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DOD AUTOMATED INFORMATION SYSTEMS (AIS) DOCUMENTATION STANDARDS



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FOREWORD

1. This military standard is approved for use by all Departments and Agencies of the Department of Defense.
2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, U.S. Army Information Systems Engineering Command (ATTN: ASQBI-TS), Fort Belvoir, VA 22060-5456, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.
3. This military standard supersedes DOD-STD-7935 of 15 February 1983, issued under the authority of DoD Instruction 7935.1, "DoD Automated Data Systems Documentation Standards." The following is a list of major changes that have been incorporated into this revision:
 - a. An End User Manual has been added. This document is directed toward functional users of automated information systems (AIS) who access their systems through terminals.
 - b. The Database Specification document has been totally revised to make it useable as a specification for a database that will be accessed by a database management system (DBMS) and also as a "living" reference document for an existing "corporate database." Any data banks that are developed for individual applications systems should be documented in the other document types such as the System Specification.
 - c. The document type for the Data Requirements Document has been eliminated due to the extensive information available with the Database Specification.
 - d. All document types have been revised to eliminate or reduce the emphasis on batch processing and reorient the standard to the use of terminals as I/O devices and to the use of advanced software technology. New or increased information requirements have been added to each document type for security, continuity of operations, and communications.
 - e. The complexity chart, which is used for tailoring the documentation required for individual development efforts, has been revised to add a new factor of communications requirements, add the use of terminals as I/O devices, change the nature of the other requirements to the current state of the art, and add a "zero" level complexity which, if a system qualifies based on its metrics, can greatly reduce the number of document types needed to support the development effort.

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f. A discussion of how to document systems that use off-the-shelf software has been included along with a recommendation that documentation be prepared using electronic media.

g. A short discussion has been included on using the standard when a "waterfall" life cycle model is being used or when the system will be developed using prototyping.

h. The term "software unit" has been used to replace the term "program" as a generic description for any logical grouping of code. This will allow system developers to define the extent of the code they should include in one Software Unit Specification (formerly the Program Specification) to make the document more useful for the target environment. The term "program" has come to be associated with an independently compilable set of code. This concept is not universally accepted in the current state of the art.

4. The data item descriptions (DIDs) applicable to this standard are listed in Section 6.

5. The following principal and alternate members of the Information Processing Standards for Computers (IPSC) committee for IPSC Project 0061 represented their DoD Component during all or most of the development of this revision of this standard:

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1. SCOPE

1.1 Purpose. These standards provide guidelines for the development and revision of the documentation for an automated information system (AIS) or applications software, and specify the content of each of the 11 types of documents that may be produced during the life cycle of an AIS.

1.2 Applicability. These standards apply to both internal and contractual development efforts by the Military Departments, Office of the Secretary of Defense, Organization of the Joint Chiefs of Staff, and the Defense Agencies of the Department of Defense (DoD), collectively known as DoD Components; and to the managers and technicians at all levels concerned with the development, modification, operation, testing, implementation, and maintenance of an AIS or applications software. These standards cover all types of technical documents for an AIS, applications software, and revisions thereto; as well as the use of existing or developed standards for each document type listed in Section 5. These document types are designed for an AIS that normally runs on general purpose computers. Excluded from the Scope are the life cycle management planning and project request documentation as discussed in Section 4.

1.3 Objectives. The objectives of these standards are to ensure:

- a. That technical information needed by readers such as users, managers, technical staffs, maintenance personnel, and systems engineers is provided.
- b. That consistent organization is used to present this information to facilitate reference and provide a basis for configuration management.
- c. Economy and efficiency in documentation by permitting managers to apply flexibility in tailoring the standards to satisfy their needs within the framework of their DoD Component implementations.

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2. REFERENCED DOCUMENTS

2.1 Government documents.

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

STANDARDS. FIPS PUB 11-2, Guideline: American National Dictionary for Information Processing (Note 1 of 2.1.2)

HANDBOOKS. None

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

DoD Directive 3020.26, "Continuity of Operations Policies and Planning," October 24, 1985 (Note 2)

DoD Directive 5200.28, "Security Requirements for Automated Information Systems (AISs)," March 21, 1988 (Note 2)

DoD Directive 5400.11, "Department of Defense Privacy Program," June 9, 1982 (Note 2; the text of this directive is also contained in Title 32, Code of Federal Regulations, Part 286a)

DoD Directive 7920.1, "Life Cycle Management of Automated Information Systems," June 20, 1988 (Note 2)

DoD 5200.1-R, "DoD Information Security Program," June 7, 1982 (Note 1)

DoD Manual 5200.28-M, "ADP Security Manual (C3I)," January 1973 (Note 3)

DoD Standard 5200.28-STD, "Department of Defense Trusted Computer System Evaluation Criteria," December 26, 1985 (Note 4)

DoD Instruction 7041.3, "Economic Analysis and Program Evaluation for Resource Management," October 18, 1972 (Note 2)

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DoD Instruction 7920.2, "Major Automated Information Systems Approval Process," October 20, 1978 (Note 2)

DoD Instruction 7920.4, "Baselining of Automated Information Systems (AIS)," March 21, 1988 (Note 2)

DoD Instruction 7935.1, "DoD Automated Data Systems Documentation Standards," September 13, 1977 (Note 2)

Note 1: Application for copies should be addressed to the National Technical Information Service (NTIS), Springfield, VA 22151

Note 2: Application for copies should be addressed to the Commanding Officer, Naval Publications and Forms Center, Attn: NPFC 3015, 5801 Tabor Ave., Philadelphia, PA 19120

Note 3: Application for copies should be addressed to the Office of the Secretary of Defense (OSD/WHS-Directives Division), The Pentagon-Room 2A286, Washington, DC 20301-1155

Note 4: Application for copies should be addressed to the National Computer Security Center, Office of Standards and Products, Attn: Chief, Computer Security Standards, Fort Meade, MD 20755-6000

2.2 Non-Government publications. None

2.3 Order of precedence. In the event of a conflict between the text of this standard and the references cited herein, the text of this standard shall take precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

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3. DEFINITIONS

3.1 Applications software. Synonym for software unit.

3.2 Automated information system (AIS). A combination of information, computer and telecommunications resources and other information technology, and personnel resources which collects, records, processes, stores, communicates, retrieves, and displays information.

3.3 Computer program. Synonym for program.

3.4 Data bank. A comprehensive collection of libraries of data, often a flat file, but usually containing only data to support one application rather than the enterprise. Contrast with database.

3.5 Database. A collection of data fundamental to an enterprise usually with a supporting database management system (DBMS). Contrast with data bank.

3.6 Program. A separately compilable, structural (closed) set of instructions most precisely associated with early generations of computers. Synonymous with computer program. Contrast with software unit.

3.7 Software unit. Any logical set or grouping of instructions to a computer, such as a module or package. Synonymous with applications software. Contrast with program.

3.8 Definitions of acronyms used in this standard. The following acronyms listed in this Military Standard are defined as follows:

- a. ADPE - automatic data processing equipment
- b. AIS - automated information system
- c. COMPUSEC - computer security
- d. COMSEC - communications security
- e. DBMS - database management system
- f. DDL - data definition language
- g. DoD - Department of Defense
- h. DODD - Department of Defense directive
- i. DODI - Department of Defense instruction
- j. DS - Database Specification

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k.	EM	-	End User Manual
l.	FD	-	Functional Description
m.	FIPS	-	Federal Information Processing Standard
n.	IP	-	Implementation Procedures
o.	MNS	-	mission need statement
p.	MM	-	Maintenance Manual
q.	OM	-	Computer Operation Manual
r.	OPSEC	-	operations security
s.	PT	-	Test Plan
t.	RT	-	Test Analysis Report
u.	UM	-	Users Manual
v.	US	-	Software Unit Specification

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4. GENERAL REQUIREMENTS

This section should be read by the managers who are responsible for the documentation of an AIS project and by those personnel who are to prepare the documentation that describes particular applications software. Section 6 contains tailoring information.

4.1 Need for AIS documentation and standardization. Some of the purposes that AIS documentation and standardization serve are to:

- a. Provide managers with documents to review at significant developmental milestones to determine that requirements have been met and that resources should continue to be expended.
- b. Record technical information to allow coordination of later development, use, and modification of the AIS.
- c. Provide authors of documents and managers of project development a guide to follow in preparing and checking documentation.
- d. Provide uniformity of format and content of AIS documentation throughout DoD Components.

4.2 Understanding and reviewing AIS documents. It is recommended that discussions of the purpose and use of this publication be held with managers and the authors of the AIS documents. In addition, they both must review the documents to be produced in compliance with these standards to ensure that they contain the information necessary for that AIS and that the information will be useful.

4.2.1 General considerations on document planning.

4.2.1.1 Manager. The manager of an AIS developmental project should ensure that:

- a. A documentation plan is developed early in the process of project development, including:
 - (1) Which document types will be produced and their appropriate level of detail.
 - (2) The dates that these documents must be available.
 - (3) Quality assurance procedures, as applicable.
- b. The draft documents are reviewed periodically to ensure that they are being prepared properly and in a timely manner.

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4.2.1.2 Authors. The authors of an AIS document of one of the types discussed herein should ensure that they have:

- a. An understanding of its relationship to the other necessary documentation.
- b. An understanding of the overall content required in the document that is to be prepared. Frequently, a section within a document that is intended to be very general is written before a later section that is intended to provide specifics. This often leads to the inclusion of too much detail in the general section. This can be avoided by reviewing the outline of the document type before writing is begun.
- c. An understanding of the audience who will use the document. For example, although "input" is discussed in the Users, Computer Operation, and Maintenance Manuals, the detail presented in each is different since each is intended to be used by a different audience.

4.2.2 Review and maintenance of documents. When documents have been prepared describing an AIS they should be:

- a. Reviewed to ensure their adequacy, completeness, and adherence to the applicable standards. Pertinent comments should then be returned to the originator of the document.
- b. Maintained and updated as modifications to the AIS occur.

4.2.3 Timeliness.

a. Philosophy. For accounting purposes, the process of documentation is often identified as a separate phase of project development. This gives the unfortunate impression that nothing need be done to write or prepare documents until the last stages of a phase of project development. It must be recognized by all personnel involved in project development, particularly the project manager, that documentation is a continuing part of the development effort. Additions to the draft documents should be made as frequently as possible to avoid the problem of requiring a concerted effort to begin the preparation of the necessary documents after programming has been completed. The Documentation Standards are arranged to allow the evolutionary creation of the necessary portions of the supporting documents.

b. Technique. When it is anticipated that a document will be formalized for managerial review in the future, the evolutionary information should be added to the draft, which may take the form of a working paper in a notebook, in modular fashion, as it becomes known.

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4.2.4 Redundancy. A comparison of the document types contained in the Documentation Standards shows a certain amount of redundancy. Introductory material is included in each document type to provide the reader with a frame of reference for reading the rest of the document. This information is included to provide "stand-alone" documents with a minimum of need for cross-referencing, although cross-referencing is allowed. There is also apparent redundancy in that most document types specify that a description of inputs and outputs, a software summary, and the like, be included. The actual information that should be included for each of these items in the various document types is different, however, since the information is intended to be read by different audiences and must, therefore, be prepared using the terminology that is suited to the appropriate audiences. If, however, the audiences are essentially the same, cross-referencing is allowed.

4.2.5 Security considerations. Security must be considered during the entire AIS life cycle and addressed in each document type. In this publication use of the term "security" includes the protection of information discussed in both a and b, below, as well as any other information that must be protected by law or regulation. An AIS is protected in order to preserve the availability, integrity, and confidentiality of the system and the information it contains. Protection is the application of the totality of all security disciplines including communications security (COMSEC), control of compromising emanations (TEMPEST), computer security (COMPUSEC), operations security (OPSEC), information security, personal security, and resource protection. When the phrase "security and privacy" is used, it is to emphasize that "privacy" should receive special consideration, but does not imply that use of the term "security" by itself does not include privacy considerations.

a. National security information. DoD 5200.1-R sets forth the policies and procedures governing the DoD information security program. DoD policies and considerations for protecting classified National Security Information stored or processed by an AIS are contained in DoD Directive 5200.28, DoD Manual 5200.28-M, and DoD Standard 5200.28-STD.

b. Privacy Act of 1974 information. Privacy considerations are implemented by DoD Directive 5400.11.

4.2.6 Contingency operations. Sometimes, part or all of a system's automated functions must be restored quickly at an alternate facility because of emergency, disaster, accident, or extended equipment malfunction. If a system is designed to facilitate quick recovery of capabilities, supporting features in the design should be clearly identified throughout the documentation.

a. The authors of each document type are reminded to be aware of the requirements of DoD Directive 3020.26,

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Continuity of Operations Policies and Planning, to assure continuity of operations in any national emergency situation so that the performance of the AIS functions and operations can continue without degradation or interruption.

- b. The authors of each document type are also reminded that conditions such as war, exercises, mobilization, and civil defense emergencies could affect usual AIS processing. These conditions must be considered in establishing design and documentation requirements such as run frequency or sequence, the type and quantity of inputs and outputs, the real time attributes, and the elimination of existing requirements.
- c. Documentation of contingency operations prepared according to this standard is intended to give technical details needed to prepare plans for continuity of operations and disaster recovery. AIS documentation is not intended to substitute for such plans. In describing alternate site operations in the Users Manual (UM), End User Manual (EM), and Computer Operation Manual (OM), the usual approach will be to state resource requirements for generic types rather than specific alternate sites and contingencies. However, actual alternate facilities can be described together with actions to be taken to transfer operations to these sites if the alternate facilities are identified at the time the UM, EM, and OM are written.

4.3 AIS project life cycle. DoD Directive 7920.1, Life Cycle Management of Automated Information Systems (AIS), prescribes life cycle phases for an AIS. These life cycle phases are shown in Figure 4-1. The stages have been added for the purpose of discussing the document types identified in this standard. Each AIS, without regard to size or level of managerial control, evolves through the depicted life cycle phases; however, the degree of formal documentation or even the recognition of the phases may vary considerably. The presentation contained herein only represents that portion of life cycle management as it applies to AIS documentation. Complete information for life cycle management is contained in DoD Directive 7920.1.

4.3.1 Need Justification Phase. Early in the development of a selected or major AIS, DoD Directive 7920.1 requires the development of a Mission Need Statement (MNS). The MNS format is included in the directive. For those systems not requiring a MNS, an adaptation of a MNS or some form of a project request will be prepared.

4.3.2 Concepts Development Phase. The purpose of this phase is to synthesize (or solicit) and evaluate alternate methods to accomplish the function documented in the approved MNS or project request. During this phase DoD Instruction 7920.2,

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Phase	Need Justification	Concepts Development	Design		Development			Deploy- ment	Oper- ations
Stage			Definition	Design	Development and Integration	Test	Evaluation		

Note: See Figure 6-3 for the relationship of the life cycle to document preparation and use.

FIGURE 4-1. The AIS development life cycle.

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Major Automated Information Systems Approval Process, requires the preparation of a System Decision Paper for major or selected systems which is updated throughout the life of the system to support appropriate policy involvement. When the System Decision Paper is not required, appropriate documentation should be available for managerial review. Also required in this phase is a detailed Functional Description.

4.3.3 Design Phase. The purpose of this phase is to define fully the functional requirements and to design an operable AIS. This phase is subdivided into two stages. In the Definition Stage the functional requirements to be automated are described and data elements and any data collection efforts are identified. In the Design Stage the functional requirements are further developed and refined. The entire phase is completed when AIS and telecommunications technical adequacy have been validated and approved.

4.3.4 Development Phase. The purpose of this phase is to develop, integrate, test, and evaluate the AIS. During the Development and Integration Stage the operation, use, and maintenance information is developed. In the Test Stage the test requirements are developed, the scope of the test is identified, and the AIS is then tested. The AIS is evaluated during the Evaluation Stage.

4.3.5 Deployment Phase. The purpose of this phase is to install the AIS at all approved locations.

4.3.6 Operations Phase. The purpose of this phase is to operate and maintain the AIS using configuration management procedures.

4.4 Project complexity. Deriving a true index of the complexity or size of the project is very difficult as many of the measurements to be used can be accurately determined only after the project has been completed. Since the documentation needed for a project depends in part on the complexity of the project, the factors involved in project complexity must be analyzed before determining which documents will be produced. A tool for determining project complexity as related to the necessary documents is presented in Section 6.

4.5 Document audiences. The following discussion of audiences is intended to be general since particular environments may have different titles for their personnel. When each document is written, the function of the audience that will use that document must be considered to ensure that the information is presented using appropriate terminology and to an adequate level of detail.

a. **Audience types.** Each document type is produced for and read by a particular audience. An audience may be an individual

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or a group of individuals. The two audiences involved in all AIS projects are the Development Group and the User Group.

- (1) The Development Group may be DoD or contractor personnel. As a minimum, this group performs the design and programming functions.
- (2) The User Group is usually a DoD office that has requested the development of a project. As a minimum, it contains those who provide inputs to the AIS and those who utilize the outputs from the AIS. The User Group includes not only those who routinely perform these tasks but also those who may have to accomplish them after an emergency, disaster, or accident.

b. Audience composition. Regardless of the organizational relationships between the Development Group and the User Group, the functions of the two are separate. Both of these groups may consist of personnel with separate titles and functions that include the following:

- (1) Manager - responsible for the official organizational position and for approval.
- (2) Staff - responsible for assisting the manager in nontechnical matters and for using the products of the software.
- (3) Analyst - responsible for assisting the manager in technical matters and for providing guidance to the staff.
- (4) Programmer - responsible for developing the coding for the original or revised software.
- (5) Operator - responsible for running the software.

4.6 Document types. The following paragraphs provide a discussion of the document types that may be produced during the evolutionary development of applications software. It must be emphasized that the need for any one of these documents must be determined from the nature of the project using the guidance provided in Section 6.

4.6.1 Functional Description.

a. Preparation. A Functional Description (FD) is normally prepared for any system requiring a basis for mutual understanding between the Development Group and the User Group of a proposed AIS. It reflects the definition of the system requirements and provides the ultimate users with a clear statement of the operational capability to be developed. If the

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scope of the FD is changed at any point, the FD should be updated and receive user concurrence.

b. Uses. The FD is a tool for use by both computer and noncomputer-oriented personnel and should be written as much as possible in noncomputer-oriented language, since many elements of the document will be subject to review by staff personnel who do not necessarily have a computer background.

4.6.2 System/Subsystem Specification.

a. Preparation. A System Specification or Subsystem Specification (SS) is prepared to guide the development of large projects. If the system breaks down readily into subsystems, this document type is used to prepare individual Subsystem Specifications. A subsystem is the logical breakdown of a system into separate areas of responsibility, such as functions, where each break down is composed of a software unit or series of units. If individual Subsystem Specifications are prepared, they may at some point be bound together to form a System Specification or a separate System Specification may be written. It may not be necessary to break down some systems into smaller components because they are already of a manageable size. In these cases this document outline may be used to write a System Specification.

b. Uses. The SS is a technical document prepared for the Development Group. It is to be as detailed as possible concerning the environment and design elements in order to provide maximum guidance to the software design effort. This document also defines system/subsystem interfaces. It is anticipated that the SS will present more detailed data than the FD as a result of the continuing design effort, but it should be noted that any modifications to the scope of the system should be submitted as changes to the FD. Subsystem Specifications will consider only those segments of the FD that are applicable to the particular subsystem.

4.6.3 Software Unit Specification.

a. Preparation. A Software Unit Specification (US) is written after an SS to expand on its requirements or without any SS having been prepared. The US may present modifications from the FD, but it should be noted that any modification to the scope of the system should be submitted as a change to the FD.

b. Uses. The US is a technical document. The amount of detail to be included is dependent upon the use to be made of the document within the particular project for which it is prepared. The intent of a US is to guide software development. It is anticipated that the US will present more detailed information than the FD and related SS as a result of the detailed software design. Furthermore, a US will consider only

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those segments of an FD or SS that are applicable to the particular software unit.

4.6.4 Database Specification.

a. Preparation. A Database Specification (DS) is generally prepared when many analysts and programmers will be involved in writing software that will utilize the same database. Due to its comparative simplicity, a data bank is normally documented within an SS rather than a DS.

b. Uses. The DS is a technical document prepared for AIS personnel. It is sufficiently detailed to permit software coding and database generation by the Development Group. The DS may be used to document a corporate database for use by a wide variety of personnel over the life of the database. Since this document is intended to cover all types of systems, it does not make specific data or presentation formats mandatory. Developers of any given system are best qualified to devise the physical formats most useful and comprehensible to project personnel.

4.6.5 Users Manual. The primary purpose of the Users Manual (UM) is to serve the needs of the User Group. Sections 1 and 2 of the UM present general and specific information on a specific computer software system, and are directed toward an organization's general management and staff personnel who have no need for detailed technical information concerning system implementation or operation. Sections 3 and 4 of the UM address staff personnel, but are more detailed in the discussion about how to provide input to the system; respond to system requests for information; and use system outputs. Instructions for the operation of specific consoles or terminals may be included in Section 5. The requirement in the UM for showing the layout of each output should be tempered for terminal-driven systems. These systems may have numerous optional screen formats. A copy of each may be unnecessary. The user may be adequately served by providing samples of format types.

4.6.6 End User Manual.

a. Preparation. An End User Manual (EM) is normally prepared when there is a single type of user who must accomplish a wide variety of tasks in the entry of data, specification of outputs, and operation of information system equipment such as a terminal or personal computer. An EM is oriented to presenting step-by-step procedures. For systems whose operation is accomplished by the end user without the need for assistance or AIS-specific controls by a computer operations staff, preparation of a Computer Operation Manual may not be necessary.

b. Uses. The EM is a document presenting technical details on the procedures needed to use an AIS and to operate any

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information system equipment such as a terminal or personal computer.

4.6.7 Computer Operation Manual. The Computer Operation Manual (OM) contains precise and detailed information on the control requirements and operating procedures necessary to successfully initiate, run, and terminate the subject system. It is directed toward supervisory and operator personnel who are responsible for the efficient performance of their organization's computer center. These readers are primarily interested in detailed information on the external characteristics and operating procedures of applications software. In general, the manual should be written in a step-by-step fashion in order to clarify and emphasize the procedures associated with the applications programs. Supporting illustrations should be concerned with the flow of input and output information but should not present breakdowns or delineations of the internal logic and flows within a computer software unit.

4.6.8 Maintenance Manual. The Maintenance Manual (MM) presents information on the applications software. It is written for personnel who are responsible for the maintenance of the applications software. It will describe this software in a detailed, technical presentation to assist maintenance personnel. Charts and narrative information may be included to relate the system as delivered to the requirements contained in any specification documents.

4.6.9 Test Plan. The Test Plan (PT) is a tool for directing the AIS testing and contains the orderly schedule of events and list of materials necessary to effect a comprehensive test of a complete AIS. Those parts of the document directed toward the user staff personnel should be presented in noncomputer-oriented language, and those parts of the document directed toward other personnel should be presented in suitable terminology.

4.6.10 Test Analysis Report. The Test Analysis Report (RT) describes the status of the computer software system after testing and presents deficiencies for review by staff and management personnel. Therefore, the document should be prepared in noncomputer-oriented language

4.6.11 Implementation Procedures. The Implementation Procedures (IP) is a tool for directing the installation or implementation of an AIS at locations other than the test site after testing of the AIS has been completed. It may also be used to direct the implementation of major modifications or enhancements of an AIS which has already been installed. Those parts of the document directed toward the staff personnel should be presented in noncomputer-oriented language and those parts of the document directed toward other personnel should be presented in suitable terminology.

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4.6.12 Other technical documentation. In addition to the documentation specified above, additional documentation may be written as required. Since these documents are intended to serve special purposes, no content requirements are reflected in the Documentation Standards.

4.6.13 Other document types. Individual DoD Components may establish their own documentation specifications or document types in addition to those contained in this standard when the purpose of those specifications or types does not duplicate the purpose of the specifications and types contained in this standard.

4.7 Determination of document types. All of the document types discussed in paragraph 4.6 may not be needed on any particular project. The project manager must, therefore, determine early in the development process which of the document types will be needed for the project within the constraints established by DoD Component directives.

4.8 Tailoring the document types. Section 6 contains guidance for tailoring the standards for different types of development efforts and for some of the different conditions that may exist during the life cycle.

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5. DETAILED REQUIREMENTS

5.1 Functional Description. A Functional Description (FD) shall be prepared in accordance with the contents of Figure 5-1 (see 6.3).

5.2 System/Subsystem Specification. A System/Subsystem Specification (SS) shall be prepared in accordance with the contents of Figure 5-2 (see 6.3).

5.2.1 System Specification. A System Specification (SS) shall be prepared in accordance with the contents of Figure 5-2 (see 6.3).

5.2.2 Subsystem Specification. A Subsystem Specification (SS) shall be prepared in accordance with the contents of Figure 5-2 (see 6.3).

5.3 Software Unit Specification. A Software Unit Specification (US) shall be prepared in accordance with the contents of Figure 5-3 (see 6.3).

5.4 Database Specification. A Database Specification (DS) shall be prepared in accordance with the contents of Figure 5-4 (see 6.3).

5.5 Users Manual. A Users Manual (UM) shall be prepared in accordance with the contents of Figure 5-5 (see 6.3).

5.6 End User Manual. An End User Manual (EM) shall be prepared in accordance with the contents of Figure 5-6 (see 6.3).

5.7 Computer Operation Manual. A Computer Operation Manual (OM) shall be prepared in accordance with the contents of Figure 5-7 (see 6.3).

5.8 Maintenance Manual. A Maintenance Manual (MM) shall be prepared in accordance with the contents of Figure 5-8 (see 6.3).

5.9 Test Plan. A Test Plan (PT) shall be prepared in accordance with the contents of Figure 5-9 (see 6.3).

5.10 Test Analysis Report. A Test Analysis Report (RT) shall be prepared in accordance with the contents of Figure 5-10 (see 6.3).

5.11 Implementation Procedures. An Implementation Procedures (IP) document shall be prepared in accordance with the contents of Figure 5-11 (see 6.3).

5.12 Contents of each document type.

5.12.1 Composition. Included within each figure are a table of contents, a list of figures presented in that document type (if

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applicable), and the narrative description of the contents of that document type. The page numbers given in the table of contents and list of figures for a particular document type are those at the bottom of the figure box containing the pages of descriptive text for the document type.

5.12.2 Paragraph numbering system. In the document types each section, paragraph, and subparagraph is numbered consecutively as shown below:

Section	1
First paragraph	1.1
First subparagraph	1.1.1
Second subparagraph	1.1.2
Second paragraph	1.2
First subparagraph	1.2.1
Second subparagraph	1.2.2

5.12.3 Itemization. Itemization within a paragraph or subparagraph is identified by lower case letters followed by a period.

5.12.4 Figures. Figures are numbered using two numerals. The first is an Arabic numeral identifying the section. The second is the 2-digit serial number of the figure within a section.

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FUNCTIONAL DESCRIPTION
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FIGURE 5-1. Functional Description.

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SECTION 1. GENERAL

1.1 Purpose of the Functional Description. This paragraph shall describe the purpose of the Functional Description (FD) in the following words, modified when appropriate:

This Functional Description for (Project Name) (Project Number) is written to provide:

- a. The system requirements to be satisfied which will serve as a basis for mutual understanding between the user and the developer.
- b. Information on performance requirements, preliminary design considerations, and user impacts including fixed and continuing costs.
- c. A basis for development of system tests.

1.2 Project References. This paragraph shall summarize the references applicable to the history and development of the project. The general nature of the computer software (e.g., inventory control, personnel, management information) to be developed shall be specified. The project sponsor, user, and operating centers that will run the completed computer software shall be indicated.

At least the following documents¹, when applicable, shall be specified by author or source, reference number, title, date, and security classification:

- a. Project request or other initiation document, a copy of which should be included as an appendix.
- b. Previously developed technical documentation relating to this project.
- c. Significant correspondence relating to the project, to include formal agreements to the requirements contained in the Functional Description.
- d. Documentation concerning related projects.
- e. Risk analysis studies documenting significant potential threats to the AIS.

¹ When applicable, specific reference should be made to the provisions of these documents in subsequent sections of the Functional Description.

FIGURE 5-1. Functional Description.

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- f. Other manuals or documents that constrain project development or explain technical factors affecting it.
- g. Standards or reference documentation, such as:
 - (1) Documentation standards and specifications.
 - (2) Programming conventions.
 - (3) DoD or Federal standards.
 - (4) Hardware manuals, support system documentation, etc., if necessary for an understanding of the FD.

1.3 Terms and Abbreviations. This paragraph shall list or include in an appendix a list of any terms, definitions, or acronyms unique to this document and subject to interpretation by the user of the document. This list will not include item names or data codes.

FIGURE 5-1. Functional Description.

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SECTION 2. SYSTEM SUMMARY

This section shall describe in noncomputer-oriented language the existing system and the major requirements of the proposed AIS.

2.1 Background. This paragraph shall present background information concerning the uses and purposes of the system. Reference must be made to interfacing systems when needed to enhance the general description. The relationships between the project and other capabilities being developed concurrently shall be described.

2.2 Objectives. This paragraph shall state the major performance requirements and goals of the proposed system. These statements should be concise, quantified if possible, and may include examples. When applicable, related events, such as exercises or impending military operations, may be discussed.

2.3 Existing Methods and Procedures. This paragraph shall briefly describe the current methods and procedures being employed to satisfy the existing information requirements. A chart must be provided depicting the existing data flow through the functional system from data acquisition through its processing and eventual output. This chart may be complemented by an explanation or another chart showing the sequence in which the operational functions are performed by the user and identifying the support provided by the present system for decision making. Additionally, at least the following information should be included in this description:

- a. Organizational and personnel responsibilities.
- b. Equipment being used.
- c. Inputs and outputs including volume and frequency.
- d. Provisions in the system design for operation in degraded modes or at alternate sites in cases of emergency, disaster, or accident.
- e. Deficiencies, including limitations, such as time delays.

2.4 Proposed Methods and Procedures. This paragraph shall describe proposed methods and procedures. This description, written in noncomputer-oriented language, shall explain how the proposed system will interact with the functional processes which the automated system will support. Products from other systems that will be used with or become part of the proposed system shall be identified.

A chart depicting the proposed data flow should be provided to present an overall view of the planned capabilities. If the proposed system will eliminate or degrade any capabilities in the existing system, these

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capabilities must also be identified and reasons stated for their elimination or degradation. Alternative methods and procedures that have been considered may be included. A chart showing the major functional processing steps and a chart showing the interacting organizations should be included within the following paragraphs wherever they best complement the narrative.

2.4.1 Summary of Improvements. This paragraph shall provide a qualitative and quantitative summary of the benefits to be obtained from the proposed system. Required capabilities that will be satisfied by the proposed system shall be explicitly identified. A comparison of the deficiencies identified in paragraph 2.3 and the identification of any additional capabilities required, along with appropriate explanations, may be provided. When improvements of the existing methods and procedures are a requirement, the extent of the anticipated improvements must be stated. The discussion may include:

- a. Functional improvements (new capabilities).
- b. Improvements of degree (upgrading existing capabilities).
- c. Timeliness (improved response time).

2.4.2 Summary of Impacts. This and the following paragraphs shall describe the anticipated impacts and associated costs of the proposed system on the existing organizational and operational environments of the user. Impacts on the user during the development of the system shall be noted.

2.4.2.1 User Organizational Impacts. Organizational impacts may include the modifications of responsibilities and the addition or elimination of responsibilities that will be necessary to use the proposed system. Any personnel positions expected to be eliminated will be identified and a discussion provided of the possibilities for retraining. Requirements for the number and skills of additional personnel will be identified. Included will be changes in authorized strength, location, and position identifier, if known. If functions of the proposed system may need to be restored at one or more alternate sites following an emergency, disaster, or accident, the number and skills of personnel needed for contingency operation at each alternate site will be identified, if known.

2.4.2.2 User Operational Impacts. The operational impacts on the organization during the use of the proposed system will be included. This discussion will consider the proposed interface between the user and the primary or alternate computer operating centers; the impacts on the user to change from the current operational procedures; new data sources; quantity, type, and timeliness of data to be submitted for use in the system; data retention requirements; modes of user operation based on peacetime, alert, and wartime conditions; and modes of user operation based on emergency,

FIGURE 5-1. Functional Description.

disaster, or accident. Also included will be proposed methods for providing input data if these data are not already available.

2.4.2.3 User Development Impacts. Development impacts will include a discussion of all user effort that will be required prior to implementation of the system, such as development or modification of the database, required training. This paragraph will also include any user requirement for the parallel operation of the new and existing system along with the potential impact on the user during the testing phase of the proposed system. Any additional activities to be provided by the user to aid development also will be included in this paragraph.

2.5 Assumptions and Constraints. This paragraph shall describe any user assumptions and constraints that will affect development and operation of the system. Any limitations affecting the desired capability and explicit identification of any desired capabilities that will not be provided by the proposed system shall be discussed. Any anticipated operational changes that will affect the proposed operation of the system shall be discussed.

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SECTION 3. DETAILED CHARACTERISTICS

This section shall provide a detailed description of the functions to be performed and the performance requirements of the proposed AIS written in noncomputer-oriented language.

3.1 Specific Performance Requirements. This paragraph shall describe the specific performance requirements for the system as a whole and for major functions or subsystems within it. This presentation shall delineate the requirements on which the system design is to be based. The requirements will be stated in such a manner that system functions discussed in paragraph 3.2 and the system tests necessary for implementation can be related to them. A quantitative presentation of requirements will be included, such as the number of events that must be handled, maximum allowed time from query to receipt of requested information, and flexibility required to accommodate changing user requirements. Performance requirements specific to data may be described in paragraphs 3.3 and 3.4.

3.1.1 Accuracy and Validity. This paragraph shall describe the accuracy requirements to be placed upon the system. Accuracy requirements of mathematical calculations and data must be considered.

3.1.2 Timing. This paragraph shall describe the timing requirements to be placed on the system. The following timing requirements must be considered:

- a. Response time from receipt of input data to availability of system products.
- b. Response time to queries and updates.
- c. Sequential relationship of functions.
- d. Priorities imposed by types of inputs and changes in modes of operation.
- e. Any deviations from specified response times for peak load periods or contingency operations, as applicable.

3.1.3 Capacity Limits. This paragraph shall specify the maximum numbers of transactions, storage requirements, or any other quantifiable information about capacity requirements placed on the system. Distinctions shall be made for changes to capacity limits due to varying modes of operation.

3.2 Functional Area System Functions. This paragraph shall amplify and describe by individual function the major functional processing steps specified in paragraph 2.4. This description should relate the functions to the performance requirements in paragraph 3.1.

FIGURE 5-1. Functional Description.

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3.3 Inputs and Outputs. This paragraph shall describe each data input and output. The following information may be listed for each data element:

- a. Data element name.
- b. Synonymous names.
- c. Definition.
- d. Format.
- e. Range or enumeration of values.
- f. Unit of measurement.
- g. Data item names, abbreviations, and codes.
- h. Characteristics such as precision, accuracy, timing, and capacity.

When the information is published in a data element dictionary, reference to an entry in the dictionary will be made rather than including an extract from that dictionary. Any variations in either the inputs or outputs from the format or data item names that will be used in the database/data bank of the AIS as discussed in paragraph 3.4 must be specifically identified.

When available, the various input data formats shall be shown and the input medium shall be specified. When available, the various output data formats including any quality control outputs shall be shown and the output medium shall be specified. When possible, these outputs should be related to the system functions described in paragraph 3.2.

3.4 Database/Data Bank Characteristics. This paragraph shall discuss data elements to be used in the database or data bank. When a multi-functional database/data bank is to be used, only those data elements that will be used by this system will be discussed. The following information may be listed for each data element:

- a. Data element name.
- b. Synonymous names.
- c. Definition.
- d. Format.
- e. Range or enumeration of values.

FIGURE 5-1. Functional Description.

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- f. Unit of measurement.
- g. Data item names, abbreviations, and codes.
- h. Characteristics such as precision, accuracy, and timing.

When the information is published in a data element dictionary, reference to an entry in the dictionary will be made rather than including an extract from that dictionary. An estimate of the data storage requirements in terms of size and number of records will be provided. A description of the expected growth of the data and related components should be provided.

3.5 Failure Contingencies. This paragraph shall discuss alternative courses of action that may be taken to satisfy the information requirements if the proposed AIS fails. There shall be included as appropriate:

a. Backup. Backup requirements for ensuring the continued achievement of system functions given in paragraph 3.2 shall be discussed. "Backup" means the redundancy available in the event the primary system element goes down.

b. Fallback. Fallback techniques for ensuring the continued satisfaction of the specific requirements of the system shall be explained. "Fallback" indicates the use of another system or other means to accomplish the system requirements. For example, the fallback techniques for an automated system might be manual manipulation and recording of data.

c. Degraded Modes of Operation. If applicable, priorities will be stated for restoring the essential functional processing steps identified in paragraph 3.2 of the Functional Description in the event that full processing capability is not available.

FIGURE 5-1. Functional Description.

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SECTION 4. DESIGN CONSIDERATIONS

This section shall briefly describe how the proposed system will satisfy the requirements delineated in Sections 2 and 3. This section shall restate the user's requirements, previously presented in nontechnical terms, using any formalism needed for the design methods to be used for development. This section may also be used to document additional technical requirements when these do not relate directly to the functions and performance seen by the user and have not therefore been described in Section 3.

4.1 System Description. This paragraph shall provide a general description of the design of the proposed AIS. Related and interfacing systems and their documentation will be referred to as required to enhance this general description. This description shall include a chart showing the relationship of the user organizations to the major components of the proposed AIS. This chart shall be based on the information included in paragraph 2.4.

4.2 System Functions. This paragraph shall describe the functions of the proposed AIS. The performance requirements stated in paragraph 3.1 and the functions described by paragraph 3.2 must be elaborated upon here in enough detail that the system environment in Section 5 can be related to them.

4.3 Flexibility. This paragraph shall describe the capability to be incorporated for adapting the system to changing requirements such as anticipated operational changes, interaction with new or improved systems, and planned periodic changes.

4.4 System Data. This paragraph shall elaborate upon the description of input data, output data, and database/data bank presented in Section 3. It shall describe details of data structures or the encoding of data that arise from technical requirements if these have not previously been addressed.

FIGURE 5-1. Functional Description.

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SECTION 5. ENVIRONMENT

This section shall describe the current ADP environment and project the environment needed to satisfy those requirements delineated in Sections 2 and 3.

5.1 Equipment Environment. This paragraph shall describe the equipment capabilities required for the operation of the proposed AIS. This paragraph will present broad descriptions of the equipment presently available and the characteristics of any new equipment necessary based on the information in Section 3. A guideline for equipment to be described follows:

- a. Processors, including number of each online/offline, and size of internal storage.
- b. Storage media, including number of disk units, tape units, etc.
- c. Output devices, including number of each online/offline.
- d. Input devices, including number of each online/offline.

5.2 Support Software Environment. This paragraph shall describe the support software with which the applications software to be developed must interact. Included will be support software, input and equipment simulators, and test software, if needed. The correct nomenclature, level (version), and documentation references of each such software system, subsystem, and software unit shall be provided. In addition, the language, the operating system, and any Database Management System to be used will be identified.

5.3 Communications Requirements. This paragraph shall state the general communications requirements of the system being developed, e.g., number of terminals, locations if known, type and volume of data being transmitted/received, and time boundaries for transmission/reception. Desired remote response times may be specified.

5.3.1 Graphic Overview. This paragraph shall contain or refer to a chart or diagram showing the known communications requirements of the AIS. Notations on type and peak volume of data will be included on the chart.

5.3.2 Hardware. This paragraph shall list the known communications hardware required to support the AIS being developed.

5.3.3 Software. This paragraph shall list the known communications software requirements of the AIS being developed.

FIGURE 5-1. Functional Description.

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5.4 Interfaces. This paragraph shall describe all interfaces with other applications systems and subsystems. For each interface, the following should be specified:

- a. Description of operational considerations of data transfer, such as security considerations.
- b. General description of data transfer requirements to and from the subject system and characteristics of communications media/systems used for transfer.
- c. Format, unit of measurement, range or enumeration of values, data codes.
- d. Type of anticipated interface, such as manual or automatic.
- e. Anticipated interface procedures, including telecommunications considerations.

5.5 Summary of Impacts. This paragraph shall describe the anticipated organizational, operational, and development impacts of the proposed AIS on the ADP organizations.

5.5.1 ADP Organizational Impacts. Organizational impacts may include the modifications of positional responsibilities and the addition or elimination of responsibilities that will be required by the proposed system. Any personnel interactions eliminated will be identified and a discussion provided of the possibilities of retraining. ADP personnel responsibilities will be discussed. Requirements for the number and skills of additional personnel will be identified. Included will be changes in authorized strength, location, and position identifier, if known.

5.5.2 ADP Operational Impacts. This paragraph shall discuss impacts on the operational procedures of the information processing centers to implement the AIS. Included will be operational impacts caused by a change in equipment configuration, if known.

5.5.3 ADP Development Impacts. This paragraph shall assess the personnel and resources necessary in the development and testing of the automated system. Additional requirements for software and data conversion will be addressed, if known, along with any additional impacts resulting from the requirements in paragraph 2.4.2.3.

5.6 Failure Contingencies. This paragraph shall discuss possible failures of the hardware or software system, the consequences (in terms of system performance) of such failures, and the alternative courses of action that may be taken to satisfy the information requirements.

FIGURE 5-1. Functional Description.

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a. Restart/Recovery. Capabilities for ensuring effective and efficient recovery from a problem within the hardware or software systems will be considered.

b. Other. Failure contingencies described in paragraph 3.5 will be considered, as appropriate. Examples of areas to be considered are:

- (1) Prepositioning of data, software units, and documentation at alternate sites or other locations which are not subject to the same threats as the primary site.
- (2) Production of special outputs upon warning or alert to support fallback or backup operation.
- (3) Additional addressing or readdressing of transactions to permit alternate site operations, both after loss of primary site capability and upon warning or alert.
- (4) Requirements for rehomeing of communications circuits to permit alternate site operations.

5.7 Assumptions and Constraints. This paragraph shall discuss any data automation assumptions and constraints that relate to development and operation of the automated system.

FIGURE 5-1. Functional Description.

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SECTION 6. SECURITY

To control dissemination of sensitive information, all or portions of this section may be maintained and distributed separately from the remainder of the document.

6.1 Background Information. This paragraph shall provide background information on the sensitivity or classification of the application.

6.2 Control Points, Vulnerabilities, and Safeguards. This paragraph shall describe each control point, the vulnerabilities at the control point, and the safeguard requirements to reduce the risk at the point to an acceptable level. This description shall include consideration of alternate modes of operation based on emergency, disaster, or accident, if appropriate.

6.2.1 Control Points. This paragraph shall describe the points in the system where there is a known vulnerability which requires specific safeguards. A control point can be located at any interface where there is movement of data within or between sites. The following control points should be considered:

a. Input Control Points.

(1) Origin. Identify where input data will be collected, prepared, and entered into the system.

(2) Data Entry. Identify remote devices intended to be used to perform data entry, update, and corrective actions.

(3) Disposition. Describe the disposition of source data after being entered into the system.

(4) Error Correction. Identify the points where data input errors will be detected, reported, and corrected.

b. Process Control Points.

(1) Accuracy and Completeness. Identify the points in the processing cycle where the system will provide notification of success or failure of the requested processing.

(2) System Interfaces. Identify the points in the processing cycle where the system will pass data to or retrieve data from other systems.

c. Output Control Points.

FIGURE 5-1. Functional Description.

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(1) Production. Identify types and locations of devices authorized to receive output.

(2) Distribution. Identify the steps involved in the distribution and disposition of output products.

6.2.2 Vulnerabilities. This paragraph shall describe the vulnerabilities at each control point identified in paragraph 6.2.1. A vulnerability is a design, implementation, or operational condition inherent in the application or system which lends itself to error, loss, or compromise of information or denial of service.

6.2.3 Safeguards. This paragraph shall describe the safeguard requirements at each control point to reduce the vulnerabilities. At least the following areas should be considered:

a. Administrative Safeguards. An administrative safeguard is defined as any procedure that requires management supervision.

(1) Personnel. Identify positions requiring security clearances or access authorizations and functions they are authorized to perform.

(2) Collection and Preparation. Describe any requirements for the proper control of the collection, preparation, and backup of data.

(3) Environment Constraints. Describe any requirement to limit operation of the proposed system to certain devices or periods of the day.

(4) Distribution. Describe any requirements for a variance from standard distribution procedures.

(5) Access/Permission. Describe procedural requirements to develop, maintain, and control access permissions to system data or functions.

b. Physical Safeguards. A physical safeguard is defined as any physical means that limits access to data, e.g., locked doors, vaults, card/key access.

(1) Dedicated Equipment. Describe any requirements for dedicated equipment.

(2) Storage and Protection. Describe all requirements for onsite and offsite storage and protection of materials (software, data, documentation, etc.).

FIGURE 5-1. Functional Description.

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c. Technical Safeguards. A technical safeguard is defined as any automated process that assures appropriate processing, e.g., passwords, read/write keys.

(1) User Access. Describe all requirements for controlling user access and detecting abnormal patterns of use.

(2) Process Safeguards. Identify the need for any unique data validation procedures or data encryption that may provide added integrity.

(3) Security Identification Requirements. Describe any unique requirements to be imposed on the system for automated labeling or display of security identification.

6.3 System Monitoring and Auditing. This paragraph shall describe all user requirements for the production of an audit trail including automated reports or journals necessary to monitor the system. This monitoring may be provided by this AIS or by other existing systems.

6.3.1 Journalizing. This paragraph shall describe all journalizing requirements for the system. Journalizing is the recording of selected events as they occur within the system and provides the basis for monitoring the processing and use of data and the use of computer resources.

a. Triggering Criteria. Describe the conditions (functions, events, dates, times, unusual circumstances, etc.) which will cause the creation of an entry in a journal.

b. Identification Information. Describe the identification information, such as date, time, system or function identification, user name, terminal identification, and location to be recorded in each type of journal entry.

c. Application Data. Identify the application systems data to be recorded for each type of journal entry.

d. Journal Use. Identify the procedural and management requirements for review of the journal and follow-up action.

6.3.2 Audit Trail. This paragraph shall describe all user requirements for an audit trail, such as total transaction counts processed by location, time, and type.

FIGURE 5-1. Functional Description.

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SECTION 7. SYSTEM DEVELOPMENT PLAN

This section shall discuss the overall management approach to the development and implementation of the proposed computer system. Included shall be a discussion of and schedule for the documentation to be produced, time frames for the development of the system or the modules of the system, necessary liaison and participation by other organizations to ensure successful development, and any other factors that must be known prior to initiating development. Reference may be made to such information contained in other documents.

FIGURE 5-1. Functional Description.

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SECTION 8. COST FACTORS

This section shall provide a summary of cost factors for the proposed system in accordance with DoD Instruction 7041.3, when applicable. While the proposed system responds directly to the project request or other initiation document, other factors may determine the need for this system, such as requirements of higher echelons of command, security considerations, telecommunications considerations, and the need to interface with other automated systems. General alternatives that may be discussed include those for system development and system design with consideration being given to equipment, software, supporting telecommunications requirements, organization, operation, etc. Reference may be made to such information contained in other documents.

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FIGURE 5-2. System/Subsystem Specification.

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SECTION 1. GENERAL

1.1 Purpose of the System/Subsystem Specification. This paragraph shall describe the purpose of the System/Subsystem Specification (SS) in the following words, modified when appropriate:

The System/Subsystem Specification for (Project Name)
(Project Number) is written to fulfill the following objectives:

- a. To provide a detailed definition of the system/subsystem functions.
- b. To communicate details of the on-going analysis between the user's operational personnel and the appropriate development personnel.
- c. To define in detail the interfaces with other systems and subsystems and the facilities to be utilized for accomplishing the interfaces.

1.2 Project References. This paragraph shall provide a brief summary of the references applicable to the history and development of the project. The general nature of the software units to be developed shall be specified including a brief description of their purpose and uses. The project sponsor, user, and the operating centers that will run the completed AIS shall be indicated. At least the following documents, when applicable, shall be specified by author or source, reference number, title, date, and security classification:

- a. Functional Description (FD).
- b. Related System/Subsystem Specifications (SS).
- c. Any other pertinent documentation or significant correspondence not specified in the Functional Description.

1.3 Terms and Abbreviations. This paragraph shall list or include in an appendix a list of any terms, definitions, or acronyms unique to this document or subject to interpretation by the user of the document. This list will not include item names or data codes.

FIGURE 5-2. System/Subsystem Specification.

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SECTION 2. SUMMARY OF REQUIREMENTS

This section shall provide a summary of the system characteristics and requirements. This section shall be an expansion of the information published in the FD to reflect the determination of additional details. Any changes to the characteristics and requirements set forth in Sections 2 and 3 of the FD must be specifically identified.

2.1 System/Subsystem Description. This paragraph shall provide a general description of the system/subsystem to establish a frame of reference for the remainder of the document. Interfacing systems/subsystems and their documentation will be referenced as required to enhance this general description. Included within this description shall be a chart showing the relationship of the user organizations to the major components of the system and a chart showing the interrelationships of the system components for the system/subsystem including networking, communications, or distributed processing. These charts shall be based on or be updated versions of the charts included in paragraph 2.4, if prepared, of the FD. The more detailed charts to be included in Section 4 shall be based on the charts included in this paragraph.

2.2 System/Subsystem Functions. This paragraph shall describe the system/subsystem functions. There will be both qualitative and quantitative descriptions of how the system/subsystem functions will satisfy the requirements. Although the descriptions of the system/subsystem functions may be refined and more detailed as a result of the on-going analysis and design, they must maintain a direct relationship to the system functions established in paragraph 4.2, if prepared, of the FD, and be stated in such a manner that the system/subsystem environment in Section 3 can be related to them.

2.2.1 Accuracy and Validity. This paragraph shall provide a description of accuracy requirements imposed on the system/subsystem. The requirements will be related to paragraph 3.1.1 of the FD. Accuracy requirements of mathematical calculations and data must be considered.

2.2.2 Timing. This paragraph shall provide a description of the timing requirements placed on the system/subsystem, if they are applicable. The requirements will be related to paragraph 3.1.2 of the FD. The following timing requirements may be considered:

- a. Throughput time.
- b. Response time to queries and to updates of data files.
- c. Sequential relationship of system/subsystem functions.

FIGURE 5-2. System/Subsystem Specification.

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- d. Priorities imposed by types of inputs and changes in modes of operation.
- e. Timing requirements for the range of traffic load under varying operating conditions.
- f. Sequencing and interleaving of software units and systems (including the requirement for interrupting the operation of a software unit without loss of data).

2.3 Flexibility. This paragraph shall provide a description of the capability to be incorporated for adapting the system/subsystem to changing requirements, such as anticipated operational changes, interaction with new or improved systems, and planned periodic changes. Components and procedures designed to be subject to change will be identified. Attention shall be given to capabilities required to support failure contingencies discussed in paragraphs 3.5 and 5.6 of the FD.

FIGURE 5-2. System/Subsystem Specification.

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SECTION 3. ENVIRONMENT

This section shall provide an expansion of the environment given in the FD to reflect the additional analysis and changes to the environment. Changes in the environment that do not affect the scope of the project as described in the FD and are the result of on-going analysis and design will be explicitly identified within the appropriate paragraphs of this section. These changes will be discussed in terms of the impacts on the currently available environmental components (equipment, software, etc.) as well as the impacts on estimates and functions which were based on the original planned environment.

3.1 AIS Equipment Environment. This paragraph shall provide a description of the information system equipment required for the operation of the system/subsystem. Included will be descriptions of the equipment presently available as well as a more detailed discussion of the characteristics of any new equipment necessary. Equipment requirements will be related to the requirements stated in paragraph 5.1 of the FD. A guideline for equipment to be described follows:

- a. Processors, including number of each online/offline and size of internal storage.
- b. Storage media, including number of disk units, tape units, etc.
- c. Input-output devices, including number of each online/offline.

3.2 Communications Environment. This paragraph shall outline the data communications environment of the AIS. Additionally, this paragraph shall contain detailed schematics of the portions of the communications environment which directly relate to the system or subsystem being documented. If a standard communications environment is being used, reference shall be made to its documentation wherever possible.

3.2.1 Network Description. This paragraph shall state the purpose of the network and describe all interfaces including at least the following:

- a. Computers and terminals.
- b. Configuration and network topology (star/ring/bus/tree).
- c. Transmission technique (baseband/broadband/multiplexing).
- d. Data transfer rates (Baud rates).
- e. Gateways.
- f. Geographic locations.

FIGURE 5-2. System/Subsystem Specification.

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- g. Required system use times, if any.

3.2.2 Physical Interface. This paragraph shall outline the physical interface of the communications portion of the AIS including the following, where applicable:

- a. Line speed capability.
- b. Electrical interface specifications, e.g., RS232, RS449, V.35, MIL-STD-188.
- c. Hardware requirements.
- d. Transmission Requirements.

3.2.3 Protocol Interface. This paragraph will identify all protocols required for the AIS. Any requirements for headers, trailers, or record formats will be specified or referenced.

3.2.4 Applications User Interface. This paragraph shall describe the interface between the communications modules and the applications user.

3.2.5 Diagnostics. This paragraph shall describe diagnostic procedures that will allow users to identify and classify communications problems. The users referred to in this paragraph include:

- a. Applications end users.
- b. Computer operations personnel.
- c. Field assistance personnel.

3.3 Support Software Environment. This paragraph shall provide a description of the support software with which the software units to be developed must interact. Test software will be included in the description, if needed. The correct nomenclature and documentation reference of each shall be provided, including that for languages (compiler, assembler, development, query, etc.), the operating system, and any Database Management System to be used. This description must relate to and expand on the information provided in paragraph 5.2 of the FD. If operation of the software units to be developed is dependent upon forthcoming changes to support software, the nature, status, and anticipated availability date of such changes must be identified and discussed.

3.4 Software Interfaces. This paragraph shall provide a description of the interfaces with other applications software units including those of other operational capabilities and from other military organizations. The

FIGURE 5-2. System/Subsystem Specification.

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individual interfaces will be related to paragraph 5.4 of the FD. For each interface, the following shall be specified:

- a. Type of interface, such as operator control of a terminal or interfaces with other software units.
- b. Description of operational implications of data transfer, including security considerations.
- c. Data transfer requirements to and from the system/subsystem and characteristics of communications media/systems used for transfer.
- d. Current formats of interchanged data for the sending and receiving systems including data item names, codes, or abbreviations that are to be interchanged.
- e. Interface procedures.

If Subsystem Specifications are being written, interfaces with other subsystems which are to be developed will be described in the same manner.

3.5 Security. This paragraph shall be related to Section 6 of the FD and shall reflect the levels of availability, integrity, and confidentiality of the system and its components. The relationship of the components to each other, how each affects the other, and their sequence of execution shall be discussed, when applicable.

FIGURE 5-2. System/Subsystem Specification.

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SECTION 4. DESIGN DETAILS

4.1 General Operating Procedures. This paragraph shall describe the operating procedures such as load, start, stop, recovery, and restart.

4.2 System Logical Flow. This paragraph shall present the logical flow of the system/subsystem in the form of charts. A presentation in either narrative, program design language, or both can be included to supplement the charts. These charts will provide an integrated presentation of the system/subsystem dynamics, of entrances and exits, and of interfaces with other software units. Additionally, these charts will represent all modes of operations, priorities, cycles, special handling, and general flow of control.

4.3 System Data. This paragraph shall describe the inputs, outputs, and database¹. Provisions to provide essential subsets of data to support operations following an emergency, disaster, or accident will be described, if appropriate. If the information is available such as in a data element dictionary or Database Specification (DS), reference to that document will be made rather than including an extract. For each record type and its data elements, information such as the following will be provided.

4.3.1 Inputs. Each input shall be described as follows:

a. Input Records.

- (1) Name.
- (2) Sources, their media and disposition.
- (3) Expected volume and frequency, including special handling (such as queueing and priority handling) for high-density periods.
- (4) Priority, e.g., routine, emergency.
- (5) Security.
- (6) Requirements for timeliness (timing constraints).

b. Input Data Elements.

- (1) Name.
- (2) Position in the input record.
- (3) Synonymous names.

¹ Optionally, inputs and outputs may be described with the individual software units to which they relate.

FIGURE 5-2. System/Subsystem Specification.

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- (4) Definition.
- (5) Unit of measurement.
- (6) Format and acceptable range of values.
- (7) Security.
- (8) Data item names, abbreviations, and codes. Specify which of these are used in the input.

4.3.2 Outputs. Each output shall be described as follows:

a. Output Reports.

- (1) Title.
- (2) Format, to include headings, line spacing, arrangement, totals, etc. A report layout sheet may be included.
- (3) Means of display, if known, e.g., visual display units, printer, typewriter, projector.
- (4) Expected volume and frequency, including special handling.
- (5) Priority, e.g., routine, emergency.
- (6) Timing requirements, e.g., response time.
- (7) User recipients and use of displays such as notification, trends, or briefings.
- (8) Preprinted form requirements.
- (9) Security.

b. Output Data Elements.

- (1) Name.
- (2) Synonymous names.
- (3) Definition.
- (4) Unit of measurement.
- (5) Format and acceptable range of values.

FIGURE 5-2. System/Subsystem Specification.

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(6) Security.

(7) Data item names, abbreviations, and codes. Specify which of these are used in the output.

4.3.3 Database/Data Bank. Each database/data bank shall be described as follows:

a. Summary Of Content.

(1) Name.

(2) Narrative.

(3) Number of records or entries.

(4) Storage media and size.

(5) Security.

(6) Retention schedule, including provisions for backup.

b. Data Elements.

(1) Name.

(2) Synonymous name.

(3) Definition.

(4) Unit of measurement.

(5) Format and acceptable range of values.

(6) Security.

(7) Data item names, abbreviations, and codes. Specify which of these are used in the database/data bank.

4.4 Software Unit Descriptions. Paragraphs 4.4.1 through 4.4.n shall provide descriptions of the functions of the software units related to paragraph 2.2.

FIGURE 5-2. System/Subsystem Specification.

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FIGURE 5-3. Software Unit Specification.

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SECTION 1. GENERAL

1.1 Purpose of the Software Unit Specification. This paragraph shall describe the purpose of the Software Unit Specification (US) in the following words, modified when appropriate:

The objective of this Software Unit Specification¹ for (Project Name) (Project Number) is to describe the software unit design in sufficient detail to permit software production.

1.2 Project References. This paragraph shall provide a summary of the references applicable to the history and development of the project. The general nature of the software unit shall be specified including a brief description of its purpose and uses. The project sponsor, user, and operating centers that will run the completed AIS shall be included. At least the following documents, when applicable, shall be specified by author or source, reference number, title, date, and security classification:

- a. Functional Description (FD).
- b. Associated System/Subsystem Specifications (SS).
- c. Related Software Unit Specifications (US).
- d. Any other pertinent documentation or significant correspondence not specified in the FD.

1.3 Terms and Abbreviations. This paragraph shall list or include in an appendix a list of any terms, definitions, or acronyms unique to this document and subject to interpretation by the user of the document. This list will not include item names or data codes.

¹ A US may be prepared for each software unit in the system or one US may be prepared for a group of related software units within the system.

FIGURE 5-3. Software Unit Specification.

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SECTION 2. SUMMARY OF REQUIREMENTS

2.1 Software Unit Description. This paragraph shall provide a general description of the software unit to establish a frame of reference for the remainder of the document. It shall include a summary of the system requirements, including any communications requirements. The documentation of higher order systems/subsystems and related software will be referenced, as required, to enhance the general description of the software. If the software unit is common to more than one system or subsystem, appropriate references will be made to the applicable SS and FD documents.

2.2 Software Unit Functions. This paragraph shall describe the functions of the software unit. Although the descriptions of the functions must be refined and more detailed as a result of the ongoing analysis and design, they must be directly related to the subsystem or system functions and they must be stated in such a manner that the environment can be related to them.

2.2.1 Accuracy and Validity This paragraph shall provide a description of accuracy requirements imposed on the software unit. The requirements will be related to paragraph 3.1.1 of the FD or to paragraph 2.2.1 of the SS. Changes in the accuracy requirements from the next higher order document will be explicitly identified. Accuracy requirements of mathematical calculations and data must be considered.

2.2.2 Timing. This paragraph shall provide a description of the timing requirements placed on the software unit. The requirements will be related to paragraph 3.1.2 of the FD or to paragraph 2.2.2 of the SS. Changes in the timing requirements from the next higher order document will be explicitly identified. The following timing requirements must be considered:

- a. Throughput time.
- b. Response time to queries and to updates of data files.
- c. Sequential relationship of software unit functions and data flows.
- d. Priorities imposed by types of inputs and changes in modes of operation.
- e. Timing requirements for the range of traffic load under varying operating conditions.
- f. Sequencing or interaction of software units within a system.
- g. I/O transfer time required for disk, tape, etc.
- h. Internal processing time.

FIGURE 5-3. Software Unit Specification.

2.3 Flexibility. This paragraph shall provide a description of the capability to be incorporated for adapting the software unit to changing requirements, such as anticipated operational changes, interaction with new or improved software, and planned periodic changes. Components and procedures designed to be subject to change will be identified. This paragraph will be related to portions of paragraph 2.3 of the SS that are applicable to the software unit. Attention shall be given to capabilities required to support failure contingencies described in paragraph 3.5 of the FD and paragraph 2.3 of the SS.

FIGURE 5-3. Software Unit Specification.

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SECTION 3. ENVIRONMENT

This section shall specify the current environment in which the system will operate indicating any changes made to the environment as reflected in the FD and SS.

3.1 Support Software Environment. This paragraph shall provide a description of the support software with which the software unit to be developed must interact. Included will be both support software and test software, if needed. The correct nomenclature and documentation references of each such software system, subsystem, and software unit shall be provided. Included must be a reference to the languages, the operating system, and any Database Management System to be used. This description must relate to and expand on the information provided in paragraph 5.2 of the FD and paragraph 3.3 of the SS. If the operation of the software units to be developed is dependent upon forthcoming changes to support software, the nature, status, and anticipated availability date of such changes must be identified and discussed.

3.2 Interfaces. This paragraph shall provide a description of the interfaces with other applications software units, including those of other operational capabilities and from other organizations. The individual interfaces will be related to paragraph 5.4 of the FD and paragraph 3.4 of the SS. For each interface, the following shall be specified:

- a. Type of interface, such as operator control of a terminal or interfaces with other software units.
- b. Description of operational implications of data transfer, including security considerations.
- c. Data transfer requirements to and from the software unit including data content, format, and sequence.
- d. Formats of data for both the sending and receiving systems including the data item names, codes, or abbreviations that are to be interchanged.
- e. Interface procedures.
- f. Interface equipment.
- g. Data conversion requirements.

3.3 Storage. This paragraph shall provide a description of the storage requirements for the software unit. Included shall be the internal storage requirements; use of auxiliary storage such as tape, disk, or diskette; and

FIGURE 5-3. Software Unit Specification.

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the estimated quantity of permanent or temporary storage required for each medium. Differences between normal storage requirements and requirements for contingency operations shall be identified. For each storage medium information such as the following should be provided:

- a. Internal storage, number of words per auxiliary core bank or bytes per auxiliary core bank, number of banks.
- b. Drum storage, number of words per field, number of fields per drum, number of drum assemblies.
- c. Disk storage, number of words per zone or bytes per cylinder, number of zones per disk or cylinders per disk, number of disks per disk unit, number of disk units.
- d. Tape storage, number of adapters, number of tape drives, number of tapes.

In addition, the machine storage will be further allocated into permanent and temporary areas.

3.4 Security. This paragraph shall reflect the type and degree of security of the data, and the degree of security of the algorithms. For all sensitive data, a statement shall be included as to whether the data are always sensitive, become sensitive upon the occurrence of specific events, or change their degree of sensitivity upon the occurrence of specific events. This paragraph shall also specify the operational environment that must exist within the information processing centers when any sensitive component of the system is being processed.

3.5 Communications Environment. This paragraph shall describe or refer to an appendix that describes communications requirements for the software units being documented. This description shall relate to and, if necessary, expand on information provided in paragraph 3.2 of the SS.

FIGURE 5-3. Software Unit Specification.

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SECTION 4. DESIGN DETAILS

4.1 Software Operating Procedures. Any special software requirements necessary for the implementation of system operating procedures shall be delineated. Also discussed shall be the interaction of the applications software with executive support and communications software.

4.2 Inputs. This paragraph shall provide a detailed description of all inputs. If the information is available, such as in a data element dictionary or DS, reference to that document shall be made rather than including an extract. Examples of prepared inputs and input preparation forms may be included. For each input type and its data elements, information such as the following may be provided.

a. Input Records.

- (1) Name.
- (2) Sources, their media, and disposition.
- (3) Expected volume and frequency including special handling.
- (4) Priority, e.g., routine, emergency.
- (5) Security.
- (6) Disposition other than processing, such as logging, hard copy reproduction of input, storage location, and custodian.
- (7) Flexibility, such as capability of omitting or adding items.
- (8) Requirements for timeliness (timing constraints).
- (9) Special handling.

b. Input Data Elements.

- (1) Name.
- (2) Position in the input record.
- (3) Synonymous names.
- (4) Definition.
- (5) Unit of measurement.

FIGURE 5-3. Software Unit Specification.

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- (6) Format and acceptable range of values.
- (7) Security.
- (8) Data item names, abbreviations, and codes. Specify as to which of these are used in the input.

This paragraph shall include examples of prepared inputs and preparation forms, such as input creation sheets and communications message forms.

4.3 Outputs. This paragraph shall provide a detailed description of all software unit outputs. If the information is available such as in a data element dictionary or DS, reference to that document will be made rather than including an extract. For each output type and its data elements, information such as the following may be provided.

a. Output Reports.

- (1) Name.
- (2) Format, to include headings, line spacing, arrangement, totals, etc. A report layout sheet may be included.
- (3) Means of display, if known, e.g., visual display unit, printer, typewriter, projector.
- (4) Expected volume and frequency, including special handling.
- (5) Priority, e.g., routine, emergency.
- (6) Timing requirements, e.g., response time.
- (7) User recipients and use of displays, such as notification, trends, or briefings.
- (8) Preprinted form requirements.
- (9) Security.
- (10) Disposition, including logging, film and hard copy printout reproduction and storage, numbers of copies required for distribution, place of storage, office responsible for permanent copy, retention period, and special handling required because of bulk, security considerations, and timing.
- (11) Description of plots or graphic displays, including the coordinates to be used, explanation of symbols, type of graphic technique, e.g., individual points or continuous lines.

FIGURE 5-3. Software Unit Specification.

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- (12) Conditional and status indicators (codes and definitions).
- (13) Supporting background information.

b. Output Data Elements.

- (1) Name.
- (2) Synonymous names.
- (3) Definition.
- (4) Unit of measurement.
- (5) Format and acceptable range of values.
- (6) Security.
- (7) Data item names, abbreviations, and codes. Specify which of these are used in the output.

4.4 Database/Data Bank. This paragraph shall provide a description of the database/data bank. If the information is available, such as in a data element dictionary or DS, reference to that document will be made rather than including an extract.

4.4.1 Summary of Contents. This paragraph shall provide information such as the following for the database/data bank.

- a. Name.
- b. Narrative.
- c. Number of records or entries.
- d. Storage media and size.
- e. Security.
- f. Relationship of each record to a common database/data bank, if applicable.

4.4.2 Data Elements. This paragraph shall provide information such as the following for each data element referenced by the software unit.

- a. Name.
- b. Synonymous names.

FIGURE 5-3. Software Unit Specification.

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- c. Definition.
- d. Unit of measurement.
- e. Format and range of values.
- f. Security.
- g. Data item names, abbreviations, and codes. Specify which of these are used in the database/data bank.

4.4.3 Software Relationships. Interrelationships of the software unit with the database/data bank shall be described to show those files and tables used in each function of the software unit.

4.5 Data Retention. Data retention requirements shall be described as follows:

- a. Historic retention to include collection of data to be retained, format, storage medium, and time parameters.
- b. Periodic report data, e.g., time retained after report generation and time retained to provide summary reports.
- c. Summary report data, such as time retained after summary report.

4.6 Software Unit Logic. This paragraph shall describe the logic of the software unit. Logical flow shall be presented in the form of charts or program design language (PDL) presentations supplemented by narrative. This logical flow will be keyed to the information in paragraph 4.2 of the SS, if applicable, or the FD. The logical flow shall provide a detailed description of the processing performed by the software unit. There shall be included for each function noted in paragraph 2.2 a description of the operation of the software unit. All processes will be described to include algorithmic or logic data manipulations and decision processes involved. Conditional decision points will be explained in detail, as well as methods for identifying error conditions and the resulting actions of the software unit.

FIGURE 5-3. Software Unit Specification.

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FIGURE 5-4. Database Specification.

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SECTION 1. GENERAL

1.1 Purpose of the Database Specification. This paragraph shall describe the purpose of the Database Specification (DS) in the following words, modified when appropriate:

The objectives of this Database Specification for (Project Name) (Project Number) are to describe the database organization and storage allocation and to provide the detailed data model of the logical and physical design and information that would be necessary for the construction of the parts of the database such as areas, records, sets, tables, and associated dictionaries, directories, and diagrams.

1.2 Project References. This paragraph shall include a brief description of the Automated Information System (AIS) providing its purpose and use. It shall identify the project sponsor, users, and the operating centers that will run the completed software. A list of applicable documents shall be included. At least the following documents, when applicable, shall be specified by author or source, reference number, title, date, and security classification:

- a. Functional Description (FD).
- b. System/Subsystem Specification (SS).
- c. Other pertinent documentation or significant correspondence not specified in the FD.

1.3 Terms and Abbreviations. This paragraph shall list or include in an appendix a list of any terms, definitions, or acronyms unique to this document and subject to interpretation by the user of the document. This list will not include item names or data codes.

FIGURE 5-4. Database Specification.

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SECTION 2. DATABASE IDENTIFICATION AND DESCRIPTION

This section shall provide all information necessary to locate, identify, and describe the database being documented. It shall, in addition, contain background information essential for proper utilization of the database.

2.1 Database Identification. This paragraph shall give the names or labels by which the database may be uniquely identified. Descriptive information may also be provided.

2.1.1 Systems Using the Database. The systems that will use this database shall be identified. Included shall be the full system identification and model, modification, or version number.

2.1.2 Relationship to Other Databases. This paragraph shall indicate whether the database will supersede another database.

2.1.3 Storage Requirements. This paragraph shall contain the estimated internal and peripheral storage requirements. Multiple storage requirements for distributed processing should be included, as well as differences applying to special modes of operation following emergency, disaster, or accident.

2.1.4 Physical Mapping of Database Files. This paragraph shall describe mapping various components of the database to one another and to the files on which they are recorded.

2.1.5 Communications Environment. This paragraph shall describe the data communications environment of the AIS. Networks shall be described including specific information on the interface protocols.

2.2 Labeling Conventions. This paragraph shall discuss the internal labeling conventions to the extent necessary to use them as a practical working tool.

2.3 Organization of the Database. This paragraph shall provide a single, central source of major design considerations for the handling of the database.

2.3.1 Conceptual Model. This paragraph shall describe the conceptual model reflecting the data requirements, portrayed by an appropriate charting technique such as an entity-relationship diagram.

2.3.2 Physical Allocation. The purpose of this paragraph is to promote consistency of design concerning the organization and manipulation of the physical database areas/files. The following information shall be provided for each area/file contained in the database:

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- a. General area/file design and format.
- b. Rationale of the design.
- c. Inter-area/file dependencies of the area/file.

2.4 Special Instructions. This paragraph shall contain instructions to be followed by personnel who will contribute to the generation of the database and who will use it for testing and operational purposes. Such instructions may include:

- a. Any specialized criteria for entering data into the database.
- b. Source documents for the rules and procedures to be followed when submitting data for entry into the database.
- c. Source documents for the machine run instructions for generating, modifying, updating, or otherwise using the database. In very large systems, where the details of such instructions are extensive, this paragraph may reference sections of other documents where this specific information can be found.

2.5 Support Software Available for Handling the Database. In this paragraph, all of the support software directly related to the database shall be either referenced or discussed briefly. Descriptions shall include software unit name, functions, and major operating considerations such as operating time, hardware setup. Detailed documentation shall be cited. If the software unit is only referenced, its name, document title, document number, and appropriate sections of the document shall be provided. Examples of such software are:

- a. Database analysis software for the reorganizing or changing of data that has been developed for this system.
- b. Database sizing software for the initialization or resizing of the database.
- c. Database loading software for the moving or copying of data.
- d. Database repairing software.

2.6 Security. This paragraph shall contain an overview and discussion of the security considerations, sensitivity, and criticality associated with the database.

FIGURE 5-4. Database Specification.

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SECTION 3. DATABASE ADMINISTRATIVE INFORMATION

This section shall provide the information necessary to define and describe the support software and the targeted hardware upon which the database is to operate. Also contained within this section is the information necessary to administer this database in the described environment.

3.1 Responsibility. This paragraph shall identify the offices responsible for database administrative functions.

3.2 System Information.

3.2.1 Database Management System (DBMS) Configuration. This paragraph shall identify the vendor, version or release date, and targeted hardware of the DBMS. Any restrictions on the initialization and use of the DBMS will be specified. The capabilities of the DBMS to support any intended distributed processing shall be described.

3.2.2 Hardware Configuration. This paragraph shall identify the hardware configurations on which the database can reside.

3.2.3 Database Software Utilities. This paragraph shall list and reference the documentation of any DBMS utility software available to support the use or maintenance of the database.

3.2.4 Security. This paragraph shall describe the use and management of integrity and access controls that apply to all database components such as schema, subschemas, areas or physical files, records or tables, sets or relations, and data elements.

3.3 Schema Information. The following paragraphs shall describe the overall structure to be reflected in the schema or other global definition of the database.

3.3.1 Rationale. This paragraph shall explain the rationale for the chosen database structure.

3.3.2 Content. This paragraph shall describe the content of the database, listing its data elements and indicating within which subschemas of the AIS they are visible.

3.3.3 Description. This paragraph shall describe the schema and each subschema of the AIS including name, file type and name, Data Description Language, access control keys, concurrence locking, data name mapping, overall area/file limitations and controls, restrictions due to redefinitions and access paths, and any other limitations or restrictions.

FIGURE 5-4. Database Specification.

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3.3.4 Logical Structure. This paragraph shall describe and depict in a chart the organization of the data into records, tuples, sets, or predefined relationships.

3.3.5 Physical Structure. This paragraph shall describe and depict in a chart the physical structure (e.g., areas/files, indexes, pointers) of the logical components. Criteria to achieve operating efficiency shall be identified.

3.3.6 Sizing. This paragraph shall provide sizing formulas for determining the storage required to support the database content and associated software.

3.3.7 Recovery. This paragraph shall describe the methodology for reestablishment or re-creation of the necessary schema and AIS support files.

3.3.8 Requirements Cross-Reference. This paragraph shall provide a cross-reference to requirements stated in Section 3 of the FD and Section 4 of the SS.

3.4 Area/File Information.

3.4.1 Rationale. This paragraph shall explain the rationale for the chosen physical structure.

3.4.2 Content. This paragraph shall describe the content of each area/file, listing the records it contains and explaining their purposes.

3.4.3 Description. This paragraph shall describe each area/file, including name, type, code, mapping, limitations and controls, access procedures and mechanisms, and training or testing capabilities.

3.4.4 Storage Control Parameters. This paragraph shall provide information about data storage and any limiting factors, such as allocation parameters and methodology, expansion methods, paging parameters, load criteria and limits, sizing procedures or formulas, and any other information that affects database storage.

3.4.5 Recovery. This paragraph shall describe the methodology or refer to documentation about the method to reconstruct the necessary data and structure.

FIGURE 5-4. Database Specification.

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SECTION 4. APPLICATIONS SOFTWARE (IDENTIFY) REQUIREMENTS

The purpose of this section is to provide technical information required by applications developers to use the database and its utilities, procedures, processes, and structure in the development, maintenance, or enhancement of software. When more than one AIS is using the database, a separate section (Sections 4 thru n) may be written for each AIS and the section title modified to reflect that AIS.

4.1 Descriptions. Detailed technical descriptions of the database shall be provided in the following paragraphs. These paragraphs shall also describe the use and management of access controls to prevent unauthorized disclosure or modification.

4.1.1 Subschema or Local View (Identify). This paragraph shall identify the title or name of the subschema and its purpose.

4.1.1.1 Records. This paragraph shall list and describe each of the records. The description should provide information such as name, code, size, and any other attributes needed to complete that description. This paragraph shall also list and describe the data elements that make up the record and their sources.

4.1.1.2 Sets. This paragraph shall list and describe each of the sets or predefined relations.

4.1.1.3 Areas/Files. This paragraph shall list and describe any areas/files of the database. Descriptions should provide information such as name, code, type, allocation, expansion, load factor, database keys, and page size.

4.1.1.4 Access Methods. This paragraph shall list and describe each of the unique access routines and query path structures that have been developed for this subschema or local view.

4.1.1.5 Security. This paragraph shall describe the controls required to protect the subschema from unauthorized modification.

4.1.2 Subschema or Local View (Identify). This paragraph shall describe the second subschema or local view using the same structure as outlined in paragraph 4.1.1. Additional subschemas or local views shall be described in paragraphs 4.1.3 through 4.1.n.

4.2 Database Software Utilities. This paragraph shall provide information regarding any utility software that has been developed to aid in database use for this AIS.

FIGURE 5-4. Database Specification.

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4.3 Error Handling. This paragraph shall describe those AIS error handling routines and procedures that are available during execution of database software.

4.4 Messages. This paragraph shall provide a list of all AIS messages output during execution of database software.

4.5 Requirements Cross-Reference. This paragraph shall provide cross-references to requirements stated in Section 3 of the FD and Section 4 of the SS.

FIGURE 5-4. Database Specification.

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SECTION 1. GENERAL

1.1 Purpose of the Users Manual. This paragraph shall describe the purpose of the Users Manual (UM) in the following words, modified when appropriate:

The objective of the Users Manual for (Project Name) (Project Number) is to provide the information necessary for the user to effectively use the automated information system.

1.2 Project References. This paragraph shall provide a brief summary of the references applicable to the project. At least the following documents shall be specified by author or source, reference number, title, date, and security classification, when applicable:

- a. Project request or other initiation document.
- b. Previously published documentation on the project, if needed by the user.
- c. Hardware documentation such as that addressing powering up, powering down, and normal operation.
- d. Documentation concerning related projects.
- e. Standards or reference documentation.

1.3 Terms and Abbreviations. This paragraph shall list or include in an appendix a list of any terms, definitions, or acronyms unique to this document and subject to interpretation by the user of the document. This list will not include item names or data codes.

1.4 Security. This paragraph shall contain an overview and discussion of the security considerations associated with the system. A warning should be included regarding making unauthorized copies of data, software, or documents, if applicable.

FIGURE 5-5. Users Manual.

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SECTION 2. SYSTEM SUMMARY.

This section shall provide a general overview of the system written in nontechnical terminology. The summary should outline the uses of the AIS in supporting the activities of the user and staff. Detailed technical information should be presented in other sections.

2.1 System Overview. This paragraph shall explain in general terms the purpose for which the AIS is intended. Capabilities, operating improvements, and benefits expected from its use should be described. The description shall include major functions performed by the system, such as generation of output, maintenance of data, and display of information. This description, part of which may be displayed graphically, shall show:

- a. Logical parts of the system from the point of view of the user.
- b. Communications paths and techniques.
- c. Interfaces and relationships to other systems.
- d. The organizations that provide input to the system or that receive output from it.

2.2 System Operation. This paragraph shall show the relationships of the functions performed by the system with the organizations or stations that are sources of input to the system and those that are recipients of output from it. Included shall be charts and a brief narrative description including only the who, what, where, and why concerning the inputs and outputs shown on the chart.

2.3 System Configuration. This paragraph shall briefly describe the equipment, communications, and networks used by the system. It shall include the type of computer and input and output devices.

2.4 System Organization. This paragraph shall present a general overview of the organization of the system. The presentation shall show, as appropriate, the logical parts of the system, such as subsystems and software units, and a brief description of their roles in the operation of the system.

2.5 System Performance. This paragraph shall describe the overall system performance capabilities which can be expected by the user. Constraints, such as capacity limitations or time needed to accomplish major functions, should be included. Performance measures and information of interest are represented by the following examples:

- a. Input - types, volumes, rate of inputs accepted.

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- b. Output - types, volume, accuracy, rate of outputs that the system can produce.
- c. Response time - include qualifications, where necessary, that affect response time in processing operational reports, such as listing a file. Type and volume of input and equipment configuration are examples of items that may influence running time and, consequently, response time.
- d. Limitations - for example, maximum size per unit of input, format constraints, restrictions on what data may be queried and from what location, and language constraints.
- e. Error rate - capabilities for detecting various legal and logical errors and the means provided for error correction.
- f. Processing time - show typical processing times.
- g. Flexibility - note provisions allowing extension of the usage of the system.
- h. Reliability - note system provisions that support, for example, alternate processing or a switch over capability.

2.6 Contingencies and Alternate Modes of Operation. This paragraph shall explain the general nature of the differences expected in what the user will be able to do with the system at times of emergencies, disasters, and accidents which may preclude normal system operation. The paragraph shall also explain any differences in what the user will be able to do based on modes of operation that differ between peacetime, war, and conditions of alert.

2.7 Database/Data Bank. This paragraph shall describe the method used to store and maintain the data.

- a. For systems using a Database Management System (DBMS), this paragraph shall provide information on the particular DBMS used including the types and usage of the data.
- b. For systems using a data bank, this paragraph shall identify all files which make up the applications system. This list should contain at least the file identification, retention, media, and sensitivity.
- c. For systems using both a DBMS and a data bank, this paragraph shall contain the information specified in both 2.7a and 2.7b.

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2.8 General Description of Inputs, Processing, Outputs. This paragraph shall describe the inputs, the flow of data through the processing cycle, and the resultant outputs.

a. Inputs. In describing the inputs, consideration should be given to the following:

- (1) Purpose of input - explain why the input is made to the system and note conditions or events requiring its submission.
- (2) Content of input - describe what the input contains in the way of operational, control, or reference data.
- (3) Associated inputs - describe any other inputs required by the system in addition to the direct input.
- (4) Origin of inputs - identify the source or preparer of the input.
- (5) Database/data bank - identify where the input is recorded in general or functional terms.
- (6) Security.
- (7) Other - include additional remarks of general information.

b. Processing. In this paragraph, the relationship of the input to the output should be described with a general description of the flow of data through the processing cycle.

c. Outputs. In describing the outputs, consideration should be given to the following:

- (1) Identification of output - list the outputs produced by the system showing their relationship to the inputs.
- (2) Purpose of output - explain the reason for the output and note conditions or events that require its generation by the system.
- (3) Content of output - describe in general terms the information provided by the output.
- (4) Associated outputs - reference other system outputs that complement the information in this output.

FIGURE 5-5. Users Manual.

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- (5) Distribution of outputs - note the recipients of this output.
- (6) Security.
- (7) Other - describe additional items of general information.

FIGURE 5-5. Users Manual.

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SECTION 3. FUNCTIONS RELATED TO TECHNICAL OPERATIONS

This section shall provide the details necessary to prepare inputs to the system. The logical arrangement of the information shall enable the functional personnel to prepare required inputs. In addition, this section will explain in detail the characteristics and meaning of the information the system produces as outputs. If an online system with batch processing capabilities is being described, this paragraph will reference Sections 5 through n of this UM to describe the terminal operations; and the following paragraphs may detail the procedures to be followed for the batch processing runs.

3.1 Initiation Procedures. The procedures that must be followed to initiate system operation shall be detailed in this paragraph. Included may be information such as sample job request forms or sample control statements. If these procedures are standard or are detailed in another manual, that manual will be referenced.

3.2 Input Requirements. The requirements to be observed in preparing entries to the system shall be delineated in this paragraph for each different type or class of input. Typical considerations are the following:

- a. Reason for input - note the operational conditions that require the submission of the input, e.g., catastrophe, normal status report, need to enter parameters, need to update data, the desire to obtain particular data, the need to respond to a particular display.
- b. Frequency of input - specify when the input must be prepared, e.g., periodically, randomly as a function of an operational situation.
- c. Origin of input - identify the organizational unit or station authorized to generate the input.
- d. Medium of input - note the medium used to enter the input.
- e. Associated inputs - reference any related inputs that are required to be entered at the same time as this input.
- f. Other - note any other applicable information, such as other recipients of the inputs; priority; security handling; variations on the basic input format using code or key indicators; limitations on what files may be affected by a particular type of input.

3.2.1 Input Formats. The layout formats used in the initial preparation of system inputs shall be illustrated and the information that may be entered on the various sections and lines explained. The explanation of each entry provision shall be keyed to the sample formats illustrated.

FIGURE 5-5. Users Manual.

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3.2.2 Composition Rules. This paragraph shall describe any rules and conventions that must be observed in order to prepare input that can be accepted by the system. The rules of syntax, usage of punctuation, etc. will be explained. Items for consideration may include the following:

- a. Input transaction length - e.g., 100 characters maximum.
- b. Format conventions - e.g., all input items must be left-justified.
- c. Labeling - e.g., usage of identifiers to denote major data sets to the system.
- d. Sequencing - e.g., the order and placement of items in the input.
- e. Punctuation - e.g., spacing and use of symbols (virgule, asterisk, character combinations, etc.) to denote start and end of input, of data groups, and of fields.
- f. Restrictions - e.g., rules forbidding use of particular characters or parameter sets in an input.

3.2.3 Input Vocabulary. This paragraph shall explain the legal character combinations or codes that must be used to identify or compose input items. An appendix may be provided containing an ordered listing of item codes that can be entered into an input to the system.

3.2.4 Sample Inputs. Each class or type of input acceptable by the system shall be illustrated and completely explained. Included in the explanation may be information on the following types of inputs:

- a. Header - containing entries that denote the input class or type, date and time, origin, instruction codes to the system, etc.
- b. Text - containing the portions of the input representing data for operational files, request parameters for information retrieval, etc.
- c. Trailer - containing control data denoting the end of input and any additional control data.
- d. Omission - indicating those classes or types of input that may be omitted at the option of the composer or because of particular circumstances concerning the input.
- e. Repeats - indicating those portions of the input that may be repeated up to a specified maximum number of entries, if required.

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3.3 Output Requirements. The requirements relevant to each class or type of output shall be described. Representative information that may be included for each class of output is:

- a. Purpose - the reasons why the output is generated.
- b. Frequency - whether the output is produced periodically or as required. If produced periodically, the period must be specified.
- c. Options - any modifications or variations of the basic output that are available.
- d. Media - physical form of the output, such as printout, display screen, tape.
- e. Location - where the output is required to appear, such as in the computer area or remotely at a particular physical area or station.
- f. Other - any additional requirements for this output, such as priority, security handling, associated outputs that complement the information in this output.

3.3.1 Output Formats. The layout in which each class or type of system output is presented shall be explained in detail. Explanations shall be keyed to particular parts of the format illustrated. Appropriate information that may be provided includes the following:

- a. Security marking.
- b. Header - the title, identification, date and time of day, number of output parts, and similar basic control data that may be contained in the header or control segment of the output shall be described.
- c. Body - the information that may appear in the body or text of the output must be explained. Described shall be the significance of fixed data, such as columnar headings in tabular display types of output. The existence of subsets or sections in the output format (e.g., part A, part B) should be noted. Any fixed positions or column locations allocated to specific output information should be described.
- d. Trailer - the control or reference information that may be appended to the body of information presented shall be discussed.

Additional characteristics concerning the makeup of outputs may include information such as the meanings of special symbols, etc.

3.3.2 Sample Outputs. Illustrations of the output obtainable from the system shall be given for each different class or type. The function or purpose of the output shall be explained. A detailed description including information such as the following may be provided:

- a. Definition - the meaning and use of each information variable for the reader or user.
- b. Source - item extracted from a specific input, from a database/data bank file, calculated by system, etc.
- c. Characteristics - concerning omission of the item under certain conditions of the output generation, range of values, unit of measure.

3.3.3 Output Vocabulary. Any codes or abbreviations that appear in the output in a form different from those used on the input described in paragraph 3.2.3 shall be described in this paragraph.

3.4 Utilization of System Outputs. An explanation shall be given for the use of the output by the operational area or activity which receives it. For example, a summary report of petroleum, oil, and lubricant stocks may be received by a materiel control activity and, depending on the information in the report, action might be required to initiate the purchase or transfer of stocks to a particular location.

3.5 Recovery and Error Correction Procedures. This paragraph shall list the error codes generated by the application software and describe corrective actions to be taken by the user. Also included in this paragraph shall be the procedures to be followed by the user to ensure that any recovery and restart capabilities can be utilized.

3.6 Communications Diagnostics. This paragraph shall describe in detail the diagnostic procedures available to the user of the AIS for validating communications and for identifying and classifying problems.

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SECTION 4. FILE QUERY PROCEDURES

This section shall be prepared for an AIS with a file query retrieval capability that does not use terminals. The instructions necessary for recognition, preparation, and processing of a query applicable to the database/data bank shall be explained in detail.

4.1 System Query Capabilities. This paragraph shall illustrate in tabular form the preprogrammed query capabilities provided by the system with a description of, or a cross-reference to, a query code. An example is shown in Figure 4-01.

4.2 Database/Data Bank Format. This paragraph shall illustrate the database/data bank format and content. An example is shown in Figure 4-02. For each data element information such as the following may be listed:

- a. Data element name.
- b. Synonymous names.
- c. Definition.
- d. Format.
- e. Range and enumeration of values.
- f. Unit of measurement.
- g. Data item names, abbreviations, and codes.

When the information is published in a data element dictionary, reference to an entry in the dictionary will be made rather than including an extract from that dictionary. Any variations in either the inputs or outputs from the format or data items that are used on the database/data bank must be specifically identified.

4.3 Query Preparation. Instructions shall be provided for the preparation of any necessary query parameters. Figure 4-03 shows an example of this format. The details of query input preparation in the context of each specific database/data bank and system retrieval capability shall be repeated as necessary in the form of positive instructions. In cases when the retrieval capability is part of a support system and query input formats are not needed, the specific query statement required shall be listed. Figure 4-04 shows a specific query statement. The formats provided will be used to transcribe queries into the technical phrasing of the retrieval system. Paragraphs 4.3.1 thru 4.3.n should be used to describe different types of queries.

4.4 Control Instructions. Instructions shall be provided for the control of the sequencing of runs and of the software necessary to extract the response to the query request from the database/data bank. These instructions shall include the requirements for, and the preparation of, control statements which may be required by the system or application software. If extensive information concerning control statement preparation is contained in support system documentation, this documentation may be referenced.

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Preprogrammed Query Capabilities

DESCRIPTION	QUERY CODE
Number of employees within an organization	A
Number of employees in a specific pay grade	B
Total gross pay for employees within an organization	C
State tax year - to - date for specific state	D
FICA tax year - to - date for a specific employee	E
Total deductions for a specific employee	F
Net pay for a specific employee	G

Figure 4-01. Example of Preprogrammed Query Capability.

Format of Data Record

ITEM NAME	FORMAT		RANGE OF VALUES	UNIT OF MEASUREMENT
ORG-NAME	30	A/N	1-9, A-Z	
ORG-ID	6	A/N	1-9, A-Z	
SOC-SEC-NO	9	N	0-9	
NAME	20	A/N	--	
PAY-GRADE	4	A/N	--	
GROSS-PAY	6	SN	0-9	Dollars
GROSS-PAY-YTD	8	SN	0-9	Dollars
FED-TAX	6	SN	0-9	Dollars
FED-TAX-YTD	8	SN	0-9	Dollars
FICA	6	SN	0-9	Dollars
FICA-YTD	8	SN	0-9	Dollars
STATE-TAX	6	SN	0-9	Dollars
STATE-TAX-YTD	8	SN	0-9	Dollars
STATE-TAX-CODE	2	A/N	B3-F6	
ALLOTMENTS	6	SN	0-9	Dollars
NET-PAY	6	SN	0-9	Dollars

A/N = Alpha-Numeric
 SN = Signed Numeric

Figure 4-02. Example of Data Record Format.

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Format of Query A			
NUMBER OF EMPLOYEES WITHIN AN ORGANIZATION			
QUERY ITEM TITLE	CHARACTER POSITION	CONTENT/ COMMENT	
Query Designator	1	Q	Constant
File Number	2-3	01	Constant
Query Number	4-5		Insert 01-99
Security Classification	10	U	Unclassified
Query Code	12	A	
Organization	14-19		Insert ORG-ID as requested by query. Refer to data format for applicable code.

Figure 4-03. Example of Query Format.

Query Statement	
Request - No. of employees within an organization (Office of Secretary of Defense)	
Query Statement - IF ORG-ID EQ OSD LIST NO OF EMPLOYEES	

Figure 4-04. Example of Query Statement.

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SECTION 5. USER TERMINAL PROCESSING PROCEDURES

This section shall provide the user with technical information on the use of terminals to accomplish processing. If procedures are complicated or extensive, additional Sections 6 through n may be added in the same paragraph structure as this section. The organization of the document will depend on the characteristics of the AIS being documented. For example, if the tasks of users vary depending upon the organizational echelon in which they work, Section 5 might be oriented to headquarters functions and Section 6 to remote site functions. For another AIS, it may be more appropriate to have Section 5 be a guide to menus used in the system, Section 6 be a guide to command language used in the system, and Section 7 be a guide to functions. Detailed procedures are intended to be presented in paragraphs 5.2 through 5.5. Depending on the design of the AIS, the subparagraphs might be organized on a function-by-function basis or on a menu-by-menu basis. For a transaction-oriented system the organization might be on a screen-by-screen basis.

5.1 Available Capabilities. This paragraph shall describe in general terms capabilities for retrieval, display, and update of data through terminal operations. This description shall include estimates of the frequency of these operations and identification of the events that caused them to be initiated.

5.2 Access Procedures. This paragraph shall present the sequence of steps required to initiate system operation and to access the database/data bank. Included will be such information as the name of the system or subsystem being called and other control information such as:

- a. The offices or personnel authorized to retrieve or update.
- b. Time periods when such access is allowed.
- c. Information for ensuring that only authorized access is allowed.

5.3 Display, Updates, and Retrieval Procedures. Paragraphs 5.3.1 through 5.3.n shall describe the step-by-step procedures necessary to produce the various displays, updates, and retrievals that are available through the use of a terminal. For each procedure, information such as the name of the operation, input formats, and sample responses may be included.

5.4 Recovery and Error Correction Procedures. This paragraph shall provide error codes and messages and indicate their meanings and any corrective actions that should be taken. Any user-initiated recovery procedures and validity checks should also be included.

5.5 Termination Procedures. This paragraph shall present the sequence of steps necessary to terminate the processing.

FIGURE 5-5. Users Manual.

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END USER MANUAL
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FIGURE 5-6. End User Manual.

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SECTION 1. GENERAL

1.1 Purpose of the End User Manual. This paragraph shall describe the purpose of the End User Manual (EM) in the following words, modified where appropriate:

The objective of the End User Manual for (Project Name) (Project Number) is to provide the end user with the information necessary to use the system effectively, including operation of (identification of terminal or personal computer) equipment.

1.2 Purpose of the System. This paragraph shall state the purpose of the system, the benefits expected from its use, and the major functions of the AIS to which the EM applies.

1.3 References. This paragraph shall identify other documents which the end user may need in accomplishing tasks and procedures described in the EM. The following documents shall be specified by author or source, reference number, title, date, and classification.

- a. Project request.
- b. Hardware documentation such as that addressing setup, powerup and powerdown, packing for relocation, activation, operation, or maintenance.
- c. Software documentation of an operating system, utility software, or documents oriented to an end user for related systems.
- d. Previously published documentation on the project if needed for accomplishing the end user's tasks.

1.4 Terms and Abbreviations. This paragraph shall provide a list or include in an appendix a list of any terms, definitions, or acronyms unique to this document and subject to interpretation by the user of the document. This list will not include item names or data codes.

1.5 Security. This paragraph shall present an overview and discussion of the security considerations associated with the system. The end user should be especially cautioned to comply with privacy requirements. A warning should be included regarding making unauthorized copies of data, documents, or software, if applicable.

FIGURE 5-6. End User Manual.

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SECTION 2. SYSTEM SUMMARY

This section provides a nontechnical presentation of information on the overall system. Detailed technical information should be presented in other sections.

2.1 Overview.

2.1.1 Application Summary. The uses of the AIS in supporting the activities of the user shall be stated in general terms and explained. The description shall include major functions performed by the system such as preparation of output, maintenance of data, and display of information. This presentation, part of which shall be presented as a general systems flowchart, shall show:

- a. Logical parts of the system from the point of view of the end user.
- b. Communications paths and techniques.
- c. Interfaces to other systems
- d. The organizations that provide input to the system or that receive output from it.

2.1.2 Performance. This paragraph shall describe the overall system performance capabilities which can be expected by the end user. Capabilities such as capacity constraints and times needed to accomplish major functions should be included.

2.1.3 Controls. This paragraph shall describe briefly the supervisory controls that can be implemented to manage the system.

2.2 System Environment. This paragraph shall provide information about the configuration of equipment and software that will be needed to support the operation of the system.

2.2.1 Hardware Required. This paragraph shall identify and briefly discuss the hardware which must be present for this system to run. Options for the use of additional hardware shall also be identified.

2.2.2 Software Required. This paragraph shall identify and briefly discuss the capabilities of the software that are necessary to use the system. These shall include both the software components developed specifically for the AIS and the operating system, utilities, and other supporting systems.

2.3 Contingencies and Alternate Modes of Operation. This paragraph shall explain the general nature of the differences expected in what the end user will be able to do with the system at times of emergency and what the user

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will be able to do based on modes of operation that differ between peacetime, war, and conditions of alert.

2.4 Assistance and Problem Reporting. This paragraph shall identify points of contact and procedures whereby the end user may obtain assistance and to which problems encountered in using the system may be reported.

FIGURE 5-6. End User Manual.

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SECTION 3. ACCESS TO THE SYSTEM

This section is intended to describe detailed step-by-step procedures oriented to the first-time/occasional end user. Enough detail should be presented so that the end user can reliably access the system even before learning the details of its functional capabilities.

3.1 First-Time Use of the System.

3.1.1 Equipment Familiarization. This paragraph shall describe the following, as appropriate:

- a. Procedures for turning on power and making adjustments.
- b. Dimensions and capabilities of the visual display screen.
- c. Appearance of a cursor, how to identify an active cursor if more than one cursor can appear, how to position a cursor, and how to use a cursor.
- d. Keyboard layout and what is accomplished by different types of keys and pointing devices.
- e. Procedures for turning power off if special sequencing of operations is needed.

3.1.2 Access Control. This paragraph will present an overview of the access and security features of the system which are visible to the end user. Consider describing the following:

- a. How and from whom to obtain a password.
- b. How to add, delete, or change passwords under end user control.
- c. Security and privacy considerations pertaining to the storage and marking of output reports and other media which the end user will generate.

3.1.3 Installation and Setup. This paragraph shall describe any special procedures which the end user must perform in order to be identified or authorized to access or install software on the equipment, or to enter parameters for AIS operation.

3.2 Initiating a Session. This paragraph shall provide step-by-step procedures about how the end user can begin work. A checklist for problem determination should be included in case difficulties are encountered.

3.3 Stopping and Suspending Work. This paragraph shall describe how the end user can cease or interrupt use of the system.

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SECTION 4. PROCESSING REFERENCE GUIDE

This section shall provide the end user with technical information on processing procedures. If procedures are complicated or extensive, additional Sections 5, 6,.... may be added in the same paragraph structure as this section. The organization of the document will depend on the characteristics of the AIS being documented. For example, if the tasks of end users vary depending upon the organization echelon in which they work, Section 4 might be oriented to headquarters functions and Section 5 to remote site functions. For another AIS, it may be more appropriate to have Section 4 be a guide to menus used in the system, Section 5 be a guide to command language used in the system, and Section 6 be a guide to functions. Detailed procedures are intended to be presented in subparagraphs of paragraph 4.3. Depending on the design of the AIS, the subparagraphs might be organized on a function-by-function basis or on a menu-by-menu basis. For a transaction-oriented system the organization might be on a screen-by-screen basis.

4.1 Capabilities. This paragraph shall briefly describe the inter-relationships of the transactions, menus, or functions in order to provide an overview of the use of the system.

4.2 Conventions. This paragraph shall describe any conventions such as the use of colors in displays, the use of audible alarms, the use of abbreviated vocabulary, and the use of rules for assigning names or codes.

4.3 Processing Procedures. This paragraph shall explain the organization of subordinate paragraphs, e.g., by function, by menu, by screen. Any necessary order in which procedures must be accomplished shall be described.

4.3.1 Variable Title (Identify). The title of this paragraph shall identify the function, menu, transaction, or other process being described. This paragraph shall describe and give examples of menus, data entry forms, outputs, diagnostic messages or alarms, and help facilities which can provide online descriptive or tutorial information. The format for presenting this information can be adapted to the particular characteristics of the AIS, but a consistent style of presentation must be used, i.e., the descriptions of menus must be consistent, the descriptions of transactions must be consistent among themselves.

4.3.2 Variable Title (Identify). This paragraph shall describe the second function, menu, or other procedure using the same information as described in paragraph 4.3.1. Additional functions, menus, or procedures should be described in paragraphs 4.3.3 thru 4.3.n.

4.4 Related Processing. This paragraph shall identify and describe any related batch, offline, or background processing performed by the AIS that

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is not invoked directly by the end user and is not described in paragraph 4.3. Any end user responsibilities to support this processing will be specified.

4.5 Data Backup. This paragraph shall describe responsibilities of the end user for making and retaining all recorded data which can be used to replace primary copies of data in event of errors, defects, malfunctions, or accidents. Step-by-step procedures shall be described as necessary.

4.6 Recovery from Errors and Malfunctions. This paragraph shall present detailed procedures for recovery from errors or malfunctions occurring during processing.

4.7 Messages. This paragraph shall list, or refer to an appendix which lists all error messages, diagnostic messages, and information messages which can occur while accomplishing any of the end user's functions described in paragraphs 4.3 through 4.6. The normal corrective action that should be taken after any such message should be identified and described.

FIGURE 5-6. End User Manual.

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COMPUTER OPERATION MANUAL
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FIGURE 5-7. Computer Operation Manual.

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SECTION 1. GENERAL

1.1 Purpose of the Computer Operation Manual. This paragraph shall describe the purpose of the Computer Operation Manual (OM) in the following words or appropriate modifications thereto:

The objective of this Computer Operation Manual for (Project Name) (Project Number) is to provide computer control personnel and computer operators in an information processing center with a detailed operational description of the system and its associated environment with which they will be concerned during the performance of their duties.

1.2 Project References. At least the following documents, when applicable, shall be specified by author or source, reference number, title, date, and security classification:

- a. Users Manual (UM).
- b. Maintenance Manual (MM).
- c. Other pertinent documentation on the project.

1.3 Terms and Abbreviations. This paragraph shall list or include in an appendix a list of any terms, definitions, or acronyms unique to this document and subject to interpretation by the user of the document. This list will not include item names or data codes.

FIGURE 5-7. Computer Operation Manual.

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SECTION 2. SYSTEM OVERVIEW

2.1 System Application. A brief description of the system including its purpose and uses shall be provided.

2.2 System Organization. This paragraph shall describe the operation of the system by use of a chart showing the data processing operations, including how the different operations are interrelated. If sets of runs are grouped by time periods or cycles, then each set of integrated operations required on a daily, weekly, etc., basis will be presented. If runs may be grouped logically by organizational level, the groups of runs that can be performed by each organizational level such as headquarters processing, field activity processing, etc., shall be presented.

2.3 Software Inventory. This paragraph shall provide an inventory of the various software units. This listing shall include the software full name, software identification, as well as security considerations of the software and identification of those software units necessary to continue or resume operation of the AIS in case of an emergency.

2.4 Information Inventory.

2.4.1 Resource Inventory. This paragraph shall list all permanent files and databases/data banks that are referenced, created, or updated by the system. This listing shall include information such as the file names and database/data bank names. Include specific file identifications, storage media and required storage (number of tapes or disks) as well as security considerations. The listing shall also identify those files and databases/data banks necessary to continue or resume operation of the AIS in case of an emergency.

2.4.2 Report Inventory. This paragraph shall list all reports produced by the AIS. This listing shall include the report name and the software which produces the report.

2.5 Processing Overview. This paragraph will provide information which is applicable to the processing of the system. Separate paragraphs may be used as needed to cover system restrictions, waivers of operational standards, information oriented toward specific support areas (e.g., library, small computer and teleprocessing support), or other processing requirements such as the following:

- a. Interface with other systems.
- b. Other pertinent system-related information.

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2.6 Communications Overview. This paragraph shall contain a general description of the communications functions and processes of the system. This paragraph shall contain a chart of the communications network involved within the system.

2.7 Security. This paragraph shall contain an overview and discussion of the security considerations associated with the system.

FIGURE 5-7. Computer Operation Manual.

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SECTION 3. DESCRIPTION OF RUNS

This section shall provide a description of the runs for use by operations and scheduling personnel in efficient scheduling of operations, assignment of equipment, the management of input and output data, and restart/recovery procedures. In online systems some information about system operational control will be related to the capabilities of the operating system. Much of the necessary information should be included in graphic representations with additional information that is specifically oriented to the hardware and software set being used.

3.1 Run Inventory. This paragraph shall provide a list of the runs showing the software units and the jobs that make up each run. Include a brief summary of the purpose of the run. This list should relate to the runs that are included in the remainder of this section.

3.2 Phasing. This paragraph shall provide a schedule of acceptable phasing of the software system into a logical series of operations. A system run may be phased to permit manual or semiautomatic checking of intermediate results, to provide the user with intermediate results for other purposes, or to permit a logical break if higher priority jobs are submitted. An example of the minimum division for most systems would be edit, file update, and report preparation.

3.3 Diagnostic Procedures. This paragraph shall furnish the setup and execution procedures for any software diagnostics. Included will be procedures for validation and trouble shooting. All parameters (both input and output), codes, and range values for diagnostic software shall be explained.

3.4 Error Messages. All error messages within the AIS shall be listed in this paragraph along with the corresponding correction procedure for each message.

3.5 Run Description (Identify). Paragraphs 3.5 through 3.n will provide the detailed information needed to execute runs of the system. The information provided will be organized in a manner most useful to the information processing centers and operations personnel that will perform the runs.

3.5.1 Control Inputs. This paragraph shall provide a listing of the runstream of job control statements needed to initiate the run.

3.5.2 Management Information. This paragraph shall present the information needed to manage the run including, for example, the following information:

- a. Run identification.

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- b. Peripheral and resource requirements.
- c. Security.
- d. Method of initiation, such as on request, as a result of another run, at a predetermined time, etc.
- e. Estimated run time.
- f. Required turnaround time.
- g. Messages and responses.
- h. Procedures for taking check points.
- i. Waivers from operational standards.
- j. Contacts for problems experienced with the run.

3.5.3 Input-Output Files. This paragraph shall list information about the files and databases/data banks that serve as input to or that are created or updated by the run. Included for each should be information such as the following:

- a. Name.
- b. Security.
- c. Recording medium.
- d. Retention schedule.
- e. Disposition.

3.5.4 Output Reports. This paragraph shall list information about the reports that are produced during the run. Included for each report should be information such as the following:

- a. Report identification.
- b. Security.
- c. Media, e.g., hardcopy, electronic tape.
- d. Volume of report.

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- e. Number of copies.
- f. Distribution of copies.

3.5.5 Reproduced Output Reports. This paragraph shall provide information about those computer-generated reports that are subsequently reproduced by other means. Included for each report shall be information such as the following:

- a. Report identification.
- b. Security.
- c. Reproduction technique.
- d. Paper size.
- e. Binding method.
- f. Number of copies.
- g. Distribution of copies.

3.5.6 Restart/Recovery Procedures. This paragraph shall provide information to the information processing center personnel concerning restart/recovery procedures that these personnel will follow in the event of a system failure.

3.6 Run Description (Identify). Paragraph 3.6 will present information about the second run in a manner similar to that used in paragraph 3.5. Additional run descriptions should be presented in paragraphs 3.7 through 3.n.

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FIGURE 5-8. Maintenance Manual.

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SECTION 1. GENERAL

1.1 Purpose of the Maintenance Manual. This paragraph shall describe the purpose of the Maintenance Manual (MM) in the following words or appropriate modifications thereto:

The objective for writing this Maintenance Manual for (Project Name) (Project Number) is to provide the maintenance programmer personnel with the information necessary to effectively maintain the system.

1.2 Project References. This paragraph shall provide a brief summary of the references applicable to the history and development of the project. The general nature of the system developed shall be specified including a brief description of its purpose and uses. Also indicated shall be the project sponsor and user as well as the information processing centers that will run the completed AIS. At least the following documents, when applicable, shall be specified by author or source, reference number, title, date, and security classification:

- a. Users Manual (UM).
- b. End User Manual (EM).
- c. Computer Operation Manual (OM).
- d. Other pertinent documentation on the project.

1.3 Terms and Abbreviations. This paragraph shall list or include in an appendix a list of any terms, definitions, or acronyms unique to this document and subject to interpretation by the user of the document. This list will not include item names or data codes.

FIGURE 5-8. Maintenance Manual.

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SECTION 2. SYSTEM DESCRIPTION

2.1 System Application. The purpose of the system and the functions it performs shall be explained. A particular application system, for example, might serve to control mission activities by accepting specific inputs (status reports, emergency conditions), extracting items of data, and deriving other items of data in order to produce both information about a specific mission and information for summary reports. These system functions shall be related to paragraphs 3.1, Specific Performance Requirements, and 4.2, System Functions, of the FD.

2.2 System Organization. This paragraph will provide a comprehensive description of the system, subsystem, communications, jobs, etc., in terms of their overall functions. This description will be accompanied by a chart showing the interrelationships of the major components of the system. Communications shall be depicted in the charts for systems that are networked or perform distributed processing. Options provided to support operation in degraded modes or at alternate sites shall be described.

2.3 Security. This paragraph shall contain an overview and discussion of the security considerations associated with the system.

2.4 System Requirements Cross-Reference. This paragraph shall provide a cross-reference between the overall functions described in paragraph 2.2 and those requirements stated in Sections 3 and 4 of the FD and Section 2 of the SS.

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SECTION 3. ENVIRONMENT

3.1 Equipment Environment. This paragraph shall discuss the equipment configuration and its general characteristics as they apply to the system.

3.2 Support Software. This paragraph shall list the various support software used by the system and identify the version or release number under which the system was developed.

3.3 Database/Data Bank. Information in this paragraph shall include a complete description of the nature and content of each database/data bank used by the system including security considerations.

3.3.1 General Characteristics. Provide a general description of the characteristics of the database/data bank, including:

- a. Identification - specify name and mnemonic reference. List the software units utilizing the database/data bank.
- b. Permanency - note whether the database/data bank contains static data that a software unit can reference, but may not change, or dynamic data that can be changed or updated during system operation. Indicate whether the change is periodic or random as a function of input data.
- c. Storage - specify the media for the database/data bank (e.g., tape, disk, internal storage) and the amounts of storage required.
- d. Restrictions - explain any limitations on the use of this database/data bank by the software units in the system.

3.3.2 Organization and Detailed Description. This paragraph will serve to define the internal architecture of the database/data bank. A description will be included which identifies data structures, elements, and entities, accompanied by a brief narrative explanation of the database/data bank and tables, if applicable. If available, computer-generated or other listings of this detailed information may be referenced or included herein. The following items indicate the type of information desired:

- a. Layout - show the composition of the database/data bank including elements, sets, entities, i.e., logical schema.
- b. Structures - note whether the physical record is a logical record or one of several that constitutes a data structure. Identify the structure parts, such as headers or control segments (keys) and the body of the record, i.e., physical storage schema.

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- c. Elements - identify each element in the structure and, if necessary, explain its purpose. Include for each element the following items.
 - (1) Labels - indicate the label assigned to reference each element.
 - (2) Size - indicate the length and number of bits/characters that make up each data element.
 - (3) Range - indicate the range of acceptable values for each element.
- d. Expansion - note provisions, if any, for adding to the structure.
- e. Contingencies - note provisions, if any, for extracting subsets of the database/data bank to permit operation in degraded modes or at alternate sites.

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SECTION 4. SYSTEM MAINTENANCE PROCEDURES

This section shall provide information on the specific procedures necessary for the programmer to maintain the software units that make up the system.

4.1 Conventions. This paragraph shall explain all rules, schemes, and conventions that have been used within the system. Information of this nature could include the following items:

- a. Design of mnemonic identifiers and their application to the labeling of software units, subunits, data structures, data elements, storage areas, etc. Provisions for unique naming or renaming at different sites shall be described if contingency processing at alternate sites requires separation of the resources named by the identifiers.
- b. Procedures and standards for charts, listings, serialization of cards, abbreviations used in statements and remarks, and symbols appearing in charts and listings.
- c. The appropriate standards, fully identified, may be referenced in lieu of a detailed outline of conventions.
- d. Standard data elements and related features.

4.2 Verification Procedures. This paragraph will include those requirements and procedures necessary to check the performance of software following its modification. Included may also be procedures for periodic verification of the software.

4.3 Error Conditions. A consolidated list of all error messages produced by the software units shall be included. This list shall include the identification of the error, a description of the error, an explanation of the source of the error, and recommended methods to correct the error.

4.4 Maintenance Software. This paragraph shall contain an inventory and description of any special software (such as file restoration, purging history files) used to maintain the system. These software units should be described in the same manner as those described in paragraph 2.2 of this document.

a. Input-Output Requirements. Included in this paragraph shall be the requirements concerning the software and workstation information needed to support the necessary maintenance tasks. Information may include names and locations of libraries containing control language for maintenance software, and information concerning location and content of testbeds for testing of software changes. Workstation information may include definitions of keyboard control keys for predefined functions. When a support system is being used, this paragraph shall reference the appropriate manual.

FIGURE 5-8. Maintenance Manual.

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b. Procedures. The procedures, presented in a step-by-step manner, shall detail the method of preparing the inputs, such as structuring and sequencing of inputs. The operations or steps to be followed in setting up, running, and terminating the maintenance task on the equipment shall be given.

4.5 Maintenance Procedures. This paragraph shall contain any special procedures required which have not been delineated elsewhere in this section. Specific information that may be appropriate for presentation would include:

- a. Requirements, procedures, and verification which may be necessary to maintain the system input-output components, such as the database/data bank.
- b. Requirements, procedures, and verification methods necessary to perform a special maintenance run.

FIGURE 5-8. Maintenance Manual.

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SECTION 5. SOFTWARE UNIT MAINTENANCE PROCEDURES

This section shall provide the information and the procedures necessary to maintain the individual software units that make up the system.

5.1 Software Unit (Identify). The software units to be discussed in this paragraph shall be identified.

5.1.1 Description. This paragraph shall provide details and characteristics of the software unit and its relationship to other software units. Information to be provided includes the following:

- a. Functions - list and describe the functions being performed by the software unit.
- b. Input - describe the input including the following:
 - (1) Input data format, e.g., data record layout.
 - (2) Source and medium of each input described above.
- c. Processing - describe the processing methodology of the software unit, including:
 - (1) Initiation procedures, such as software calls and parameters as well as job control statements.
 - (2) Major operations of the software unit. The description may reference charts and diagrams which may be included in an appendix. These charts and diagrams will show the general logical flow of operations, such as accepting input, accessing a database/data bank, making a decision, and producing output which would be represented by segments or units within the software unit. Reference may be made to included charts and diagrams that present each major operation in more detail.
 - (3) Major branching conditions provided in the software unit.
 - (4) Restrictions that have been designed into the system with respect to the operation of this software unit, any limitations on the use of the software unit, and any timing requirements.
 - (5) Exit requirements concerning termination of the operation of the software unit.
 - (6) Communications or linkage to the next logical software unit.

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- (7) Output produced by the software unit for use by related software units.
- d. Output - describe format and medium of each output produced by the software unit including any for use by related software units. This description may reference output described in the Users Manual.
- e. Storage - describe the amount and types of storage required to use the software unit, the broad parameters of the storage locations needed, and any algorithm used to determine that amount.
- f. Interfaces - describe the interfaces to and from this software unit.
- g. Data Structures - provide details and characteristics of the data structures used within the software unit. If the data description of the software unit provides sufficient information, the software listing may be referenced to provide some of the information. At least the following will be included:
 - (1) Structure name or label or symbolic name.
 - (2) Purpose.
 - (3) Other software units that use this data structure.
 - (4) Logical divisions within the data structure.
 - (5) Data structure description access paths. A graphic presentation may be used.
 - (6) For elementary items within the data structure not described under inputs, outputs, or database/data bank provide at least the following:
 - (a) Name.
 - (b) Synonymous names.
 - (c) Definition.
 - (d) Unit of measure.
 - (e) Format and acceptable range of values.
 - (f) Data item names, abbreviations, and codes.
 - (g) Unique features for running this software unit such as diagnostic modes that are not in the UM, EM, or OM.

FIGURE 5-8. Maintenance Manual.

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5.1.2 Software Unit Requirements Cross-Reference. This paragraph shall provide a cross-reference between the functions of this software unit as outlined in paragraph 5.1.1 and those cross-referenced in paragraph 2.4.

5.1.3 Conventions. This paragraph shall describe all rules, schemes, and conventions used within the software unit unless they have been included in paragraph 4.1.

5.1.4 Verification Procedures. This paragraph shall describe those requirements and unique procedures necessary to check the performance of the software unit. Included may also be procedures for periodic verification of the software unit.

5.1.5 Error Conditions. This paragraph shall describe any unique error conditions not previously documented. This description shall include an explanation of the source of the error and recommended methods to correct it.

5.1.6 Listings. This paragraph shall contain or provide a reference to the location of the software listings. Comments appropriate to particular instructions may be made to understand and follow the listing.

5.2 Software Unit (Identify). This paragraph shall describe the second software unit using the same structure as outlined in paragraph 5.1. Additional software units should be described in paragraphs 5.3 through 5.n.

FIGURE 5-8. Maintenance Manual.

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FIGURE 5-9. Test Plan.

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FIGURE 5-9. Test Plan.

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SECTION 1. GENERAL

1.1 Purpose of the Test Plan. This paragraph shall describe the purpose of the Test Plan (PT) in the following words, modified as appropriate:

The Test Plan for (Project Name) (Project Number) is written to fulfill the following objectives:

- a. To provide guidance for the management and technical effort necessary throughout the test period.
- b. To establish a comprehensive test plan and to communicate the nature and extent of the tests deemed necessary to provide a basis for evaluation of the system.
- c. To coordinate an orderly schedule of events, a specification of equipment and organizational requirements, the methodology of testing, a list of materials to be delivered, and a schedule of user orientation.
- d. To provide a written record of the actual test inputs to exercise system limits and critical capabilities, the instructions to permit execution of tests, and the expected outputs.

1.2 Project References. This paragraph shall provide a brief summary of the references applicable to the history and development of the project. Documentation describing systems or procedures which supplement or provide for interaction with the subject system during the course of normal operation or at any point in the testing shall be specified. Included shall be a listing of at least all applicable documentation prepared for this project.

1.3 Terms and Abbreviations. This paragraph shall list or include in an appendix a list of any terms, definitions, or acronyms unique to this document and subject to interpretation by the user of the document. This list will not include item names or data codes.

FIGURE 5-9. Test Plan.

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SECTION 2. DEVELOPMENT TEST ACTIVITY

2.1 Statement of Pretest Activity. -- This paragraph shall provide a description of the testing completed as part of the system development activity. It may refer to an appendix in the form of a listing of the elements in the PS and SS against which the software operation has been explicitly checked.

2.2 Pretest Activity Results. This paragraph will provide an overall evaluation of the test results obtained from all tests conducted as part of the system development activity. It may refer to an appendix when multiple tests have been conducted. Included must be a statement of any known system deficiencies and their potential impact.

FIGURE 5-9. Test Plan.

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SECTION 3. TEST PLAN

3.1 System Description. A brief description or system chart showing inputs and outputs shall be included to provide a frame of reference for the description of the tests to be conducted.

3.2 Testing Schedule. This paragraph shall provide a listing or chart depicting the locations at which the testing will be scheduled and the time frames during which the testing will be conducted.

3.3 First Location (Identify) Testing. This paragraph shall identify the first location at which the testing will be conducted and the participating organizations. This paragraph will also list the tests to be performed at this location and will reference the appropriate sections that describe the tests.

3.3.1 Milestone Chart. This paragraph shall provide a chart to depict the activities and events listed below. An example of this type of chart is shown in Figure 3-01. When preparing this chart, consideration will be given to all tests scheduled for this location. The chart will be in chronological order with supporting narrative as necessary and will show, for example:

- a. Overall on-site test period by calendar date and portions of the period assigned to major portions of test.
- b. Pretest on-site period required for system debugging, orientation, and familiarization.
- c. Period assigned for the collection of database/data bank values, input values, and other operational data required for system test.
- d. Period assigned for user orientation and familiarization with system documentation.
- e. Period assigned for user training, operator training, maintenance and control group training, and management orientation briefing.
- f. Period assigned for preparation, review, and approval of the Test Analysis Report.

3.3.2 Equipment Requirements. This paragraph shall provide a chart or listing to depict the period of usage and quantity required of each item of equipment employed throughout the test period at each location where the system is to be installed. Any communications and test data reduction equipment shall be included.

FIGURE 5-9. Test Plan.

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Milestones for Record Association System												
Day \ Event	1	2	3	4	5	6	7	8	9	10	11	12
A						X	X	X	X	X		
B	X	X	X	X	X	X	X					
C					X	X	X					
D	X	X	X	X								
E			X	X	X				X			
F										X	X	X

Figure 3-01. Example of Milestone Chart.

FIGURE 5-9. Test Plan.

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3.3.3 Software Requirements. This paragraph shall list software, including systems support, communications, and applications software and their media (tape, disk, etc.) used during and in support of the testing when not a part of the system being tested.

3.3.4 Personnel Requirements. This paragraph shall provide a chart or a list of the number and period of use of personnel with indicated skill types required during the entire test periods. It will indicate special requirements, such as multishift operation and assignment or the retention of key skills to ensure continuity and consistency in extensive test programs. This chart or list should be related to the milestone chart.

3.3.5 Orientation Plan. This paragraph shall describe the number of personnel providing training during the testing and the types of training to be undertaken. This information shall be related to the personnel requirements in paragraph 3.3.4. This plan shall include user instruction, operator instruction, maintenance and control group instruction, and the orientation briefing of staff personnel. If extensive training is anticipated, a separate manual may be developed and referenced here.

3.3.6 Test Materials. This paragraph shall itemize the articles and apparatus associated with conducting the tests.

3.3.6.1 Deliverable Materials. This paragraph shall itemize all materials that will be delivered as part of the system to include the quantity and full identification. Examples of these include:

- a. Users, Computer Operation, and Maintenance Manuals.
- b. Listings of software units and data.
- c. Media on which software units and data definitions are recorded.
- d. Media on which data used in the tests are recorded.
- e. Sample listings of system output.

3.3.6.2 Site Supplied Materials. All items that are expected to be provided shall be listed in this paragraph. Examples of these include:

- a. Database/data bank and its media, fully identified.
- b. Other inputs and their media.
- c. Test control software or other special test software and their media.

FIGURE 5-9. Test Plan.

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- d. Test worksheets and other forms or instructions prepared to control and expedite the test activity. Their type, layout, and quantity must be fully explained.
- e. Apparatus required during or in support of the testing, when it is not normally part of the equipment configuration or is not being delivered as part of the installation effort. Examples of this apparatus are extra peripherals (tape drives, printers, plotters), test message generators, test timing devices, test event records, etc. Such apparatus must be identified by name, type, and quantity required.

3.3.7 Security. Describe any security and privacy considerations associated with these tests.

3.4 Second Location (Identify) Testing. This paragraph shall describe the testing to be conducted at the second location using the same information as outlined in paragraph 3.3. Additional testing locations will be described in paragraphs 3.5 through 3.n.

FIGURE 5-9. Test Plan.

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SECTION 4. TEST SPECIFICATION AND EVALUATION

4.1 Test Specification.

4.1.1 Performance Requirements. This paragraph shall list the individual requirements to be demonstrated by the tests derived from the specific performance requirements given in paragraph 3.1 of the FD.

4.1.2 System Functions. This paragraph shall provide a detailed list of the system and communications functions that will be exercised during the overall test activity. This list, derived from paragraph 3.2 of the FD, must be ordered in such a way that the functions are related to the performance requirements given in paragraph 4.1.1, above.

4.1.3 Test/Function Relationships. This paragraph shall provide a list of the tests which, taken as a whole, constitute the overall test activity. It shall also include a test/function matrix chart summarizing the overall allocation of the system functions to the tests. Figure 4-01 shows an example of this type of chart expanded to also show the relationship of software units to functions.

4.2 Test Methods and Constraints.

4.2.1 Test Conditions. This paragraph shall indicate whether the test of the system is to be made using the normal input and database/data bank or whether some special input and database/data bank are to be used.

4.2.2 Extent of Test. This paragraph shall indicate the extent of the testing to be employed. Where total testing is not to be employed, the test requirements will be presented either as a percentage of some well defined total quantity or as a number of samples of discrete operating conditions or values. Also indicate the rationale for adopting limited testing.

4.2.3 Data Recording. This paragraph shall indicate data recording requirements for the test process, including data not normally recorded during system operation.

4.2.4 Test Constraints. This paragraph shall indicate the anticipated limitations imposed on the test due to system or test conditions, such as limitations on timing, interfaces, equipment, personnel, and database/data bank.

4.3 Test Progression. In cases of progressive or cumulative tests, an explanation shall be included concerning the manner in which progression is made from one test to another so that the cycle or activity for each test is completely accomplished.

Test and Function Relationships for the Record Association System

FUNCTION (FD paragraph)		Generate and maintain the database (3.2.1)		Selectively retrieve data (3.2.2)							Produce special catalog (3.2.3)			
Software Units Providing Function		G N O P	D L P R	A S S C	P R O J	M D P R	F U A R	D A E L	D S P R	D A T A	P R I N T	D I R T	N A M E	P E R
TEST														
TC010	Add new record	X												
TC020	Add new originator	X												
TC030	Add a field	X												
TC040	Change a field	X												
TC050	Delete a field	X												
TC060	Delete a record	X												
TC070	Delete an originator		X											
TC080	Create index file			X										
Retrieve records with a requested:														
TC090	Originator				X									
TC100	Command designator					X								
TC110	Functional area						X							
TC120	Record ID code (RIC)							X						
TD130	Several RICs							X						
TC140	Index set and originator								X					
TC150	Index set									X				
TC160	2 different index sets									X				
TC170	3 different index sets									X				
TC180	RIC and associated records									X				
TC190	Print full database										X			
TC200	Extract record directory											X		
TC210	Extract record names/RICs												X	
TC220	Extract keywords, permuted													X

Figure 4-01. Example of Test and Function Relationships Chart.

FIGURE 5-9. Test Plan.

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4.4 Test Evaluation.

4.4.1 Test Data Criteria. This paragraph shall describe the rules by which test results will be evaluated; for example:

- a. Tolerances - range over which a data value output by a system performance parameter can vary and still be considered acceptable.
- b. Samples - the minimum number of combinations or alternatives of input conditions and output conditions that can be exercised to constitute an acceptable test of the parameters involved.
- c. Counts - the maximum number of interrupts, halts, or other system breaks which may occur due to nontest conditions.

4.4.2 Test Data Reduction. This paragraph shall describe the technique to be used for manipulation of the raw test data into a form suitable for evaluation, if applicable. The available techniques could include:

- a. Manual - manual collection and collation of system test outputs into test sequence order followed by verification of the results.
- b. Semiautomatic - automatic inspection of test results as obtained by data recording means using a test data reduction program followed by manual inspection of selected test results which do not lend themselves to complete reduction by automatic means.
- c. Automatic - automatic inspection of test results specifically recorded for manipulation by the test data reduction program. Test results, as recorded, include all items of test significance. The test data reduction program contains an image of correct data output for an item-by-item comparison of data and provides a summary of an evaluated test as output

FIGURE 5-9. Test Plan.

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SECTION 5. TEST (IDENTIFY) DESCRIPTION

This section shall describe major logical groups of tests to be performed. If appropriate, additional logical groups shall be described in subsequent sections following the same format as that used in this section.

5.1 Test Description. This paragraph shall provide a general description of the test to be performed.

5.2 Test Control.

5.2.1 Means of Control. This paragraph shall indicate whether the test is to be controlled by:

- a. Manual means - manual inspection of necessary inputs and manual control of test sequence.
- b. Semiautomatic means - manual insertion of necessary inputs and automatic (test software) control of test sequence.
- c. Automatic means - preparation and use of a special test software to provide necessary input, conduct tests, monitor and record test results.

5.2.2 Test Data. In each of the following paragraphs identify any security considerations.

5.2.2.1 Input Data. This paragraph will describe the manner in which input data are controlled in order to:

- a. Test the system with a minimum number of data types and values.
- b. Exercise the system with a range of bona fide data types and values which test for overload, saturation, and other "worst case" effects.
- c. Exercise the system with bogus data types and values which test for rejection of irregular inputs.

5.2.2.2 Input Commands. This paragraph shall describe the manner in which input commands are used to control:

- a. Initialization of test.
- b. Halt or interrupt of test.
- c. Repeat of unsuccessful or incomplete test.

FIGURE 5-9. Test Plan.

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- d. Alternate modes of operation as required by test.
- e. Termination of test.

5.2.2.3 Output Data. This paragraph shall describe the manner in which output data are analyzed in order to:

- a. Detect whether an output is produced.
- b. Identify media and location of data produced by the test.
- c. Evaluate output as a basis for continuation of test sequence.
- d. Evaluate test output against required output to assess performance.

5.2.2.4 Output Notification. This paragraph shall describe the manner in which output notifications (messages output by the system concerning status or limitations on internal performance) are controlled in order to:

- a. Indicate readiness for test.
- b. Provide indications of irregularities in input test data or test database/data bank due to normal or erroneous test procedures.
- c. Provide indications of irregularities in internal operations on test data due to normal or erroneous test procedures.
- d. Provide indications on the control, status, and results of the test as available from any auxiliary test software.

5.3 Test Procedures. This paragraph shall contain the step-by-step procedures to accomplish each test of the system. Each step shall be assigned a number and this number, along with critical test data and test procedures information, shall be tabulated onto a test procedure form for test control and the recording of results.

5.3.1 Test Setup. This paragraph shall describe or refer to standard operating procedures that describe the activities associated with setup of the computer facilities to conduct the test, including all routine machine activities.

5.3.2 Test Initialization. This paragraph shall itemize, in test sequence order, the activities associated with establishing the testing conditions starting with the equipment in the setup condition. Initialization may include such functions as:

FIGURE 5-9. Test Plan.

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- a. Readout of control function locations and critical data from indicators and storage locations for reference purposes.
- b. Queueing of data input values for the test.
- c. Queueing of test support software.
- d. Coordination of personnel actions associated with test.

5.3.3 Test Steps. This paragraph shall describe, in test step sequence, special operations such as:

- a. Inspection of test conditions.
- b. Data dumps.
- c. Instructions for data recording.
- d. Modifications of database/data bank.
- e. Interim evaluation of test results.

5.3.4 Test Termination. This paragraph shall itemize, in test sequence order, the activities associated with termination of the test such as:

- a. Readout and location of critical data from indicators for reference purposes.
- b. Termination of operation of time-sensitive test-support software and test apparatus.
- c. Collection of system and operator records of test results.

FIGURE 5-9. Test Plan.

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FIGURE 5-10. Test Analysis Report.

SECTION 1. GENERAL

1.1 Purpose of the Test Analysis Report. This paragraph shall describe the purpose of the Test Analysis Report (RT) in the following words, modified when appropriate:

The Test Analysis Report for (Project Name) (Project Number) is written to fulfill the following objectives:

- a. To document the results of the test.
- b. To provide a basis for assigning responsibility for deficiency correction and follow-up.
- c. To provide a basis for preparation of a statement of project completion.
- d. To establish user confidence in the operation of the system.

1.2 Project References. This paragraph shall provide a brief summary of the project objectives and identify the project sponsor and user. Also provided shall be a list of applicable documents by author or source, reference number, title, date, and security classification. This paragraph shall include the following, when applicable:

- a. Functional Description (FD).
- b. Users Manual (UM).
- c. End User Manual (EM).
- d. Computer Operation Manual (OM).
- e. Maintenance Manual (MM).
- f. Test Plan (PT).

1.3 Terms and Abbreviations. This paragraph shall list or include in an appendix a list of any terms, definitions, or acronyms unique to this document and subject to interpretation by the user of the document. This list will not include item names or data codes.

1.4 Security. This paragraph will describe any security considerations associated with the test analysis and the data being handled.

SECTION 2. TEST ANALYSIS

2.1 Test (Identify). This paragraph shall describe the first test as identified in the PT.

2.1.1 System Functions. Each system function, corresponding to the functions tested according to paragraph 4.1.3 of the PT, shall be separately described.

2.1.2 Functional Capability. This paragraph shall describe the capability to perform the function as it has been demonstrated. It shall also assess the manner in which the test environment may be different from the operational environment and the effect of this difference on the capability.

2.1.3 Performance. This paragraph shall quantitatively compare the performance characteristics of the software with the criteria provided in the PT, when applicable.

2.2 Test (Identify). This paragraph shall describe the second test in a manner similar to that used in paragraph 2.1. Additional tests will be described in paragraphs 2.3 through 2.n.

FIGURE 5-10. Test Analysis Report.

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SECTION 3. SUMMARY AND CONCLUSIONS

3.1 Demonstrated Capability. This paragraph shall provide a general statement of the capability of the system as demonstrated by the test, compared with the performance requirements contained in the FD. An individual discussion of conformance with specific requirements may be included on complex systems.

3.2 System Deficiencies. This paragraph shall provide an individual statement for each deficiency in system operations, as measured against the PT. Accompanying each deficiency will be a discussion of the impact:

- a. If the deficiency is not corrected.
- b. If the deficiency is corrected, along with the assignment of organizational responsibility for the correction.

3.3 System Refinements. This paragraph shall itemize improvements that can be realized in system design or operation, as determined during the test period. Accompanying each improvement shall be a discussion of the added capability it provides the system and the impact on the system design.

FIGURE 5-10. Test Analysis Report.

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FIGURE 5-11. Implementation Procedures.

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SECTION 1. GENERAL

1.1 Purpose of the Implementation Procedures. This paragraph shall describe the purpose of the Implementation Procedures (IP) in the following words, modified when appropriate:

The objective of the Implementation Procedures for (Project Name) (Project Number) is to provide the necessary information to the functional users and data processing personnel to accomplish the installation of a previously tested AIS and to achieve operational status at additional sites.

1.2 Project References. This paragraph shall provide a brief summary of the references applicable to the history, development, operation, and maintenance of the system. A list of applicable documents shall be provided by source or author, reference number, title, date, and security classification. This list shall include the following, when applicable:

- a. Project request.
- b. Users Manual (UM).
- c. End User Manual (EM).
- d. Computer Operation Manual (OM).
- e. Other pertinent documentation on the project.

1.3 Terms and Abbreviations. This paragraph shall list or include in an appendix a list of any terms, definitions, or acronyms unique to this document and subject to interpretation by the user of this document. This list will not include item names or data codes.

FIGURE 5-11. Implementation Procedures.

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SECTION 2. IMPLEMENTATION OVERVIEW

This section shall provide a description of the implementation process, including support, user, and operations activities. It shall also identify who will accomplish the various segments of the implementation process, provide a schedule of events, and present additional information of common interest to both the functional user and data processing personnel.

2.1 Description. This paragraph shall provide a general description of the implementation process to provide a frame of reference for the remainder of the document. A list of sites for AIS installation, the schedule dates, and the method of implementation shall be included.

2.2 Contact Point. This paragraph shall provide the organizational name, office symbol/code, and telephone number of a contact for questions relating to this implementation.

2.3 Support Materials. This paragraph shall list the type, source, and quantity of support materials required for the implementation. Included shall be items such as magnetic tapes, disk packs, computer printer paper, and special forms.

2.4 Training. This paragraph shall describe the type and amount of special training required, if any.

2.5 Tasks. Each task required for the system installation shall be described or listed in general terms. Each task shall be identified with the organization that will accomplish this task, usually either the user, computer operations, or the developer. This task list or description shall include such items to be accomplished as:

- a. Providing overall planning, coordination, and preparation for implementation.
- b. Ensuring that all manuals applicable to the installation effort are available when needed.
- c. Providing technical assistance.
- d. Establishing criteria, supervising, and conducting training activities associated with the implementation.
- e. Scheduling processing required for the implementation.
- f. Providing comprehensive support for the implementation.

FIGURE 5-11. Implementation Procedures.

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- g. Ensuring that all prerequisites have been fulfilled prior to the implementation date.
- h. Providing personnel for the implementation team.
- i. Arranging lodging, transportation, and office facilities for the implementation team.
- j. Providing instructor and student personnel for training before and during the implementation effort.
- k. Providing computer support.
- l. Providing priority scheduling to ensure adequate turnaround.

2.6 Personnel Orientation. This paragraph shall identify those efforts such as briefings and seminars intended to orient personnel to the new system.

2.7 Personnel Requirements. This paragraph shall describe the number, time, and skill level of the personnel required during the implementation period, including the need for multishift operation, clerical support, etc.

2.8 Security. This paragraph shall contain an overview and discussion of the security considerations associated with the system.

FIGURE 5-11. Implementation Procedures.

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SECTION 3. SITE INFORMATION - COMPUTER OPERATIONS

3.1 Site (Identify). The site or sites to be discussed in this paragraph shall be identified. Additional paragraphs (paragraphs 3.2 through 3.n) will be prepared as necessary to cover other sites. Multiple sites may be discussed within paragraph 3.1 when the information is generally consistent.

3.1.1 Schedule. This paragraph shall present a schedule of activities to be accomplished during implementation. It will depict the required tasks in chronological order with beginning and ending dates of each task with supporting narrative as necessary.

3.1.2 Software Inventory. This paragraph shall provide an inventory of the software required to support the implementation. The software will be identified by name, identification code or acronym, and security classification. It will be indicated if the software is expected to be on site or will be delivered for the implementation. Any software to be used only to facilitate the implementation process shall be identified.

3.1.3 Facilities. This paragraph shall detail the physical facilities and accommodations required during the implementation period. Some of the factors to be considered are:

- a. Classroom, work space, and training aids needed, specifying hours per day, number of days, and shifts.
- b. Hardware that must be operational and available.
- c. The availability of transportation and lodging for the implementation team.

3.1.4 Implementation Team. When an implementation team is required, this paragraph shall describe its composition. Each team member's tasks should be defined.

3.1.5 Detailed Procedures. Paragraphs 3.1.5.1 through 3.1.5.n shall provide in step-by-step sequence the detailed procedures required to accomplish the implementation, including conversion. Reference may be made to other documents, such as the OM. Examples of the areas to be considered are:

- a. Control inputs.
- b. Operating instructions.
- c. Communications.
- d. Database/data bank.

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- e. Output reports.
- f. Special handling.
- g. Diagnostic messages.
- h. Restart/recovery procedures.

3.1.6 Data Update Procedures. This paragraph shall present the data update requirements that may occur during the implementation period. When the data update procedures are the same as the normal updating or processing procedures, reference may be made to the OM. Paragraphs 3.1.6.1 through 3.1.6.n shall provide step-by-step procedures to update the converted data. Examples of the areas to be considered are:

- a. Control inputs.
- b. Operating instructions.
- c. Database/data bank.
- d. Output reports.
- e. Special handling.
- f. Diagnostic messages.
- g. Restart/recovery procedures.

3.2 Site (Identify). This paragraph shall describe the computer operations at the second site using the same information as outlined in paragraph 3.1. Additional sites will be described in paragraphs 3.3 through 3.n.

FIGURE 5-11. Implementation Procedures.

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SECTION 4. SITE INFORMATION - USER

This section shall provide users with the information necessary to accomplish an orderly implementation. When more than one functional user is involved, a separate section (Sections 5 through n) may be written for each user and the section titles modified to reflect each user.

4.1 Site (Identify). The site or sites to be discussed in this paragraph shall be identified. Additional paragraphs (paragraphs 4.2 through 4.n) will be prepared as necessary to cover all sites. Multiple sites may be discussed within this paragraph when the information is generally consistent.

4.1.1 Schedule. This paragraph shall present a schedule of activities to be accomplished by the user during implementation. It will depict the required tasks in chronological order with beginning and ending dates of each task with supporting narrative as necessary.

4.1.2 Detailed Procedures. Paragraphs 4.1.2.1 through 4.1.2.n shall provide in step-by-step sequence the detailed procedures required to accomplish the implementation, including conversion. Reference may be made to other documents, such as the UM. Examples of the areas to be considered are:

- a. Initiation procedures.
- b. Input formats.
- c. Output formats.
- d. Utilization of outputs.
- e. Recovery and error correction procedures.

4.1.3 Data Update Procedures. This paragraph shall present the user's data update requirements that may occur during the implementation period. When update procedures are the same as normal processing, reference may be made to the UM, EM, and Section 3 of this document, as appropriate. Paragraphs 4.1.3.1 through 4.1.3.n shall provide step-by-step procedures for the update. Examples of areas to be considered are:

- a. Initiation procedures.
- b. Input formats.
- c. Output formats.
- d. Utilization of outputs.

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e. Recovery and error correction procedures.

4.2 Site (Identify). This paragraph shall describe the user information at the second site using the same information as outlined in paragraph 4.1. Additional sites will be described in paragraphs 4.3 through 4.n.

FIGURE 5-11. Implementation Procedures.

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6. NOTES

6.1 Intended use. Documents conforming to the requirements of this standard are intended for use in the development, revision, or use of an automated information system (AIS) by either a contractor or by DoD personnel.

6.2 Tailoring and management options.

6.2.1 Documentation and project complexity. A general guide for the suggested minimal documentation may be obtained by the use of the Level of project complexity chart in Figure 6-1 and Document types and project complexity chart in Figure 6-2. This guide will assist managers in the selection of appropriate documentation from the 11 document types contained in this standard.

6.2.1.1 Level of project complexity chart. This chart provides a method to rate the complexity of an AIS based on the following 13 factors:

- 1 - ORIGINALITY REQUIRED. The extent of original concepts or software required in the Design Phase.
- 2 - PROCESSING FLEXIBILITY. The ability of the system to accept and produce data in a variety of formats.
- 3 - SPAN OF OPERATIONS. The variety of organizations where the system is designed to be processed.
- 4 - DYNAMICS OF REQUIREMENTS. The frequency of change expected.
- 5 - EQUIPMENT COMPLEXITY. Configuration of computers employed.
- 6 - PERSONNEL ASSIGNED TO DEVELOPMENT EFFORT. The average number of full-time and part-time personnel assigned to the development effort.
- 7 - SYSTEM DEVELOPMENT COSTS. All direct costs for system development, except hardware.
- 8 - CRITICALITY OF OPERATIONS. The criticality ranges from unique systems that involve only the local internal operations to systems impacting national defense.
- 9 - RELATIVE PRIORITY FOR SOFTWARE CHANGES. Emphasis that management places on the system in terms of priority of assignments of personnel.
- 10 - PROCESSING REQUIREMENTS. This factor is separated between batch and terminal-driven processing as shown below. If the system has both types of processing,

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select the evaluation that produces the highest numerical rating.

CRITICALITY OF FILE UPDATES FOR BATCH SYSTEMS. The time allowed for updating the files after input is received.

REQUIRED RESPONSE TIME FOR TERMINAL-DRIVEN SYSTEMS. The operational mode employed to satisfy a processing command.

11 - PROGRAMMING LANGUAGES. The nature and mix of the programming languages used. As shown in Figure 6-1, "advanced software technology" includes the use of 4th generation languages, software design and development tools, and database languages rather than the use of high order, assembly, or machine language.

12 - CONCURRENT SOFTWARE DEVELOPMENT. The amount of specialty software that must be developed to interface with the applications software. The specialty software includes such items as database management systems, communications interfaces, operating systems, and system-to-system interfaces.

13 - COMMUNICATIONS ARCHITECTURE. The type of communications to be used by the AIS. Both hardware and software should be considered.

Each of the above factors has six possible complexity ratings. Higher numbered rating indicates a need for increased documentation. The sum of the ratings assigned is used with the Document types and project complexity chart.

6.2.1.2 Document types and project complexity chart. The numeric value obtained by completing the Level of project complexity chart is used in the "Complexity Total" column of Figure 6-2 to find the suggested minimum documentation. This is a managerial guide, not an exact rule. For example, a complexity rating of 26 correlates with documentation consisting of a Users Manual (or an End User Manual), Computer Operation Manual, Maintenance Manual, Test Plan, and a Test Analysis Report. It also can include a Functional Description as shown on the next line of the chart.

6.2.1.3 Document types and AIS life cycle. In Figure 6-3 the identification of each document type is shown under the AIS life cycle heading to indicate in which phase or stage the basic development of the document would occur. The horizontal lines in Figure 6-3 illustrate for each document the normal period of time during which the document is used. In actual practice, the sequence of the preparation of the various documents is rarely as sharply defined as shown. Paragraph 6.2.4.5 discusses management options related to prototypes and modular

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COMPLEXITY FACTORS		0	1	2
1. ORIGINALITY REQUIRED		None; use prescribed query procedure	None; reprogram on different equipment	Minimum; more stringent requirements
2. PROCESSING FLEXIBILITY		No flexibility; for one time need	Very restricted; single process	Restricted; parameterized for selection of input-output formats
3. SPAN OF OPERATIONS		Single workstation	Local or utility	Component command
4. DYNAMICS OF REQUIREMENTS		No changes	Infrequent changes	Occasional changes
5. EQUIPMENT COMPLEXITY		Single remote terminal or micro-computer for a local unique application.	Single CPU, routine processing	Single CPU, routine processing, extended peripheral system
6. PERSONNEL ASSIGNED TO DEVELOPMENT EFFORT		Total requirement is not significant enough for long term assignment. Less than 1.	1 - 2	3 - 5
7. SYSTEM DEVELOPMENT COSTS (EXCLUDING HARDWARE)		Less than \$25K	\$25K - 100K	\$100K - 300K
8. CRITICALITY OF OPERATIONS		Non-critical	Data processing, internal operations	Mission requirements
9. RELATIVE PRIORITY FOR SOFTWARE CHANGES		No changes to any programs needed	When available, fill-in work	Lowest scheduled
10. PROCESSING REQUIREMENTS	(A) CRITICALITY OF FILE UPDATES FOR BATCH SYSTEMS	Does not update any file	2 or more weeks allowed	Must be processed within 1 - 2 weeks
	(B) REQUIRED RESPONSE TIME FOR TERMINAL DRIVEN SYSTEMS	N/A	Queued for batch	Conversational mode
11. PROGRAMMING LANGUAGES		No language used by developer	Advanced software technology	High order language
12. CONCURRENT SOFTWARE DEVELOPMENT		None	Very limited	Limited
13. COMMUNICATIONS ARCHITECTURE		None; no communications requirements	Terminal to host and return	LAN point to point transfer of data; remote job entry terminal
TOTALS		x 0 = 0	x 1 =	x 2 =

FIGURE 6-1. Level of project complexity.
(complexity levels 0 - 2)

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3		4		5		COMPLEXITY FACTORS	
Limited; more environment, new interfaces		Considerable; apply existing state of art to environment		Extensive; requires advance in state of the art		1. ORIGINALITY REQUIRED	
Limited flexibility; allows limited variety in input - output formats		Moderately flexible; processes a variety of outputs		Very flexible; to process a broad range of data matter on different equipment		2. PROCESSING FLEXIBILITY	
Single command		Multi-command		Defense world-wide		3. SPAN OF OPERATIONS	
Frequent changes		Very frequent changes		Continuous change		4. DYNAMICS OF REQUIREMENTS	
Multi-computer, standard peripheral system		Multi-computer, advanced programming, complex peripheral system		Master control system, multi-computer, auto input - output and display equipment		5. EQUIPMENT COMPLEXITY	
6 - 10		11 - 18		19 and over		6. PERSONNEL ASSIGNED TO DEVELOPMENT EFFORT	
\$300K - 500K		\$500K - 1000K		Over \$1000K		7. SYSTEM DEVELOPMENT COSTS (EXCLUDING HARDWARE)	
Personnel safety		Unit survival		National defense		8. CRITICALITY OF OPERATIONS	
Average placement in schedule		High priority in schedule		Highest priority		9. RELATIVE PRIORITY FOR SOFTWARE CHANGES	
Must be processed within 1 - 7 days		Must be processed within 1 - 24 hours		Must be processed within 0 - 60 minutes		10. (A) CRITICALITY OF FILE UPDATES FOR BATCH SYSTEMS	
Real-time		Real-time with automatic backup		Real-time with national security considerations		(B) REQUIRED RESPONSE TIME FOR TERMINAL DRIVEN SYSTEMS	
Multiple high order languages		High order and assembly language		Assembly or machine language		11. PROGRAMMING LANGUAGES	
Moderate		Extensive		Exhaustive		12. CONCURRENT SOFTWARE DEVELOPMENT	
LAN distributive processing		Geographically distributed subscriber - type processing		Geographically distributed multi-network processing		13. COMMUNICATIONS ARCHITECTURE	
x 3 =		x 4 =		x 5 =			
Complexity Total:							

FIGURE 6-1. Level of project complexity - Continued.
(complexity levels 3 - 5)

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Complexity Total	Document Types						
0 - 12 ^{2,3}				EM ⁴			
13 - 18 ³				EM ⁴ UM			
16 - 28 ³				EM ⁴ UM OM MM	PT	RT	
26 - 42	FD	DS ¹		EM ⁴ UM OM MM	PT	RT	IP ¹
39 - 54	FD	SS DS ¹		EM ⁴ UM OM MM	PT	RT	IP ¹
52 - 65	FD	SS US DS ¹		EM ⁴ UM OM MM	PT	RT	IP ¹
Abbreviations: FD - Functional Description SS - System/Subsystem Specification US - Software Unit Specification DS - Database Specification EM - End User Manual UM - Users Manual OM - Computer Operation Manual MM - Maintenance Manual PT - Test Plan RT - Test Analysis Report IP - Implementation Procedures							

1. Preparation of the DS and the IP is situationally dependent.
2. For complexity totals below 13, a documentation package of relevant automated outputs such as display menus, project correspondence, or vendor procedures should be compiled under a system document cover.
3. Additional document types may be required at lower complexities.
4. An EM may be substituted for a UM or an OM or for both in some situations.

FIGURE 6-2. Document types and project complexity.

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Phase	Need Justification	Concepts Development	Design		Development			Deploy- ment	Oper- ations
Stage			Definition	Design	Development and Integration	Test	Evaluation		
		FD							
			SS						
				US					
				DS					
					UM				
					EM				
					OM				
					MM				
				PT					
							RT		
					IP				
<div> <div> FD - Functional Description SS - System/Subsystem Specification US - Software Unit Specification DS - Database Specification UM - Users Manual EM - End User Manual </div> <div> OM - Computer Operation Manual MM - Maintenance Manual PT - Test Plan RT - Test Analysis Report IP - Implementation Procedures </div> </div>									

FIGURE 6-3. The AIS development life cycle related to document preparation and use.

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development. The document types and their relationship to the AIS life cycle are discussed below:

a. Concepts Development. A Functional Description is normally the only document produced during this phase.

b. Definition. During this stage a System/Subsystem Specification may be produced.

c. Design. During this stage a Software Unit Specification and a Database Specification may be produced and preparation of a Test Plan may begin.

d. Development and Integration. During this stage the final documentation in the form of a Users Manual, End User Manual, Computer Operation Manual, and a Maintenance Manual may be prepared. Preparation of the Implementation Procedures may begin during this stage.

e. Test. A Test Plan may be completed during this stage.

f. Evaluation. The Test Analysis Report may be prepared during this stage.

g. Deployment. In this phase the Implementation Procedures may be completed.

6.2.2 Preparation of individual document types.

6.2.2.1 Document preparation responsibilities. Responsibility for the preparation of each of the document types that will be developed for each AIS must be identified early in the project life cycle. Some document types are logically the responsibility of the Development Group, others the responsibility of the User Group, and others should be prepared jointly. While both groups may work together on some document types, one of the groups should be identified as having primary responsibility.

6.2.2.2 Sizing of document types. Each of the the outlines of the document types may be used to prepare project documents that range from a few to several hundred pages in length. The size depends on the magnitude and complexity of the project, the decision of the project manager as to the level of detail necessary in the document, the environment in which the AIS will operate, and other factors. Each of the sections within a given document type, however, generally bears a relationship to the other sections of that same document in its percentage of volume. While it is recognized that these vary considerably, Figure 6-4 suggests approximate size relationships among sections of a given document type.

6.2.2.3 Combining document types. In an operational environment with widely divergent project types and

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DOCUMENT TYPE SECTION NUMBER	FD	SS	US	DS	UM	EM	OM	MM	PT	RT	IP
1	5%	5%	5%	5%	5%	5%	5%	10%	10%	10%	5%
2	15	20	20	20	10	15	30	60	15	50	15
3	35	20	20	65	30	20	65	20	15	40	45
4	10	55	55	10	15	60	—	10	20	—	35
5	15	—	—	—	40	—	—	—	40	—	—
6	10	—	—	—	—	—	—	—	—	—	—
7	5	—	—	—	—	—	—	—	—	—	—
8	5	—	—	—	—	—	—	—	—	—	—

FIGURE 6-4. Approximate percentage relationship of sections within document types.

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environments, it is occasionally necessary to combine several document types under one cover or to produce several different manuals of the same document type, each of which discusses one module of an AIS. When this is done, the document type outlines should still be followed, but each should be identified separately.

6.2.3 Management options within document types.

6.2.3.1 Section and paragraph titles. Titles of sections and paragraphs should, in general, be identical to those given for the document type being prepared. Titles at the third organizational level, i.e., N.N.N, may be modified to reflect terms and titles that are unique to the AIS being documented, such as software unit names, file names, etc.

6.2.3.2 Deletion or addition of sections and paragraphs. It is anticipated that the vast majority of documents produced in accordance with these standards will contain all of the sections designated in the standards and most of the paragraphs of the second organizational level, i.e., N.N. When a paragraph of the second, third, or fourth organizational level, i.e., N.N, N.N.N, or N.N.N.N, is omitted, the standard number and title need not be included in the document. Additional paragraphs may be added at the end of the section or major subject matter grouping.

6.2.3.3 Sequencing of sections and paragraphs. The order of the sections and paragraphs in a particular document type should be the same as that given in Section 5. The order of paragraphs within a section may, however, be changed if the communication of information is significantly enhanced.

6.2.3.4 Expansion of paragraphs. Many of the paragraphs within a document type have a general title and an itemized list of the factors that might appropriately be discussed within the paragraph. The intent of the paragraph is not always that the resulting document include a discussion of each of the items, but that these be considered in writing the paragraph. Paragraph 3.3.2 of the Users Manual serves as an example of this. In most projects this paragraph has been divided into paragraphs numbered 3.3.2.1, 3.3.2.2, etc., each dealing with a separate output report. Within each of these paragraphs is a discussion of the appropriate and necessary items from paragraph 3.3.2 of the Users Manual.

6.2.4 Management options in document preparation.

6.2.4.1 Document publication. The decision of whether or not to publish a document must be made by the appropriate manager. The requirements for documents vary widely, depending on the management techniques employed by the the User Group. While one approach may be best in a contractual situation, a completely different one may be needed when the User Group is also the

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Development Group. In general, as the project complexity increases so does the need for publication.

6.2.4.2 Graphic presentations. The description of some problem solutions is treated best in the form of charts, decision tables, or other graphic presentations. As the criteria for determining the best approach have not been established, either charts, decision tables, or other graphic presentations may be used in the documents produced on any given project.

6.2.4.3 Forms. Some of the information specified in individual paragraphs of the document types may be presented on approved forms. The establishment of specific forms to be used, however, is not possible due to the dependency of most forms on the particular computer software, hardware, and management practices at individual DoD Components. Although the use of forms is encouraged, the information contents of the document type must still be followed. If a form is used as a figure or in an appendix, it must be referenced from an appropriately numbered paragraph within the document.

6.2.4.4 AIS documentation support. Computer automated techniques to produce AIS documentation may aid personnel in the development of system documentation. These techniques or tools may be either acquired from a vendor or programmed as an individual development effort. They include, but are not limited to, source code analyzers to document data flow, chart generators, text editors, scanners for extracting particular types of code, and some stand-alone documentation systems. The dissemination, storage, and access of AIS documentation by electronic media is encouraged. If these tools are used in the preparation of the documents described in Section 5, the content and format requirements of this standard must be met. The capability of producing hard copy must be available.

a. Definition. A support software tool is a software system or software unit that is acquired or developed to provide useful functions to one or more systems. These functions may be provided during any of the life cycle stages such as design, test, or evaluation. There are a broad range of types of support software tools; some provide functions that are necessary for system development or routine processing, others are not essential for development or operation. Those support software tools which provide necessary development routines include commonly used computational subroutines, sort routines, print routines, and other routines invoked directly by the system. Those support software tools that are not essential for development or operation include tools such as program optimizers and trace routines for debugging.

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b. Documentation.

(1) Support software tools are independent of any particular system they support and may be:

(a) Acquired from a vendor.

(b) Programmed as part of a separate development effort or the project being developed.

(2) An essential support software tool should be described briefly in the documentation of a system that requires its use. Complete documentation of a support software tool, if readily available, may be referenced in the documentation of the using system; otherwise, the documentation of the tool should be included as an appendix to a document for the using system. Figure 6-5 provides some recommended paragraphs for placement of this documentation. It is not intended that components of the system software, such as utility programs available with operating systems or database management systems, be individually described once the overall system software is identified.

6.2.4.5 Using the "waterfall life cycle model" for modular development/prototyping. The life cycle model in DoD Directive 7920.1 is a traditional "waterfall model" and appears to imply that all activities of one phase or stage must be completed prior to starting the next phase or stage. If prototyping or modular development is to be used for the project where different modules may be developed and completed at significantly different times, each module can be considered to evolve through the phases and stages of the "waterfall model" independent of the other modules. Management control must be used so that proper overall software engineering is applied to ensure that all requirements are satisfied and that proper testing for the integration of all modules is planned and executed. Planning for the documentation is essential to ensure that available information is recorded since the use of modular development may dictate that only portions of documents be written pending completion of the related modules and their documentation.

6.3 Data requirements. When this standard is used in an acquisition which incorporates a DD Form 1423, Contract Data Requirements List (CDRL), the data requirements identified below shall be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved CDRL incorporated into the contract. When the provisions of the DoD FAR clause on data requirements (currently DoD FAR Supplement 27.475-1) are invoked and the DD Form 1423 is not used, the data specified below shall be delivered by the contractor in accordance with the contract or purchase order requirements. Deliverable data required by this standard is cited in the following paragraphs.

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Type and Paragraph ¹	FD	SS	US	DS	OM	MM	PT	RT	IP
Tool Function									
Aids in stating and recording requirements	5.2								
Used in operation of AIS	5.2	3.3			2.3 ²				
Supports test and evaluation, development of test data, review and audit of tests, or test operations	5.5.3						3.3.3		
Supports implementation, conversion, or interface to existing AIS	5.5.3	3.3							3.1.2
Aids in overall design or development		3.3				3.2			
Aids in design or development of specific software units	5.5.3	3.3	3.1			3.2			
Aids in review of test results or audit of AIS								2.1.1	
Enhances capabilities or performance of database/data bank				2.5					

1. Paragraph numbers are the primary suggested locations for tool descriptions if the documents are produced.
2. Paragraph 2.5, Processing Overview, of the OM can be used for an expanded description of when the support software tools will be used.

FIGURE 6-5. Appropriate paragraphs to describe support software tools

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<u>Paragraph no.</u>	<u>Data requirement title</u>	<u>Applicable DID</u>
a. 4 and 5.1	Functional Description (FD) Document for AIS	DI-IPSC-80689
b. 4 and 5.2	System/Subsystem Specification (SS) Document for AIS	DI-IPSC-80690
c. 4 and 5.3	Software Unit Specification (US) Document for AIS	DI-IPSC-80691
d. 4 and 5.4	Database Specification (DS) Document for AIS	DI-IPSC-80692
e. 4 and 5.5	Users Manual (UM) Document for AIS	DI-IPSC-80693
f. 4 and 5.6	End User Manual (EM) Document for AIS	DI-IPSC-80694
g. 4 and 5.7	Computer Operation Manual (OM) Document for AIS	DI-IPSC-80695
h. 4 and 5.8	Maintenance Manual (MM) Document for AIS	DI-IPSC-80696
i. 4 and 5.9	Test Plan (PT) Document for AIS	DI-IPSC-80697
j. 4 and 5.10	Test Analysis Report (RT) Document for AIS	DI-IPSC-80698
k. 4 and 5.11	Implementation Procedures (IP) Document for AIS	DI-IPSC-80699

(Data item descriptions related to this standard, and identified in Section 6 will be listed as such in DoD 5010.12-L, Vol. II, AMSDL)

6.4 Subject term (key word) listing.

Baseline
 Computer
 Computer software
 Computer software unit
 Configuration management
 Detailed design
 Documentation standards
 End user documentation
 General purpose computers
 Preliminary design
 Life cycle phases and stages
 Life cycle management
 Software

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Software development
Software engineering
Software metrics
Software unit
Tailoring documentation
Testing software documentation

6.5 Changes from previous issue. Vertical lines or asterisks are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

6.6 Superseded data. This standard supersedes the requirements contained in DOD-STD-7935 of 15 February 1983.

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DLA - DH
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Preparing Activity:

Army - SC

(Project IPSC-0061)

Review Activities:

DNA - DS
NSA - NS
DMA - MP
DIA
ANSI

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1. DOCUMENT NUMBER DOD-STD-7935A		2. DOCUMENT TITLE DoD Automated Information Systems (AIS) Documentation Standards	
3a. NAME OF SUBMITTING ORGANIZATION		4. TYPE OF ORGANIZATION (Mark one) <input type="checkbox"/> VENDOR <input type="checkbox"/> USER <input type="checkbox"/> MANUFACTURER <input type="checkbox"/> OTHER (Specify) _____	
b. ADDRESS (Street, City, State, ZIP Code)			
5. PROBLEM AREAS			
a. Paragraph, Number and Wording:			
b. Recommended Wording:			
c. Reason/Rationale for Recommendation:			
6. REMARKS			
7a. NAME OF SUBMITTER (Last, First, MI) - Optional		b. WORK TELEPHONE NUMBER (Include Area Code) - Optional	
c. MAILING ADDRESS (City, State, ZIP Code) - Optional		8. DATE OF SUBMISSION (YYMMDD)	

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