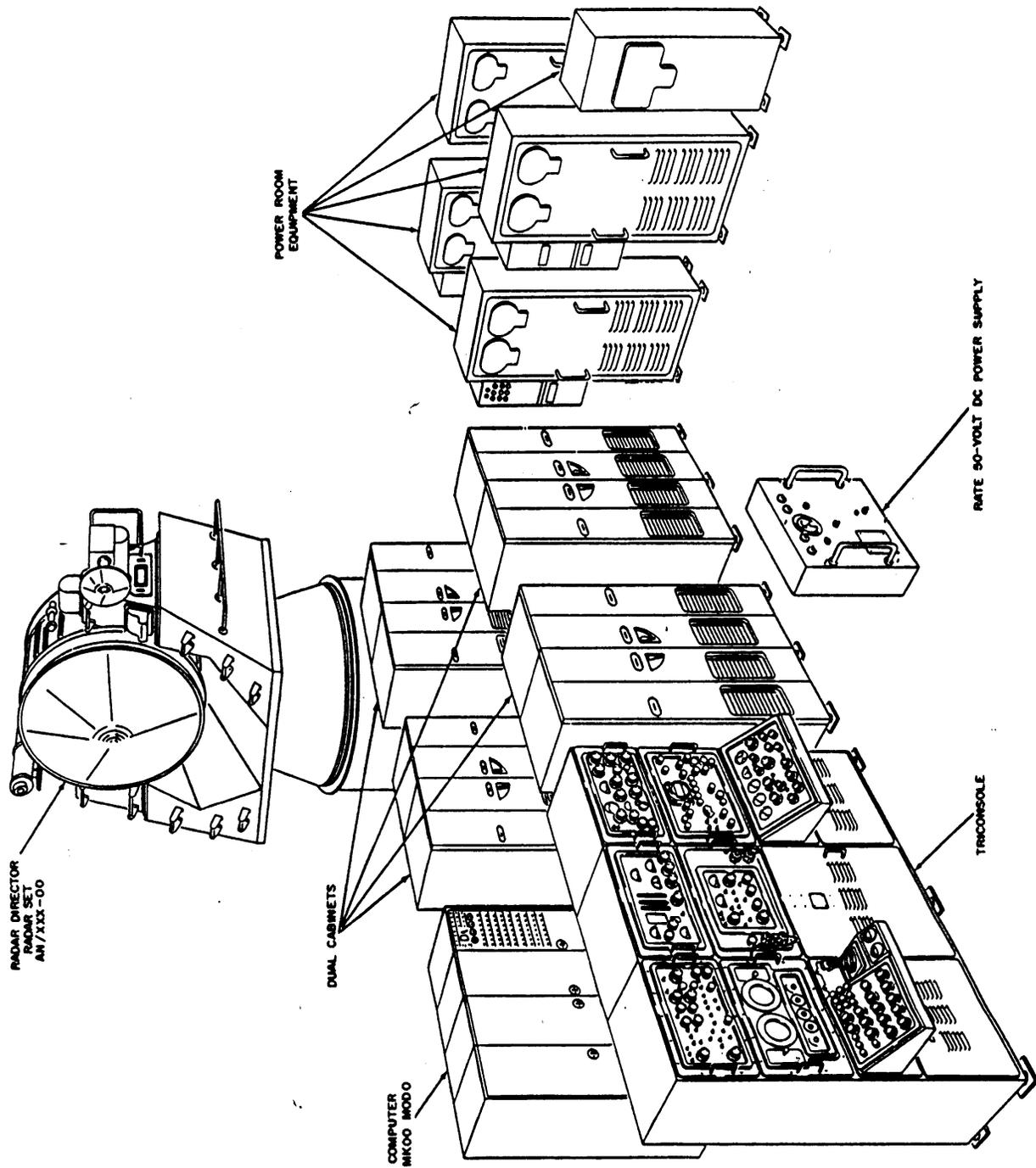


FIGURE 19.5. Weapon system/subsystem/equipment group. (Typical)

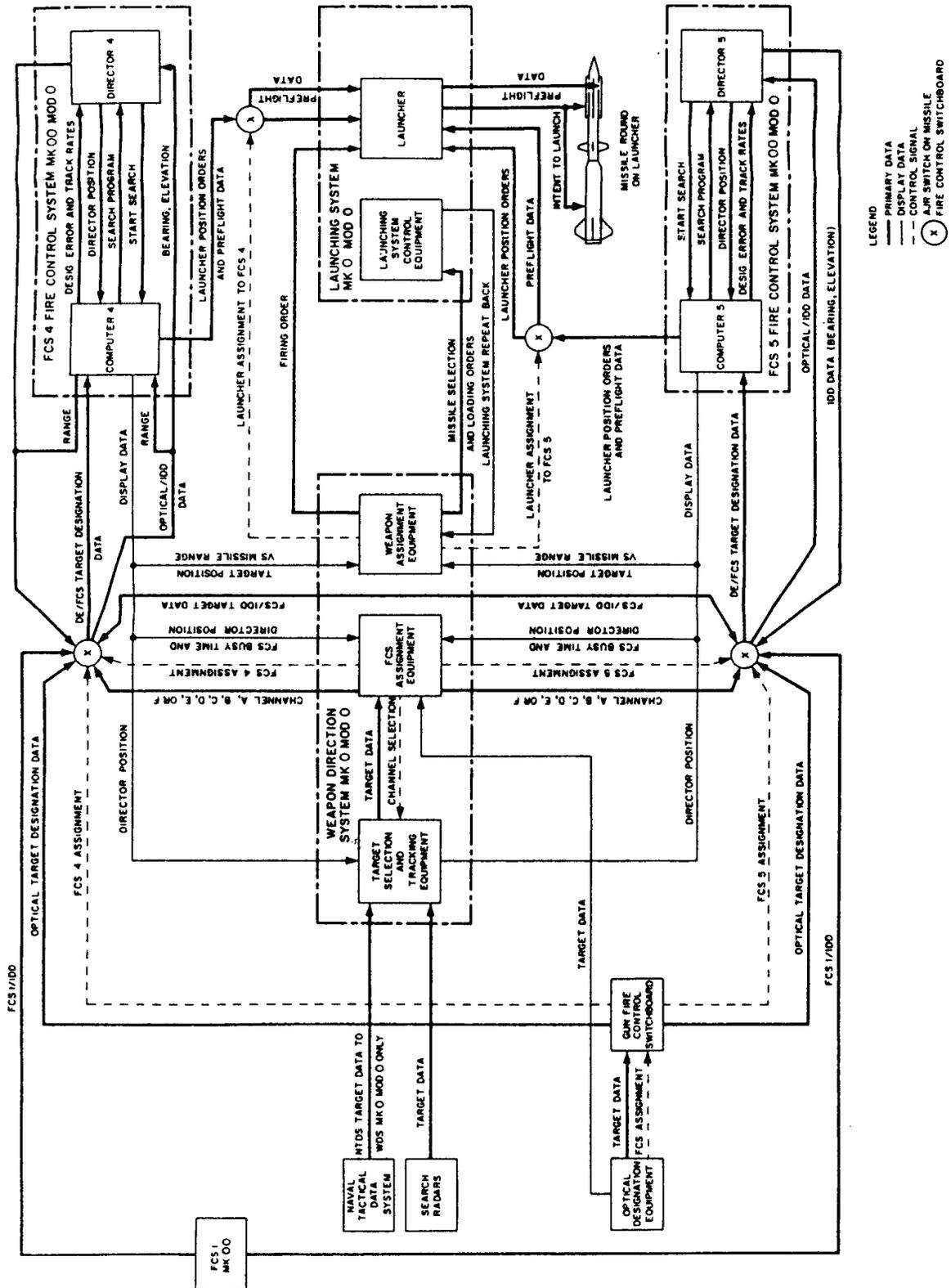
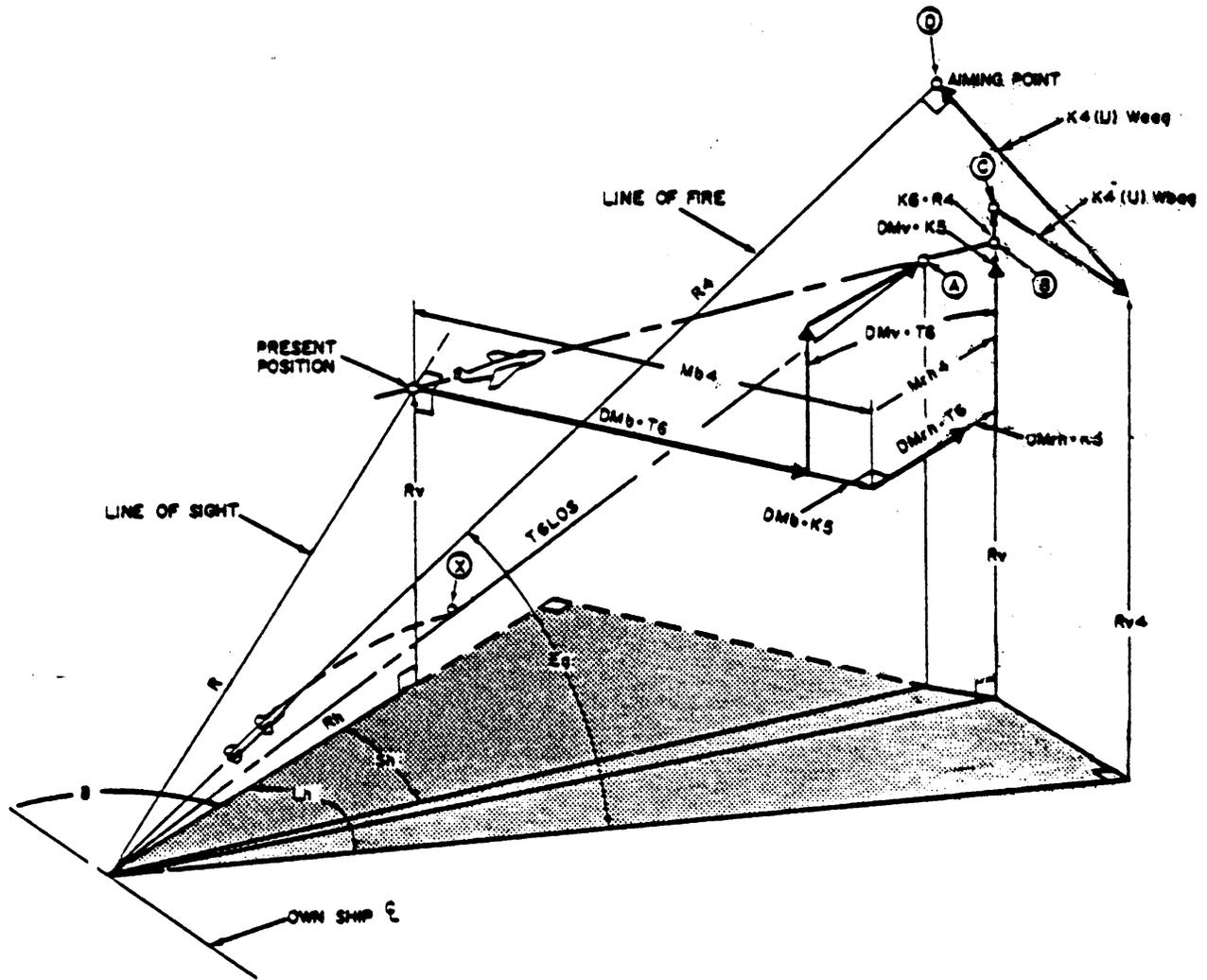


FIGURE 19-6. Functional block diagram, interface



LEGEND:

- (A) TARGET POSITION AT $T\&$
- (B) SPATIAL OFFSET FOR LAUNCHER ROTATIONAL CORRECTION FROM POINT (A)
- (C) SPATIAL OFFSET FOR GRAVITY CORRECTION FROM POINT (B)
- (D) SPATIAL OFFSET FOR WIND CORRECTION FROM POINT (C)
- (X) BEAM INTERCEPT AT $T\&$

FIGURE 19-8. Geometric diagram, simplified.

TABLE __ TEST __ SUMMARY DATA SHEET

- ACCEPTABLE - MARGINAL - FAILURE GREATER THAN - LESS THAN		DATE					
		PROBLEM					
		EQUIP. COMB.					
STEP	DESIRED RESPONSE	LIMIT/TOLERANCE		OBSERVED RESPONSE			
15	(Deviation)	±1 MC					
40	(Deviation)	±100 CPS					
48	(Deviation)	±2%					
81	(DBC)	NA					
92	(Frequency)	NA					
157 IT PC	1. +79.4 VDC 2. +45.0 VDC 3. +78.4 VDC	±1.6 VDC ±1.0 VDC ±1.6 VDC					
160 IT	1. 5.0 VDC 2. 3.3 VDC	±0.1 VDC ±0.07 VDC					
160 BT Sweep	1. Illuminated 2. Extinguished 3. Illuminated	--- --- ---					
162 IT GB	Illuminated	---					
185 BT VNR	1. +66.3 VDC 2. +9.8 VDC 3. +40.0 VDC	+6.6 VDC ±1 VDC ±4 VDC					
186 IT PC	1. 79.4 VDC 2. 45.0 VDC 3. 78.4 VDC	±1.6 VDC ±1.0 VDC ±1.6 VDC					
	TIME COMPLETED						
	ELAPSED TIME						

NOTE: Only one copy of each Test Data Sheet will be provided with the manual.
 Additional copies will be reproduced locally by the particular user.

FIGURE 19-9. Test summary data sheet. (Sample)

NAVORD OP 0000 (PMS/SMS) VOLUME 0

<u>ATTACK CONSOLE MK 53</u>				
Ba Dial			2	9-3.14
MISSILE TRACKING Lamp			2	9-3.7
Ra Dial			2	9-3.14
Rm Dial			2	9-3.14
<u>BATTERY CONTROL UNIT MK 119</u>				
FCS2-IT LAMP			3	9-4.4
FCS2-SM1 Lamp			3	9-4.4
FCS2-SM1A Lamp			3	9-4.4
IT Lamp			3	9-4.4
SM1A Lamp			3	9-4.4
SM1 Lamp			3	9-4.4
<u>BEARING INDICATOR MK 22</u>				
Cqo Dial			3	9-5.2
<u>CASUALTY CONTROL UNIT MK 121</u>				
IT Lamps			3	9-4.4
SM1 Lamps			3	9-4.4
SM1A Lamps			3	9-4.4
SURF Lamp			2	9-3.11
<u>CHANNEL SELECTOR MK 4</u>				
CH MATCHED LAMP	1	8-2.13	3	9-4.7
CHANNEL 1-19 Lamps	1	8-2.8	3	9-4.7
END OF BAND			3	9-4.7
MANUAL OVERRIDE LAMP			3	9-4.7
<u>COMPUTER MK 42</u>				
E Dial			2	9-3.5
R Dial			2	9-3.4
<u>COMPUTER MK 118</u>				
a Dial				9-4.1
A ORDER Dial				9-4.3
AIR READY Lamp	1	8-2.1	2	9-2.7
B Dial (Air Ready)			2	9-2.6
B Dial (Normal Desig.)			2	9-3.1
B Dial (Search)			2	9-3.10

FIGURE 19-10. Indicator fault directories. (Sample)

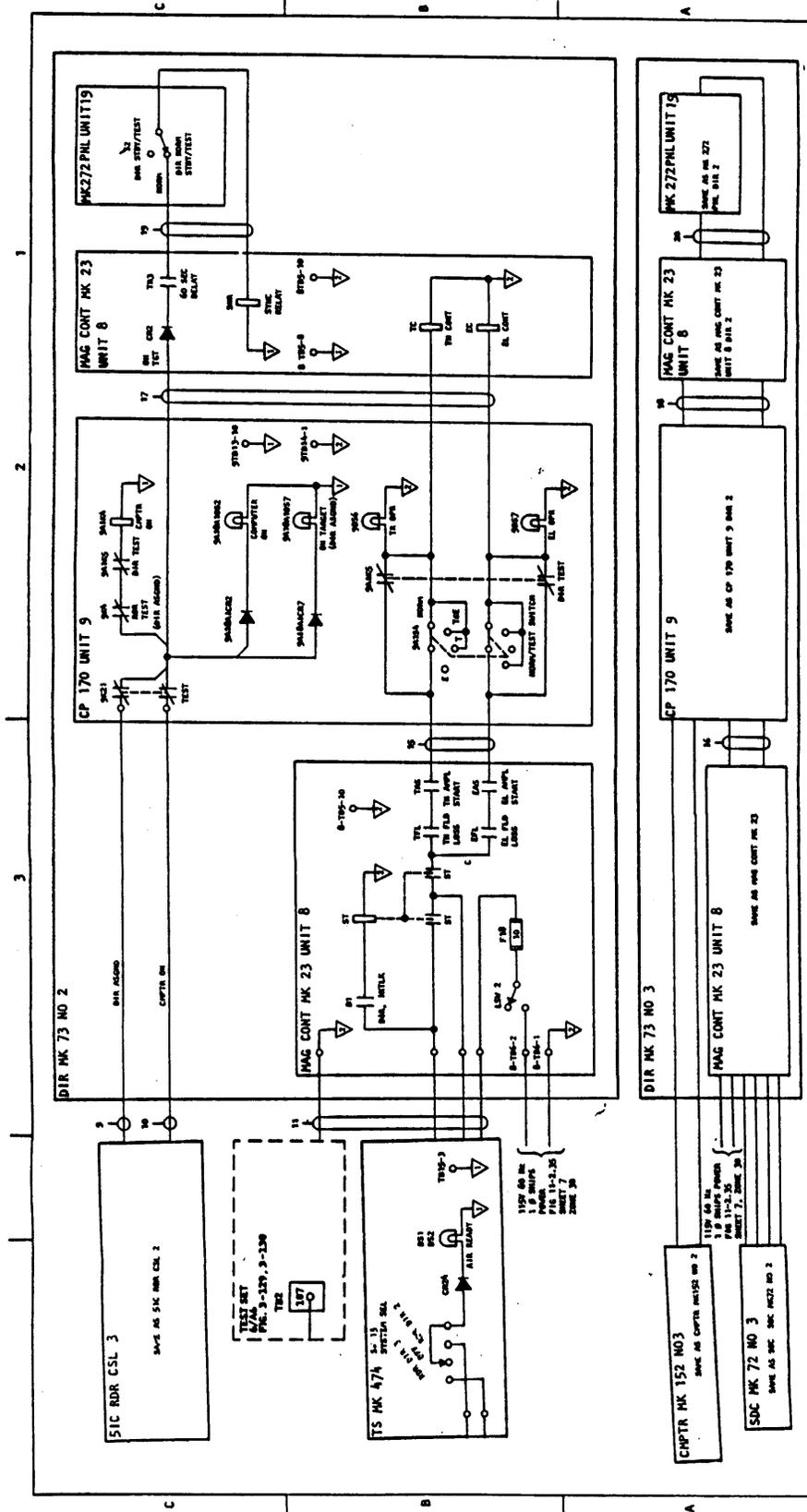


FIGURE 19-11. System functional diagram. (Sample)

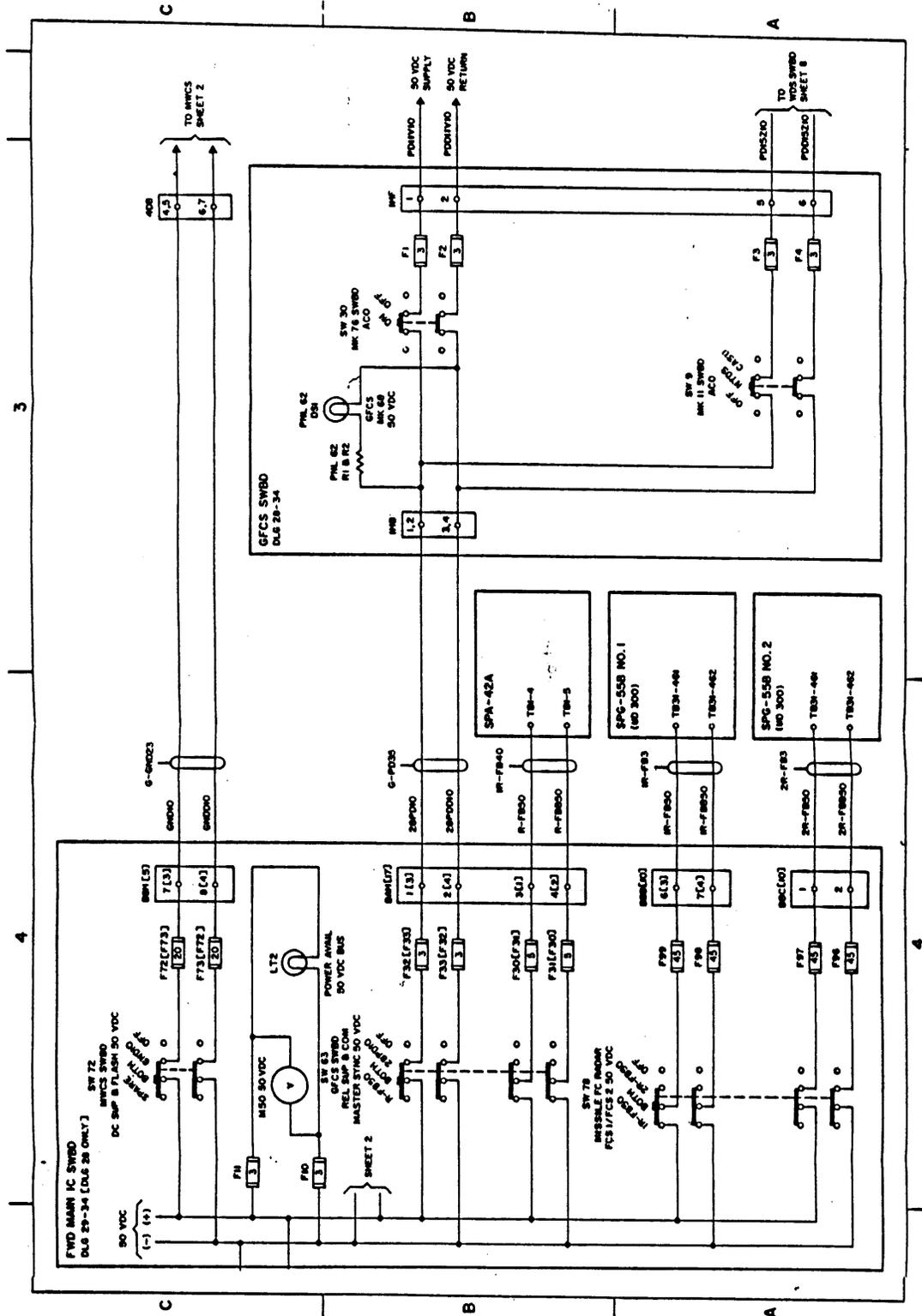


FIGURE 19-12. System function diagram - power distribution. (Sample)

TABLE 11-1.1. SYSTEM FUNCTION DIRECTORY FOR DDG 2-14 CLASS SHIPS (Continued)

FUNCTION NAME	SYMBOL	ORIGIN, TERMINATION	VOLUME 1 FUNCTIONAL DESCRIPTION SECTION NUMBER	VOLUME 2 MRC NUMBER	VOLUME 3 SFD FIGURE NUMBER
DECREASE RANGE		Fm: C152 To: RDR DC V1a: SDC 72	3-6	W-1 thru W-12	11-1.11 11-1.17 11-1.20
DELAY TIME	T8	Fm: WDE To: C152 V1a: WCSB(M) SDC 72	3-12	M-2	11-1.22
DESIGNATED DIRECTOR ELEVATION	d(Ed')	Fm: TDT To: D68 V1a: WCSB(G) RDR 53	3-6	R-2	11-1.15
DESIGNATED DIRECTOR ELEVATION IDD	d(Ed')	Fm: C152 2/3 To: C152 3/2	3-6		11-1.17
DESIGNATED DIRECTOR TRAIN	d(Bd')	Fm: TDT To: D68 V1a: WCSB(G) RDR 53	3-6	R-2	11-1.14
DESIGNATED DIRECTOR TRAIN IDD	d(Bd')	Fm: C152 2/3 To: C152 3/2	3-6		11-1.17
DESIGNATED ELEVATION	d(E)	Fm: C47 To: C152 V1a: WCSB(M) WCSB(G) SDC 72	3-6		11-1.11

FIGURE 19-13. System functional directory. (Sample)

Custodian:
Navy - SH

Review Activity:
Navy - EC

Preparing activity:
Navy - SH
(Project TMSS-N325)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

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

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

I RECOMMEND A CHANGE:

1. DOCUMENT NUMBER
MIL-DTL-24784/19B (SH)

2. DOCUMENT DATE (YYYYMMDD)
15 February 2002

3. DOCUMENT TITLE HULL,
SURFACE MISSILE SYSTEM MANUAL REQUIREMENTS

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

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (*Last, First, Middle Initial*)

b. ORGANIZATION

c. ADDRESS (*Include Zip Code*)

d. TELEPHONE (*Include Area Code*)

7. DATE SUBMITTED
(YYYYMMDD)

(1) Commercial
(2) DSN
(if applicable)

8. PREPARING ACTIVITY

a. NAME

SEA 05Q

b. TELEPHONE (*Include Area Code*)

(1) Commercial (2) DSN
(202) 781-3726

c. ADDRESS (*Include Zip Code*)

Commander, Naval Sea Systems Command
ATTN: SEA 05Q, 1333 Isaac Hull Ave SE Stop 5160,
Washington Navy Yard DC 20376-5160

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Defense Standardization Program Office (DLSC-LM)
8725 John J. Kingman Road, Suite 2533,
Fort Belvoir, VA 22060-6221
Telephone (703) 767-6888 DSN 427-6888