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MILITARY STANDARD

GENERAL REQUIREMENTS

TEST PROGRAM SETS

AMSC N4024

ATTS-P001

DEPARTMENT OF DEFENSE
WASHINGTON, DC 20301

General Requirements Test Program Sets

MIL-STD-2077A(NAVY)

1. This military standard is approved for use by the Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this standard should be addressed to: Commanding Officer, Naval Air Engineering Center, Systems Engineering and Standardization Department (Code 9313), Lakehurst, NJ 08733, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this standard or by letter.

FOREWORD

The Naval Air Systems Command, the Space and Naval Warfare Systems Command and the Naval Sea Systems Command have revised MIL-STD-2077A(NAVY). Clearly not all of the requirements for Test Program Sets (TPSs) are identical for each Systems Command. Careful attention to tailoring the requirements of this standard is required to avoid duplication of data and ensure that TPSs provide useful information to serve their intended function.

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1. SCOPE

1.1 General. This standard contains the requirements to achieve cost-effective acquisition and life cycle maintenance of Test Program Sets (TPSs).

1.2 Purpose. This document establishes a standard for design, development, documentation, configuration management, validation, verification, quality assurance and preparation for delivery of TPSs. A TPS is composed of a Test Program (TP), Interface Device (ID) and Test Program Set Document (TPSD). This document is specifically limited to TPS developments for Automatic Test Equipment (ATE) systems.

1.3 Applicability. This document provides guidance and direction to Engineers, Analysts and Program Managers in the design and development process of TPSs. The methodology and requirements articulated within this document represent a preferred approach approved by the issuing activity. Any test program development project undertaken must conform to these requirements unless expressly directed otherwise by the cognizant Navy activity.

2. REFERENCED DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards and handbooks. Unless otherwise specified, the following specifications, standards and handbooks of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DODISS) specified in the solicitation form a part of this standard to the extent specified herein.

SPECIFICATIONS

MILITARY

DOD-D-1000	Drawings, Engineering and Associated Lists
MIL-Q-9858	Quality Program Requirements
MIL-E-17555	Electronic and Electrical Equipment, Accessories, and Provisioned Items (Repair Parts); Packaging of
MIL-N-18307	Nomenclature and Identification for Aeronautical Systems including Joint Electronics Type Designated Systems and Associated Support Systems
MIL-T-28800	Test Equipment for Use with Electrical and Electronic Equipment, General Specification for
MIL-M-38784	Manuals, Technical; General Style and Format Requirements
MIL-S-52779	Software Quality Assurance Program Requirements
MIL-B-81705	Barrier Materials, Flexible, Electrostatic-Free Heat Sealable

STANDARDS

MILITARY

MIL-STD-12	Abbreviations for Use on Drawings, and in Specifications, Standards, and Technical Documents
DOD-STD-100	Engineering Drawing Practices
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-454	Standard General Requirements for Electronic Equipment
DOD-STD-480	Configuration Control - Engineering Changes, Deviations and Waivers
MIL-STD-1472	Human Engineering Design Criteria for Military Systems, Equipment and Facilities
MIL-STD-2165	Testability Program for Electronic Systems and Equipments

HANDBOOKS

MILITARY

MIL-HDBK-217	Reliability Prediction of Electronic Equipment
DOD-HDBK-263	Electrostatic Discharge Control Handbook for Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices)

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

2.2 Other publications. The following document(s) form a part of this standard to the extent specified herein. The issues of the documents which are indicated as DOD adopted shall be the issue listed in the DODISS and the supplement thereto, if applicable.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI/IPC-T-50	Terms and Definitions for Interconnecting and Packaging Electronic Circuits
ANSI/Y32.2	Graphic Symbols for Electrical and Electronics Diagrams
ANSI/Y32.14	Graphic Symbols for Logic Diagrams (Two-State Devices)

(Copies of the document are stocked by the DoD Single Stock Point, Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120 for issue to DoD activities only. Contractors and industry groups must obtain copies directly from The Institute for Interconnecting and Packaging Electronic Circuits, 3451 Church Street, Evanston, IL 60203 or from the American National Standards Institute, 1430 Broadway, New York, NY 10018.)

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.

3. DEFINITIONS

3.1 Test Program Set (TPS). A TPS consists of those items necessary to test a Unit Under Test (UUT) on an ATE. This includes the electrical, mechanical, instructional and logical decision elements. The individual elements of the TPS shall be the TP, ID and TPSD.

3.1.1 Test Program (TP). The TP contains the coded sequence which, when executed by the ATE, will provide the ATE a set of instructions sufficient to automatically ascertain the operational condition of a UUT and detect and isolate faults within the UUT.

3.1.1.1 Digital Test Program Comprehension (TPC). Digital TPC is defined as the ratio between the number of faults capable of being detected by the test program and the total number of faults. This ratio is expressed as a percentage. A fault is defined in paragraph 3.3.

3.1.1.2 End-to-end run time. The end-to-end run time is defined as the time required for a TP to determine that a good UUT is good.

3.1.1.3 Branch logic isolation time. Branch logic isolation time is the time required to follow the worst case logic chain of each diagnostic branch containing three or more unique tests.

3.1.1.4 Test Accuracy Ratio (TAR). TAR is defined as the ratio of the stimulus/measurement accuracy required to test the UUT to the accuracy of the stimulus/measurement introduced by the uncertainty of the ATE. For example, if it is required that a UUT output be accurate to 5% and the ATE/TPS accuracy in measuring the parameter is .010%, the TAR is 500.

3.1.2 Interface Device (ID). The ID is any device which provides mechanical and electrical connection and signal conditioning between the ATE and the UUT.

3.1.3 Test Program Set Document (TPSD). A TPSD consists of the printed information, not provided by the ATE, which is necessary to determine the operational condition and perform fault detection and fault diagnostics of a UUT on an ATE. The individual elements of the TPSD shall be the Test Program Instruction (TPI) and Supplemental Data (SD). TPSD data is required for support at the Intermediate Level of maintenance.

3.1.3.1 Test Program Instruction (TPI). The TPI provides information needed for testing (e.g., hook-up, probe point locations or other programmed operator intervention) which cannot be conveniently provided by the ATE under control of the TP. Appropriate contents are largely dependent on the ATE being used.

3.1.3.2 Supplementary Data (SD). Supplementary data consists of any relevant information, text, schematics and logic diagrams necessary for analysis of the TPS and UUT in the event of a problem or anomaly during the testing process.

3.2 Engineering Support Data (ESD). Engineering support data consists of text, schematics, assembly drawings, program listings and computer-generated outputs, functional flow diagrams, engineering reports (such as Test Strategy Reports) and any relevant information to provide for the life cycle support of the TPS. ESD is required for support at the Depot Level of maintenance, and at Cognizant Field Activities (CFAs), such as Naval Air Rework Facilities (NARFs).

3.3 Fault. A fault is a degradation outside of normal performance limits in UUT operation due to detuning, maladjustment, misalignment, failure of parts and so forth. See Table I for devices and examples of possible faults.

3.3.1 Fault detection. Fault detection involves one or more tests performed to determine if any faults are present in the UUT.

3.3.2 Fault isolation. Fault isolation involves tests performed to isolate detected faults within the UUT.

3.4 Unit Under Test (UUT). A UUT is any system, set, subsystem, assembly or subassembly undergoing testing.

3.5 Test Program Set integration. TPS integration is that phase in the development of a TPS by which the developer interfaces the TPS elements with the UUT and ATE for the purpose of debugging the TPS. This integration is accomplished prior to TPS validation.

TABLE I. Examples of possible faults.

Device	Possible Faults
Capacitors	Opens and shorts (see Note 2).
Resistors	Opens (see Notes 2 and 3).
Transformers	Opens and shorts (see Notes 1 and 2).
Inductors	Opens and shorts (see Notes 1 and 2).
Diodes	Opens and shorts (see Note 2).
Transistors	Opens and shorts.
Relays	Open contacts, stuck contacts. Coil open and short (see Note 1).
Circuit Breakers	Stuck shut. Stuck open.
Rotary Switches	Open wipers and high resistance contacts.
Level or Pushbutton Switches	Open normally-closed contacts. Stuck contacts.
Delay Lines	Opens and shorts.
Microcircuit, Linear, SSI, MSI, LSI	The possible faults shall include only the pins external to the microcircuit with the following failure mode indication(s): 1. Hardover Positive (latched/saturated at or near maximum positive supply voltage). 2. Hardover Negative (latched/saturated at or near the maximum negative supply voltage). 3. Excessive DC Offset from a reference voltage. 4. Output clipped. 5. Latched/saturated at a maximum extreme of a device output. 6. No Output Signal (refers only to cases where the failure mode cannot be classified in any of the above categories and there is no response to an input signal. 7. Parameter out of tolerance (only when the UUT circuit design allows measurement to the parameter).

NOTE 1. The effect of short(s) must make a device parameter that is measurable as installed in the circuit fall outside acceptable limits.

NOTE 2. UUT will be evaluated to determine if drift of precision components should be considered as a fault.

NOTE 3. Extremely remote failure modes shall not be considered (e.g., carbon resistors shorting).

TABLE I. Examples of possible faults (Continued).

Device	Possible Faults
Microcircuit Digital, SSI, MSI, LSI	For microcircuits which are modeled according to a NAND equivalent modeling scheme and whose operability is to be graded relative to the operation of an associated NAND equivalent circuit, the fault set will consist of gate-level faults associated with the NAND equivalent model of the particular microcircuit, specifically: NAND gate outputs stuck at zero and NAND gate input junctions stuck at one, NAND gate outputs stuck at one and NAND gate input junctions stuck at zero. Faults associated with NANDs added to the model solely to enhance the operation of Automatic Test Generation (ATG) will be excluded. For microcircuits other than memory devices (RAMs, ROMs and PROMs), which are not modeled according to a NAND equivalent modeling scheme, the fault set will consist of continuous conditions observable at the terminations to the microcircuit, specifically: stuck at one, and stuck at zero. For RAMs which are not modeled according to a NAND equivalent modeling scheme, the fault set will be limited to the following: 1. External pins stuck at one or stuck at zero. 2. Memory cells stuck at one or stuck at zero. 3. Perturbation of unaddressed cells during a write operation. 4. Failure to access all memory cells. 5. Slow access time. 6. Failure to retain data between refresh operations (dynamic RAMs). For ROMS and PROMs which are not modeled according to a NAND equivalent modeling scheme, the fault set will be limited to external terminations stuck at one or stuck at zero and memory cells stuck at the complement of the correct value.

3.6 Test Program Set validation and verification. TPS validation is that process in the development of a TPS by which the correctness of the program is evaluated by running it on the ATE together with the UUT and its appropriate ID. The process includes the identification of run-time errors, procedure errors and other errors, or omissions inhibiting test performance. The process is accomplished by actual fault insertion on the UUT. The process is performed by the contractor in accordance with his approved quality assurance criteria. Verification by the cognizant Navy activity constitutes a First Article acceptance of all elements of a TPS in accordance with this standard and the work authorization document.

3.7 Production acceptance test. Production acceptance testing is test, inspection and quality assurance process used to ascertain that the contents of a production TPS are in conformance with the contents of a first article verified TPS.

3.8 Automatic Test Program Generator (ATPG). An ATPG is a generic computer program which automatically generates the test patterns and responses from UUT circuit equivalent inputs.

3.9 Operational Test Program Set (OTPS). An OTPS is the result of merging two or more Test Program Sets into a group which share a single ID for the purpose of testing a selected group of Weapon Replaceable (WRAs) or Shop Replaceable Assemblies (SRAs) in Automatic Test Equipment (ATE).

4. GENERAL REQUIREMENTS FOR TPS

4.1 Test Program Set. A TPS shall be prepared for each UUT. A TPS is composed of one TP, one or more IDs and one TPSD. An ID may be shared by multiple UUTs. The TP and TPSD shall be unique to a UUT.

4.2 Accuracy requirements.

4.2.1 Test Accuracy Ratio (TAR) requirement. In order to assure sufficient TP accuracy with respect to UUT tolerances, as well as reliability and repeatability of test results, TPs are required to be designed to meet, as a design goal, a TAR of 10:1. The minimum acceptable TAR to be incorporated into a TP is 3:1. When analysis indicates a TAR equal to or greater than 3:1 cannot be achieved, a Test Accuracy Ratio Analysis shall be provided to the cognizant Navy activity describing the nature of the problem and proposed solution to the problem and/or trade-offs to be considered.

4.2.2 Accuracy augmentation. When specified TARs cannot be met, consideration will be given to the use of auxiliary test equipment which is generally more accurate than the ATEs complement. Specific permission for each accuracy augmentation will be considered after review of the subject "Test Accuracy Ratio Analysis" report for the subject UUT.

4.3 Safety. TPSs shall be so designed that hazard to users is minimized. The requirement for safety is paramount. Safety consideration shall, as a minimum, be implemented in accordance with MIL-T-28800 as defined for Type III Class 4 equipment.

4.3.1 Test Program. The TP shall warn operators of hazards via the ATE system display or printout. A warning message shall precede application of power to the UUT and individual messages shall precede all test processes where an increased hazard is presented. Further, the TP shall minimize operator contact with dangerous UUTs. In particular, high voltage probing should be effected by affixing clip probes to the UUT, after removing power, and then restoring power and continuing test when the operator is clear.

4.3.2 Interface Devices. IDs shall be constructed to present minimal hazards in themselves and protect users from UUT hazards. Where appropriate, the ID shall have warning legends and shall enclose or shield hazardous UUTs.

4.3.3 Test program set document. The TPI section of the TPSD shall provide detailed instructions of how to safely perform hazardous tests.

4.4 First article acceptance.

4.4.1 Test program set verification. TPS verification shall consist of a preproduction OTPS demonstration and a first article acceptance of all elements of a OTPS. The acceptance test procedures and reports for verification shall be as indicated in this standard and the work authorization document (see 6.1). The TPS shall be demonstrated on two UUTs, selected at random from inventory by the cognizant Navy activity. Each TP shall be verified by insertion of faults in the UUT to demonstrate the ability to successfully perform the level of fault detection/isolation on the UUT for which the TP was written, thereby demonstrating the integration of the TPS to the ATE and the UUT. The developer shall maintain a TPS integration log book (see 6.1).

4.4.1.1 Test Program. The TP shall be capable of detecting faults as specified in 5.1.7.9. Those faults determined by the cognizant Navy activity to be "non-detectable" shall be specifically waived. The TP shall be capable of isolating all detectable faults. Any fault which could result in catastrophic failure of the UUT or ATE shall not be inserted.

4.4.1.2 Interface Devices (ID). The IDs used for verification shall be inspected:

a. To insure that sound engineering practices have been incorporated in the design.

b. To verify that the design has been reviewed for elimination of duplication.

c. To insure that the ID is identified electrically in accordance with this standard and that all elements of the ID are identified in accordance with the requirements of MIL-N-18307.

4.4.1.3 Test Program Set Document (TPSD). The TPSD shall be inspected to insure that the proper numbering sequence has been used and that the document is complete, accurate and legible and has the proper format. The TPSD shall be inspected for print quality and size of margins for reproducibility considerations and shall be demonstrated during TPSD verification.

4.4.1.4 Engineering Support Data. In addition to the TPS, the ESD shall be available for review during verification.

4.4.2 Production acceptance testing. Production acceptance testing shall consist of the production inspection of a TPS for conformance to the verified first article TPS (see 6.1). Each set of TPSs delivered shall also be inspected to insure integrity of performance and acceptability for final release. Testing of all TPS elements will be performed by the cognizant Navy activity prior to release.

4.4.2.1 Interface Devices. IDs shall be inspected for conformance with the approved Acceptance Test Procedure (ATP).

4.4.2.2 Test Program media. All TPs shall be inspected to verify conformance to the verified first article TPS.

4.4.2.3 Test Program Set Document. The TPSD shall be inspected to verify conformance to the approved ATP.

4.5 Configuration Management.

4.5.1 Test Program Set numbering. A single cognizant Navy activity shall assign a part number to each element of the TPS. This requires a part number to be assigned in accordance with Appendix C for each TPS, ID and TPSD. These part numbers will be assigned within the cognizant Navy activity's part numbering system and shall be consistent for all TPSs developed.

4.5.2 Configuration management procedures. Configuration management for the identification, control, updating and status accounting of developed TPSs shall be documented (see 6.1). Specific requirements for a configuration management system are as follows:

4.5.2.1 Control and updating. All elements of validated TPSs shall be subject to formal engineering change control in accordance with DOD-STD-480 (see 6.1). All modifications to TPSs shall meet the requirements of quality assurance provisions of this standard. It is the developer's responsibility to maintain an internal configuration management program during the TPS development period.

4.5.2.2 Status accounting. Configuration status accounting information necessary to effectively manage the TPS configuration shall be recorded and reported (see 6.1).

5. DETAIL REQUIREMENTS

5.1 Detail requirements for TP. The TP shall provide the coded sequence which, when executed by the ATE, will provide the ATE a set of instructions sufficient to automatically ascertain the operational condition and perform fault isolation of a UUT. Each UUT for which a TPS is to be prepared shall have a unique TP. The specific elements of the TP shall be designed to perform the functions as defined in this standard and cited in the work authorization document.

5.1.1 Automatic Test Generation (ATG). An approved ATG shall be used to generate all digital TPs developed under this standard.

5.1.2 Message display. All directions for operator actions required during the running of the TP shall be displayed on the ATE display or printing device. Appendix B shall be used as a guide for displaying messages. When it is impractical to display the message on the ATE display or printing device, the operator will be referred to the Test Program Instruction (TPI) section of the TPSD for illustrations or special procedures required as an integral part of the testing or diagnostic procedure.

5.1.3 Removal of UUT power and stimuli. Once testing has been completed, either through fault identification or successful completion of the program, all power, stimuli and measurement device connections shall be removed, under program control, from the UUT and ATE interface.

5.1.4 Merging. When TPs are related, merging onto a single physical unit (i.e., program medium) may be required.

5.1.5 Utilization of BIT/BITE. UUTs that include Built-In Test and/or Built-In Test Equipment (BIT/BITE) circuitry shall be tested in a manner that efficiently utilizes these testing aids. This requirement does not preclude the need for fully testing the BIT/BITE circuitry to ensure that it is functional.

5.1.6 Test language. All test programs developed under this standard shall be as specified by the acquisition activity.

5.1.7 Test Program content.

5.1.7.1 Elements. The TP shall consist of the following elements, as optionally required depending on the test requirements for the UUT, the capability of the ATE and the requirements of the work authorization document. The organization of the elements shall be designed to provide the functions defined in the following paragraphs:

a. Program Heading and Identification

b. Identity Checks for UUTs and Interface Devices (IDs)

c. Self-Test Survey

d. Safe-To-Turn-On Tests

e. Power Application

f. Cautions and Warnings

g. BIT/BITE

h. Performance Routines (End-To-End Test)

i. Diagnostic Fault Isolation Routine (including active IDs)

j. Adjustment/Alignment Routines (including active IDs)

k. Program Entry Points

l. Test Program Comments

5.1.7.2 Program heading and identification. Program heading and identification data shall contain information concerning the pertinent configuration identifiers associated with the TP. This shall include the TP name, identification number and revision level; the ID identification and revision level; the UUT name, identification (P/N and NSN) and revision level; and such additional information as may be necessary to allow the operator to verify that the elements required for testing have been assembled.

5.1.7.3 Identity checks. The identity checks or handshakes shall verify that the ID, when feasible, the UUT and the interconnections are correct. The checks are intended to preclude equipment damage and shall be performed prior to turning on power. Low power, low voltage tests such as resistance, capacitance or logic levels shall be used. If UUT identity cannot be ascertained electrically with high confidence, the operator shall be so informed and instructed to check the identity visually.

5.1.7.4 Self-test survey. The self-test survey routines are designed to test these resources (ATE and ID) that will be required by the TP. It is normally included as a set of optional tests that may be performed based on the ATE operator's discretion.

5.1.7.5 Safe-to-turn-on test. Safe-to-turn-on test shall be provided if there is a possibility of ID and/or UUT conditions that could damage the UUT, ID or ATE. The test shall not be restricted to power lines; signal lines must also be considered within the limits of ATE capability and UUT design.

5.1.7.6 Power application. Power shall be applied to the UUT in accordance with the UUT test requirements. When necessary, the TP shall incorporate time delays to make suitable provision for UUT warm-up.

5.1.7.7 Cautions and warnings. When voltages or currents exceeding critical levels specified in MIL-STD-454, Requirement 1, are applied to the UUT or ID, the TP shall display a message which warns the operator of the hazard. The message shall be displayed prior to connection of the voltage or current. A message shall also be displayed after the hazard is removed from the UUT or ID.

5.1.7.8 BIT/BITE. BIT/BITE shall be run on those UUTs that contain BIT/BITE, and utilized to the greatest extent possible for fault detection and isolation.

5.1.7.9 Performance routines. The performance routines shall consist of discrete tests designed to automatically detect and annunciate the presence of any fault within the UUT commensurate with the design requirements. ATPG or simulator developed programs shall be designed to provide maximum percent fault detection consistent with reasonable cost targets; minimum fault detection shall be 95%. A fault not detectable at the UUT input/output connector shall be considered a "no-contest" fault (non-detectable). The test shall contain the discrete steps to set up the ATE/UUT interface, apply all necessary power and stimuli, and to verify individual UUT parameters based on measured, stored or calculated data. Performance routines shall be designed to minimize program end-to-end run time.

5.1.7.9.1 Pass criteria. Satisfactory completion of the performance routine shall assure that the UUT will perform its designed function when installed in its next higher assembly.

5.1.7.9.2 Fail criteria. Unsatisfactory completion of any test or step of the performance routine shall invoke a diagnostic fault isolation routine or adjustment/alignment routine or exit to repair action message.

5.1.7.10 Diagnostic Fault Isolation (DFI) routine. The DFI routine shall isolate and identify the fault(s) detected by the performance routine(s) to the next lower assembly or component(s). The DFI routine shall consist of fault isolation routines designed to minimize the run time and operator intervention required for isolation.

5.1.7.11 Adjustment/alignment routine. When a test in the performance routine fails and that failure is possibly attributable to improper setting of an adjustment device in the UUT or the ID, the performance routine shall invoke an alignment/adjustment routine to provide for correction of the possible improper setting of the UUT or the ID.

5.1.7.12 Program entry point. This is an independent entry point which begins execution of the TP at a point other than its beginning. Program entry points should be placed at the beginning of long test sequences, at the beginning of the test of a module or group of modules, and at the beginning of tests for critical parameters. This will facilitate access to various parts of the program for incorporating design changes, during TPS maintenance, and for the purpose of easing debugging. All program entry points are to be followed by a repeat of the initialization sequence or sequences.

5.1.7.13 Test Program comments. Each test group and each test within the group shall be preceded by comments briefly and concisely describing its purpose and any special conditions. The annotation of ATG programs shall apply only to the non-ATG sections. Comments within a test shall be avoided unless the information cannot be described at the test level.

5.2 Detail requirements for ID. The ID shall provide mechanical and electrical connections and signal conditioning, if required, between the ATE and the UUT. Requirements for the design, testability, maintainability and documentation are specified in the following paragraphs.

5.2.1 General design. All IDs shall be designed in conformance with the requirements of MIL-STD-454 and MIL-STD-1472. In addition, it is a requirement that ID design minimize the complexity of the ID and the need for adjustment or alignment.

5.2.2 ID optimization. IDs shall be optimized so that as many UUTs as is cost effective can be tested by the same basic ID assembly, with the objective of reducing ID storage requirements.

5.2.3 ID cables. ID cables shall be designed to be completely repairable using standard tools, or special tools provided with the ID set.

5.2.3.1 ID expansion capabilities. The IDs shall be designed with a 10% expansion capability. That is, provisions shall be made in the design of the ID to accommodate unanticipated ID requirements including number of wires, added functions and/or subassemblies 10% greater than the defined requirements.

5.2.4 Mean Time Between Failure (MTBF). Each ID shall be designed to have minimum MTFB of 1000 hours calculated in accordance with MIL-HDBK-217.

5.2.5 Testability. IDs shall be designed in conformance with the requirements of MIL-STD-2165 to maximize design for testability to accommodate automatic fault detection and piece part isolation. In addition, IDs shall be designed to be tested on the ATE in the same manner as a typical UUT except that no additional ID shall be required. In this context shorting plugs and test cables are not considered IDs.

5.2.6 Identification. All elements of the ID shall be identified in accordance with the requirements of MIL-N-18307.

5.2.7 Identity checks. The ID must contain circuitry permitting its identification by the program (TP). If ID identity cannot be ascertained electrically with high confidence, the operator shall be so informed and instructed to check identity visually.

5.2.8 Safe-to-turn-on test. IDs shall be designed to accommodate safe-to-turn-on testing if there is a possibility of ID conditions that could damage the UUT, ID or ATE. The test shall not be restricted to power lines; signal lines must also be considered within the limits of the ATE capability.

5.2.9 ID self-test. IDs shall be designed to accommodate self-testing by the test program for the UUT, with the UUT connected if possible. If the complexity of the ID is such that evaluation of the performance of the ID requires the use of shorting plugs and/or test cables, the ID shall be treated as a typical UUT; performance and diagnostic tests are to be performed as required and a separate TP and TPSD shall be provided and applicable sections of this standard shall apply. When a failure is detected in the overall performance of the ID, the ATE display/printout shall indicate the maintenance action or the running of a DFI routine.

5.2.10 Test points. IDs shall be designed to provide access for repair and troubleshooting. The test points shall be provided, when appropriate, to ensure ID maintainability and/or performance of any of the testability requirements. Also, IDs shall be provided with test points to enable measurement of necessary input/output and circuit parameters for alignment of the ID, introduction of any necessary functional inputs and/or dummy loads necessary to conduct a test, or to monitor ID test signals undistorted by the ATE.

5.2.11 BIT/BITE. BIT/BITE shall be an integral part of ID design when BIT/BITE is the most appropriate means of ensuring the testability and maintainability of the ID.

5.2.12 Mechanical considerations.

5.2.12.1 Size and weight. Each ID shall be small enough to permit both the ID and the UUT to be physically supported by the ATE. The weight of that portion of the ID including cables that must be fastened to the ATE shall not exceed 40 pounds. The total weight of an ID shall not exceed the requirements of MIL-STD-1472. Modifications of this requirement may be authorized consistent with the ATE constraints.

5.2.12.2 Holding fixture. When required by a particular UUT, and in addition to the ID, a holding fixture shall be provided as part of the TPS.

5.3 Detail requirements for TPSD. The TPSD is comprised of the TPI and Supplemental Data (SD) (see 6.1). Revision and change control will be maintained at the TPSD level. TPSD data is required for support at the Intermediat Level of maintenance.

5.3.1 TPI format. The TPI format is provided in Appendix A of this standard.

5.3.2 Supplemental Data (SD). The supplemental data shall contain that information necessary to execute UUT testing and troubleshooting in the event of unexpected test results or anomalies. The SD section of the TPSD shall include the following elements:

a. UUT Schematics

b. UUT Parts List

c. UUT Parts Location Diagram

d. ID Data Package

e. Special Handling Data

f. Test Diagrams

g. Functional Flow Charts

h. Diagnostic Flow Charts

i. Test Program Listing (if not available from ATE)

j. Digital Data Cross Reference Table

k. Test Program Cross Reference Table

5.4 Detailed requirements for Engineering Support Data (ESD). ESD is essential to a full comprehension of the intent, design, structure and interrelation of all elements of the TPS. ESD shall consist of the following elements, as required, depending on the test requirements for the UUT, the capability of the ATE and the requirements of the work authorization document (see 6.1). ESD is required for support at the Depot Level of maintenance, and at Cognizant Field Activites (CFAs), such as Naval Air Rework Facilities.

As authorized by the acquisition activity both the TPSD and ESD may be required. To avoid acquiring duplicate items TPSD data shall not be included in ESD.

a. Reference Documents

b. Test Strategy Report

c. Test Program Listing

d. Functional Flow Chart

e. Diagnostic Flow Chart

f. Test Diagrams

g. ATG Support Data

h. Computer Program Aids Documentation

i Reproducible Copy of TPI Master

j. Unique Parts Specification

k. ID Data Package

5.5 Computer program aids. All software associated computer program aids, and methodology documentation required to develop and maintain the TPS or used by the contractor which are not commercially available to the

Government, shall be provided. The aids developed by the contractor shall be provided on the same media used by the contractor, as well as hard copy of the source code.

5.6 Preparation for delivery.

5.6.1 Preparation of magnetic media. Magnetic tapes, discs and other program media shall be packaged in barrier material in accordance with MIL-B-81705 and DOD-HDBK-263, Class 2, requirements.

5.6.2 Marking of shipping containers. All deliverable items shall be marked in accordance with MIL-STD-129.

5.6.3 Physical protection. The requirements of MIL-E-17555 shall be met, unless otherwise specified.

6. NOTES

6.1 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 DOD FAR Supplement, Part 27, Sub-Part 27.410-6 (DD Form 1423) are invoked and the DD Form 1423 is not used, the data specified below shall be delivered by the contractor in accordance with the contractor purchase order requirements. Deliverable data required by this standard are cited in the following paragraphs.

Paragraph No.	Data Requirement Title	Applicable DID No.	Option
4.4.1, 4.4.2	Test Program Set Integration Log Book	DI-ATTS-80281	
4.4.1	First Article Test Report	UDI-T-23790	
4.4.1, 4.4.2	Test Program Set (TPS) and Operational Test Program Set (OTPS) Acceptance Test Procedures (ATPs)	DI-ATTS-80282	
4.4.1, 4.4.2	Test Program Set (TPS) and Operational Test Program Set (OTPS) Acceptance Test Report (ATR)	DI-ATTS-80283	
4.5.2	Configuration Management Plan	DI-E-1100	
4.5.2	Software Configuration Management Plan	DI-MCCR-80009	
4.5.2.1	Engineering Change Proposals (ECPs) and Requests for Deviations and Waivers (Long Form)	DI-E-2037	

Paragraph No.	Data Requirement Title	Applicable DID No.	Option
4.5.2.2	Configuration Status Accounting Reports	DI-E-2039	
5.3	Test Program Set Document	DI-ATTS-80284	
5.4	Engineering Support Data	DI-ATTS-80285	

(Data item descriptions related to this standard and identified in Section 6 will be approved and listed as such in DoD 5010.12-L, AMSDL. Copies of data item descriptions required by the contractors in connection with specific acquisition functions should be obtained from the Naval Publications and Forms Center or as directed by the contracting officer.)

6.2 Subject term (key word) listing.

Automatic test equipment
Automatic test generation
Configuration management
Data requirements
Digital test program comprehension
Engineering support data
First article acceptance
Interface device
Operational test program set
Production acceptance test
Supplementary data
Test accuracy ratio
Test program
Test program instruction
Test program set
Test program set document
Test program set integration
Unit under test
Validation
Verification

6.3 Changes from previous issue. Asterisks or vertical lines are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodians:
Navy - AS

Review Activities:
Navy - EC, SH

Preparing Activity
Navy - AS
(Project No. ATTS - P001)

APPENDIX A

TEST PROGRAM INSTRUCTION FORMAT

10. SCOPE

10.1 General. A Test Program Instruction (TPI) shall be prepared for each Unit Under Test (UUT) and shall be in the format specified herein. This appendix is a mandatory part of the standard. The information contained herein is intended for compliance.

20. REFERENCED DOCUMENTS

This section is not applicable to this appendix.

30. GENERAL REQUIREMENTS

This section is not applicable to this appendix.

40. FORMAT

40.1 Page and image size. All TPI masters shall be printed on 8-1/2 by 11-inch paper stock, one sided. Text is printed at 100 percent original size. All printed pages must have a minimum margin of one inch on the inside and outside edges. Reproduced TPI documents shall be printed on both front and back. The text (image) area is 6-1/2 inches wide and 9 inches high including running head and foot (see Figure A-1 - Mechanical Specification Sample).

40.2 Page documentation identification. Each 8-1/2 by 11-inch page shall be identified with the appropriate document number centered and located 1/2 inch from the top of page. Each foldout drawing shall be identified with the document number in the upper right-hand corner, 1/2 inch from the top and 1 inch from the right edge. The revision level shall only be indicated on the document title page.

40.3 Page numbering. Page numbers are to be centered on the bottom of each page 1/2 inch from the bottom. The title page is always page i (not marked) with remaining front matter following numerically, ii, iii, etc.

40.4 Punching. TPI documentation masters will NOT be punched with three holes, nineteen holes or otherwise. Masters with punched holes will copy but leave shaded areas where holes have been punched.

40.5 Paste-up pages and corrections. Paste-ups to be held to a minimum due to the shading detection during copying. Under circumstances where paste-ups have to be used, extreme care should be taken to ensure that the print quality is not degraded and margin requirements of paragraph 40.1 are maintained.

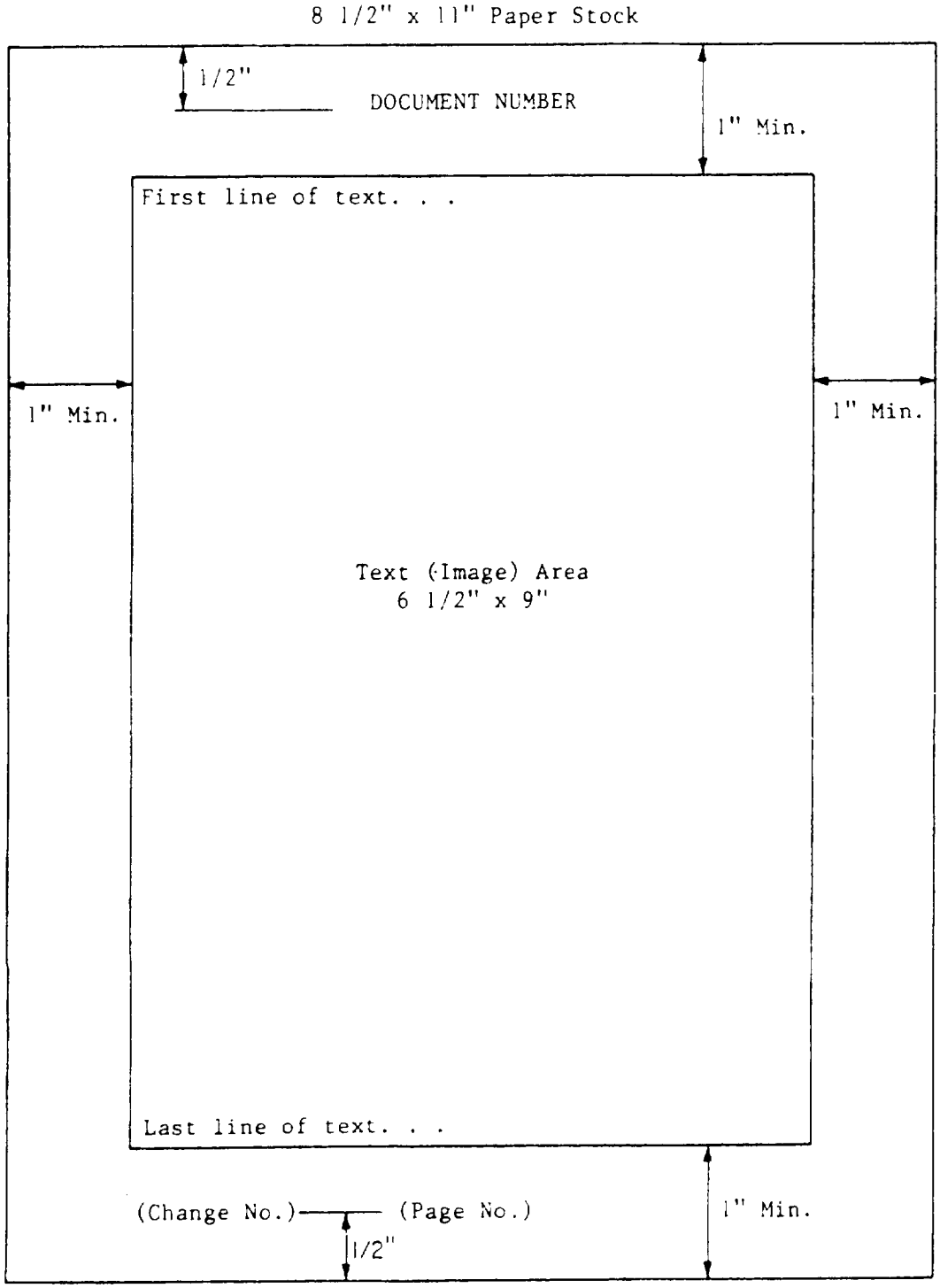


FIGURE A-1

Mechanical Specification Sample

SECTION 1. ONE-DIGIT MAJOR HEADING (ALL CAPS)

1.1 TWO-DIGIT MAJOR HEADING (ALL CAPS)

1.1.1 Three-Digit Major Heading (Initial Caps)

a. First item

b. Second item

c. Third item

1.1.1.1 Four-Digit Paragraph. Text is run in, gives instructions by steps.

1.1.1.2 Second four-digit paragraph

1.1.1.3 Third four-digit paragraph

1.1.2 The Second Three-Digit Major Heading (Initial Caps)

1.2 THE SECOND TWO-DIGIT MAJOR HEADING (ALL CAPS)

FIGURE A-2

Subordination Scheme Used in TPI

40.6 Subordination scheme. The paragraph subordination scheme used in TPSD documentation consists of two basic levels of subordination: major subordination consisting of one, two, three and four-digit decimal numbers; and a minor subordination consisting of letters. (See Figure A-2 for examples of both levels of subordination.)

40.6.1 Paragraph numbers and letters. Paragraph numbers/letters indicate the quantity of items in a series as well as their relative priority. They also facilitate making references to the contents of a document. At any particular level of subordination, there must be at least two elements. For example, if the writer has a paragraph 1.1, he also must include 1.2; if he has a paragraph 1.1.1.4a, he also must have a 1.1.1.4b.

40.6.2 Paragraph titles. Paragraph titles highlight for the reader the exact subject under discussion. Titles in any given series at the same subordination level must be grammatically parallel. In addition, all the paragraphs in a series at the same level either will or will not have titles. All or none is the rule.

40.6.3 Full headings. A full heading consists of a number or letter, as well as a title; however, the minimum identification required for any paragraph is a number or letter.

40.6.4 Section-level headings. Section-level headings are always of the one-digit level. Documents which are divided into sections and paginated accordingly will begin each section on a right-hand page and section headings will incorporate the word "SECTION" (e.g., "SECTION 1. TEST PROGRAM INSTRUCTION").

40.6.5 Simple listing. The phrases "as following," or similar phrases are used to introduce listings of one and two-line items; minor subordination in the form of an "a-b-c" or "1-2-3" listing or a titled listing must follow. The individual items in listings are terminated with periods, whether or not the items form sentences.

40.6.6 Notes, cautions and warnings. Notes, cautions and warnings are used to introduce items of information which are parenthetical (cannot logically be included in the text) and which the writer feels must be emphasized. They should be used sparingly, consistent with real need. Cautions and warnings should include the reason for the instruction or the consequences if not heeded.

40.6.6.1 Format. All three items are called out by labeling the information "Note," "CAUTION," or "WARNING" in the horizontal center of the page. None of the three are ever plural (i.e., "Notes" is not acceptable). The body of a note, warning or caution is centered horizontally under its title. If several distinct items of information are to be covered at the same time and all are of the same type (i.e., either more than one note, caution or warning), include all under the single appropriate heading, number each item and double space between items. Avoid having notes, warnings and cautions follow each other consecutively without intervening text. The text of notes, cautions and warnings should not be divided at the end of a page.

40.6.6.2 Note. Use a note for information parenthetical to the text but too bulky to be included internally within parentheses. The title "Note" has an initial capital and is not underscored. In most instances, a note should immediately follow the text to which it refers, but it may precede if the context demands. For example, in test procedures, it may be desirable to tell the reader that if certain conditions are met, then certain succeeding steps can be omitted.

40.6.6.3 Caution. Use a caution for parenthetical information which, if not regarded, might result in damage to the equipment. The title "CAUTION" is written in all capital letters and is not underscored. A caution immediately precedes the text to which it refers.

40.6.6.4 Warning. Use a warning for information which is parenthetical to the text and which, unless regarded, might result in injury to the personnel. The title "WARNING" is written in all capital letters and is underscored. A warning immediately precedes the text to which it refers.

40.6.7 Illustrations. Illustrations are used to present essential information not readily understandable in text or tabular form. Illustrations are also used to clarify and reinforce the meaning of text, to call attention to details and furnish pictorial identification of parts and schematics. Illustrations are labeled "figure" and should follow the section numbering schemes. For example, the first figure in Section 1 is labeled figure 1-1, the second figure 1-2, etc.; the third figure of Section 2 would be figure 2-3.

40.6.7.1 Callout. Illustrations should be introduced in the text with a formal "callout." A callout consists of a statement (usually parenthesized) which refers to the figure by its complete number, e.g., "(refer to figure 2-10)."

40.6.7.2 Title. Every illustration must be titled with both a number and a name. The title is placed at the bottom of the figure, horizontally centered and located 1/2-inch from the bottom unless it is a foldout illustration or drawing.

40.6.7.3 Foldouts. Standard foldout sizes are 11 x 17 inches. To ensure that the length is not exceeded for large figures, multipage figures should be utilized. UUT drawings can exceed the standard foldout size if the drawing flow and continuity are significantly degraded using the multipage method. Foldout pages will always be printed as right-hand pages and are never backed up. A foldout figure must be titled with both a number and a name. The title is placed at the bottom right-hand corner outside the image area. Multipage figures will be numbered using the same number followed by a decimal number scheme, e.g., "(figure 2-7.1 and figure 2-7.2)."

40.6.7.4 Lettering. Lettering is preferably typed; however, Leroy lettering may also be used. Hand lettering is acceptable only for illustrating entries on forms. Letters should not be reduced smaller than the equivalent of 6-point type (i.e., 0.06 inch tall or No. 60 Leroy with No. 00 pen). Lettering should be parallel to either the vertical or horizontal axis of the figure. Lettering enclosed in boxes or other geometrical forms should

be centered in the enclosure. All letterings should be in capitals, but if space prohibits, normal capitalization may be used (except for titles which must be initially capitalized). Avoid using all capitals in units of measure, the notations of which normally include lower case letters. Computer generated letter quality illustrations shall be approved by the acquisition activity.

40.6.8 Tables and/or listings. Tables and/or listings are used to present essential information in a tabular form, when the meaning and clarity of the data presented cannot be clearly established in text. Tables/listings are labeled "table" and should follow the section numbering schemes presented for illustrations (see 40.6.7).

40.6.8.1 Callout. Tables/listings should be introduced in the text with a formal "callout." A callout consists of a statement (usually parenthesized) which refers to the table/list by its complete number, e.g., "(refer to table 2-10)." Tables/listings should be presented immediately following the call-out, unless the amount of data requires the use of a foldout.

40.6.8.2 Title. Every table/list must be titled with both a number and a name. The title is placed at the top of the table/list, horizontally centered unless it is a foldout, and located within the image area.

40.6.8.3 Foldouts. Standard foldout sizes are 11 x 17 inches. To ensure that length is not exceeded for large tables/lists, multipage tables/lists should be utilized. Foldout pages will always be printed as right-hand pages and are never backed up. A foldout table must be titled with both number and a name. The title is placed at the bottom right-hand corner outside the image area. Multipage tables/lists will be numbered using the same number followed by a decimal number scheme, e.g., "(table 2-7.1 and table 2-7.2)."

40.6.8.4 Lettering. Lettering is preferably typed; however, Leroy lettering may also be used. Lettering should not be reduced smaller than the equivalent of 6-point type (i.e., 0.06 inch tall or No. 60 Leroy with No. 00 pen). Lettering should be parallel to either the vertical or horizontal axis of the tables and lists. Lettering enclosed in boxes or other geometrical forms should be centered in the enclosure. All lettering should be in capitals but, if space prohibits, normal capitalization may be used (except for titles which must be initially capitalized). Avoid using all capitals in units of measure, the notations of which normally include lower case letters. Computer generated letter quality tables and lists shall be approved by the acquisition activity.

40.7 Text specifications. Except for page numbers, TPI numbers, change and revision numbers, all text copy is to be typed within a space 6-1/2 by 9 inches. Computer generated letter quality text shall be approved by the acquisition activity.

40.7.1 Location of page and document number. Page numbers are centered on the bottom of each page, 1/2-inch above the bottom edge of paper. The TPI numbers are centered at the top of each page 1/2-inch below top edge of paper.

40.7.2 Spacing:

a. Use one carriage return between lines of text.

b. Use two carriage returns between paragraphs.

c. Use two carriage returns between paragraph headings (other than one-digit headings) and the first line of text for that paragraph, unless the text is run in with the heading.

d. Use four carriage returns between one-digit paragraph or section headings and succeeding text.

40.7.3 Paragraph headings.

a. One-digit headings. One-digit headings are in all capital letters and are horizontally centered one carriage return below the image at the top of the page (or four carriage returns from the preceding text, as in short documents where one-digit headings appear on the same page with the last sub- paragraph of the previous one-digit headings).

b. Two-digit headings. Two-digit headings are started at the left margin two carriage returns down from the preceding text or heading; using all capital letters and stand alone (i.e., there is no run-in text).

c. Three-digit headings. Three-digit headings are started at the left margin two carriage returns down from the preceding text; using initial capitalization and if they contain a title it is underscored.

d. Four-digit headings. Four-digit headings are started at the left margin two carriage returns down from the preceding text or headings. A four-digit heading is used to introduce step instructions. If a four-digit heading has a title, it is underscored and the text is run-in.

50. FORMAT OF FRONT MATTER

50.1 Title page. The title page shall serve as a cover sheet for the TPI. Each TPI shall be identified. Sufficient data shall be provided to ensure document identification, as assigned by the developer in accordance with the work authorization document and to verify correlation between the TPI and UUT (see figure A-3 Title Page Format). TPI changed revisions shall be indicated by means of a revision letter.

50.2 Baseline data. Change information pages must be included with all printed pages to and revisions of TPI master documents. It consists of a list of affected pages and a record of revisions and/or changes.

50.2.1 List of affected pages. The list of affected pages shall list all pages in numerical sequence with the appropriate change. Numerical sequence is interrupted for the following reasons:

Title - as follows:

XXX*

XXX XXX XXX**

TEST PROGRAM INSTRUCTION

XXX ***

XXX XXX XXX ****

* Where "AN" identification (if assigned) and narrative title of UUT.

** Name of prime system. Full name and acronym (if any).

*** "AN" identification of Test System.

**** Name of Test System. Full name and acronym (if any).

TPI NO:
UUT Nomenclature:
UUT Type:
UUT NSN:
UUT Rev:
Developing Activity:
Contract No:
Approving Activities:

FIGURE A-3 TITLE PAGE FORMAT

a. To indicate differences in revision and change numbers.

b. To indicate letter pages inserted by changes (e.g., 2-29A thru 2-29F).

c. To indicate pages which have been deleted.

d. To indicate the beginning of each section.

50.2.2 Record of revision and/or changes. This page should begin with the original issue of the document and list all subsequent changes and revisions. It is issued with the original document and subsequently maintained by the user. This page shall specify the configuration baseline of the UUT with respect to the TPI.

50.3 Table of contents. A Table of Contents must be included in all TPIs and it must include the following information:

a. A listing of paragraph headings and corresponding page numbers, entitled "Contents."

b. A complete listing of figures (by figure number and title) and corresponding page numbers, entitled "List of Illustrations."

c. A complete listing of tables (by table number and title) and corresponding page numbers, entitled "List of Tables."

Note: Only the first page number of multi-page sections, tables or illustrations is listed in the table of contents.

APPENDIX B

STANDARDIZATION OF MESSAGES FOR AUTOMATIC TEST EQUIPMENT (ATE)

10. SCOPE

10.1 General. This Appendix contains the requirements for standardizing the format of operator instructions and messages specified by the test engineer for display on the Cathode Ray Tube (CRT), printer or other ATE I/O media. The Test Program Instruction (TPI) section of the Test Program Set Document (TPSD) shall contain those messages which are not capable of being readily supplied on the ATE communication media. This Appendix is a mandatory part of this standard. The information contained herein is intended for compliance.

10.2 Purpose. This Appendix establishes standardized display format statements developed to deal with most situations encountered by the operator in the functioning of an ATE station. The I/O device shall display those messages necessary for the execution of the program.

20. REFERENCED DOCUMENTS

20.1 Government documents. The following documents of the issue listed in the Department of Defense Index of Specifications and Standards (DODISS) and its supplements, form a part of this appendix to the extent specified herein.

STANDARDS

MILITARY

MIL-STD-12	Abbreviations for Use on Drawings, Specifications and in Technical Documents

30. GENERAL REQUIREMENTS

30.1 Message format. Messages shall be designed in a manner consistent with the capabilities of the ATE I/O media and in a format which facilitates ease in reading. Messages shall be separated into single steps or instructions which require a response prior to the next instruction being supplied. Detailed requirements and specific examples of standardized messages and formats are provided in Section 40. Formats shall be arranged to avoid the splitting of words or symbols between lines.

30.2 Abbreviations. All message statements must be concise and unambiguous. Clarity is of prime consideration in using any abbreviation. If the items to be abbreviated appear on the approved list (see Table B-1), only the approved abbreviation is to be used.

TABLE B-I
STANDARD LIST OF ABBREVIATIONS

WORD OR WORD COMBINATIONS	ABBREVIATION
ADJUSTMENT/ADJUST	ADJ
ALTERNATING CURRENT	AC
ALTERNATE	ALTN
AMPERES	A
APPROXIMATELY/APPROXIMATE	APROX
ASSEMBLY	ASSY
AUXILIARY	AUX
AVAILABLE	AVAIL
BUILDING BLOCK	BB
BUILT IN TEST	BIT
BUILT IN TEST EQUIPMENT	BITE
CALIBRATE	CAL
CATHODE RAY TUBE	CRT
CHANNEL	CHAN
CHECK	CHK
CIRCUIT	CKT
CONFIGURATION	CONFIG
CONTINUE	CONT
CURRENT	CUR
DATA TRANSFER UNIT	DTU
DECIBLES	DB
DEGREES	DEG
DIAGNOSTIC	DIAG
DIGITAL SUBSYSTEM	DSS
DIRECT CURRENT	DC
DISCONNECT	DISC
DISPLAY	DISPL, DSP
ELECTRONIC MODULE	EM
EQUAL TO	EQ
EXTERNAL	EXT
FAILURE	FLR
FARADS	F
FEET	FT
FILTER	FL
FREQUENCY	FREQ
GIGA	G
GREATER THAN	GT
GROUND	GND
HERTZ	HZ
HENRIES	H
HORIZONTAL	HORIZ
IDENTIFY/IDENTIFICATION	IDENT
INDICATOR	IND
INITIAL/INITIALIZE/INITIATE	INIT
INSTRUCTION	INST
INTERFACE DEVICE	ID

TABLE B-I (Continued)
STANDARD LIST OF ABBREVIATIONS

WORD OR WORD COMBINATIONS	ABBREVIATION
INTERFACE	INTFC
INTERMEDIATE FREQUENCY	IF
INTEGRATED CIRCUIT	IC
KILO (PREFIX)	K
LESS THAN	LT
LIMIT	LIM
LOWER LIMIT	LL
MAINTENANCE INSTRUCTION MANUAL	MIN
MANUAL	MNL
MAXIMIZE/MAXIMUM	MAX
MEGA (PREFIX)	M
MICRO (PREFIX)	U
MILLI (PREFIX)	MILLI
MINIMIZE/MINIMUM	MIN
MISSION	MSN
MONITOR	MON
NANO (PREFIX)	N
NOT EQUAL TO	NE
NO-GO HI	NH
NOMINAL	NOM
NUMBER	NO.
OHM	OHM
OPERATE/OPERATOR	OPR
OSCILLOSCOPE	SCOPE
OVERFLOW	OVFL
PARAMETER	PRMTR
PERCENT	PCT
PICO (PREFIX)	P
POSITION	POSN
POSITIVE	POS
POTENTIOMETER	POT
POWER	PWR
PRINTED CIRCUIT BOARD	PCB
PROBABLE CAUSE OF FAILURE	PCOF
PROCEDURE	PROC
RADIO FREQUENCY	RRF
READY-FOR-ISSUE	RFI
REFERENCE	REF
REMOVE	REM
REMOVE AND REPLACE	R/R
REPEAT	RPT
REQUIRED	REQD
RESISTORS/RESISTANCE	RES
SECOND (TIME)	SEC
SENSITIVE	SENS
SIGNAL	SIG

TABLE B-I (Continued)
STANDARD LIST OF ABBREVIATIONS

WORD OR WORD COMBINATIONS	ABBREVIATION
SIGNATURE	SIGNTR
STATION	STA
STATUS	STAT
SWITCH (NOUN)	SW
SYSTEM	SYS
TEMPERATURE	TEMP
TEST PROGRAM INSTRUCTION	TPI
TEST POINT	TP
TESTING DATA TABLE	TDT
TOLERANCE	TOL
TRANSFORMER	XFMR
TRIGGER	TRIG
UNIT-UNDER-TEST	UUT
UNKNOWN	UNK
UPPER LIMIT	UL
VERTICAL	VERT
VOLTMETER	VM
VOLTS: VOLTAGE	V
WEAPONS REPLACEABLE ASSEMBLY	WRA

30.2.1 Individual words. Individual words and word combinations can only be abbreviated when their meaning is unquestionably clear. When in doubt, the word(s) must be spelled out.

30.2.2 Five letter words. In general, words having five (5) letters or less are not abbreviated, except those established by long-standing practice, e.g., the letter V is used to abbreviate "Volts."

30.2.3 Word combinations. Word combinations in general are not abbreviated; there are, however, some exceptions. Approved abbreviations for word combinations are listed in Table B-I.

30.2.4 Abbreviations in Table B-I. Only the abbreviations identified in Table B-I are to be displayed. This table will be updated to include new abbreviations, as deemed necessary.

30.2.5 MIL-STD-12. The abbreviations listed in Table B-I reflect the requirements of MIL-STD-12.

30.3 Instructions. Keep the display message simple. Instructions should be easily remembered and executed.

30.4 Operator intervention. There shall be an "-OPR ACTION-" statement when operator intervention is required.

30.5 Readability. An effort should be made to increase readability whenever possible. As an additional aid to readability, vertical and horizontal centering of the message should be used.

30.6 Failure message. "Failure" messages must indicate the "failed" test.

30.7 Printed displays. All displays containing information necessary for the documentation of the test in process should be printed out on a teletypewriter or line printer.

30.8 Operator message. When the required operator action is described in the TPI section of the TPSD, the following message, properly centered, should be displayed:

SEE TPSD TABLE 1-1 TXXX FOR INST

40. STANDARDIZED MESSAGES

40.1 General. Standardized display messages have been developed for most common situations faced by the programmer. When a special message is necessary, standardized messages should be used as guidelines for preparing the special message. The use of a standardized message, where applicable, is mandatory.

40.2 Identity checks. The identity checks verify that the proper UUT/ID(s) is (are) connected to the ATE for the selected test program. When the identity check results in a NOGO condition, the program shall display a message and execute an instruction to halt the test program. Then the operator is informed of the improper ID or UUT signature on the CRT display.

40.3 Operator intervention. The operator action statement requires operator intervention during test program execution and will generally fall into one of the following categories: UUT adjustment, UUT response monitoring or end of program. Standard message formats for each of these categories described in the subsequent paragraphs.

40.3.1 UUT adjustment. If the UUT and/or ID contains switches, calibration controls and/or other adjustment features, display statements will generally have to be composed to manually change their position during the execution of a test program. Unless otherwise indicated, it is assumed that all controls and switches to be repositioned/adjusted are located on the UUT. If they are elsewhere, their location must be identified on the displayed instructions. If more than one switch or control must be repositioned, the required settings shall be described in the TPI section of the TPSD or displayed. The operator display shall provide the direction for repositioning settings one switch or control at a time with an operator action required to resume program execution after each section. The designations shown in these messages should be the marking engraved on the UUT (or the ID) and shall be highlighted by asterisks.

EXAMPLE 1

```
-OPERATOR ACTION-
CHANGE SWITCH A1 POSITION TO ON
FOR GAIN TEST
SEE TPI TABLE 1-2 TXXX FOR INST
```

EXAMPLE 2

```
-OPERATOR ACTION-
ADJUST "GAIN" POT FOR
1.9v to 2.1v OUTPUT
CONTINUE
DEPRESS YES
ADJUSTMENT IS NOT POSSIBLE
DEPRESS NO
```

Note: It is preferable to provide the actual voltage between which an adjustment can be made, than to indicate a nominal voltage and tolerance.

EXAMPLE 3

```
-OPERATOR ACTION-
PRESS AND HOLD "LAMP TEST" SWITCH
CHECK IF ALL LAMPS ARE LIT AND
REPLACE ALL LAMPS NOT LIT
DEPRESS YES TO CONTINUE
```

40.3.2 UUT response monitoring. When the UUT contains indicator lights and/or meters, statements will likely have to be generated for visual response monitoring.

EXAMPLE

```
-OPERATOR ACTION-
CHECK "BIT FAIL" LIGHT
IF OFF, DEPRESS YES
IF ON, DEPRESS NO
SEE TPI TABLE 1-1 TXXX FOR INST
```

40.3.3 "End of Program" messages. In the "end of program" message it is understood that the required repairs will be accomplished off-line. The following examples of "end of program" messages are for TPs without fault isolation.

EXAMPLE 1

```
END OF PROGRAM
UUT FAULTY
TEST XXX FAILED
```

EXAMPLE 2

```
END OF PROGRAM
UUT GOOD
```

40.4 Fault isolation. "End of program" messages when fault isolation is provided are described in the following paragraphs. In both examples shown, any other component which could be the source of the problem will be listed in the TPI section of the TPSD or the display in order of lowest MTBF (Highest Failure Rate) to highest MTBF (Lowest Failure Rate).

40.4.1 Isolation to one component. In cases where fault isolation is provided and isolates to one component, the "end of program" message is:

EXAMPLE

```
END OF PROGRAM
UUT FAULTY
TEST XXX FAILED
(PERFORMANCE ROUTINE TEST NUMBER)
R/R Z1
```

40.4.2 Isolation to two or more components. In cases where fault isolation is provided and isolates to a group of two or more components, the "end of program" message is:

EXAMPLE

```
END OF PROGRAM
UUT FAULTY
TEST XXX FAILED
(PERFORMANCE ROUTINE TEST NUMBER)
PROBABLE ORDER OF FAILURE-
R/R Z1, Z3, Z9
```

40.5 Probe message. A probe message shall contain, as a minimum, the component name and pin number to be probed. A period is to be used to separate the component reference designator from the pin number. For example, a message would read as follows:

PROBE U1.2

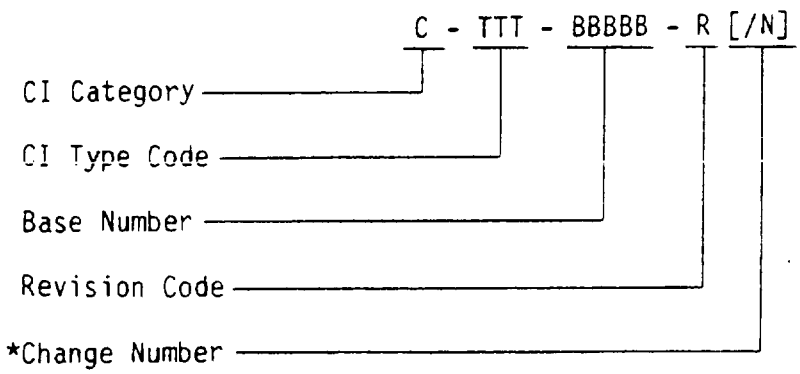
APPENDIX C

SPAWAR/NAVSEA TPS NUMBERING SYSTEM

10. SCOPE. The TPS numbering system described herein is the system to be used by Support and Test Equipment Program TPS developers. This Appendix is a mandatory part of the standard. The information contained herein is intended for compliance.

10.1 Hardware/software identification. A Test Program Set (TPS) consists of the following Configuration Items (CI): Test Program Set Document (TPSD), Test Program (TP) and Interface Device(s). The TPSD is the TPS control number. All TPS CIs to be identified will use the system outlined in the following paragraphs for each CI. The TPSD, mass media and adapter base number portion of the identification number will be allocated in blocks to each TPS developer by the ATE/TPS Coordination Center, Fleet Analysis Center, Code 8242, Corona, CA 91720.

10.2 TPS family identification numbering. The TPSD (both "T" and "S" categories), TP, and TPS support documents identification numbers will be structured in accordance with the following format:



*(CI category "P" has revision code ONLY, NO change number)

For a given TPS, all associated CIs will have the same base number to form a family identity (except for ID documentation, see paragraph 10.3) and, by using block base number assignments to developers, the base number can identify the TPS developer. The adapter will have a different base number as discussed in paragraph 10.3 since individual adapters may handle multiple TPS.

10.2.1 CI category. The following single character alpha codes will be used for the associated CI:

Code		CI
T	=	TPS (Diagnostic)
S	=	SCREENING TPS
P	=	Test Program
D	=	Support Documents

10.2.2 CI type code. The following three digit numeric codes will be used to identify the associated CI type:

a. Where CI category equals TPSD (both "T" and "S") or TP:

Code		CI ATE
01X	=	GENRAD 2225
02X	=	BENDIX "HERBIE"
03X	=	THREE PHOENIX
04X	=	DIMOTE
05X-99X	=	(Future Assignments)

NOTE: The "X" will initially be "0" (zero). This digit will be changed to next higher digit to reflect ATE changes and/or modifications.

b. Where CI category equals Support Documents:

Code		Document Type
010	=	TRD
020	=	TRS
030	=	TPS Specification
040	=	TPS Design Documents
050	=	Test Program Instruction (Do NOT Use - TPI Section of TPSD is NOT to be identified separately)
060	=	Adapter Design Documentation (Includes drawings)
070	=	Supplementary Data (includes Drawings and Illustrations requiring unique identity - Do NOT use for SD Section of TPSD; SD is NOT to be identified separately)
080-990	=	(Future Assignments)

10.2.3 TPSD base number. The five digit base number will be assigned by the TPS developer from blocks of TPSD base numbers allocated by the ATE/TPS Coordination Center. A TPSD assigned base number is used for all CIs of each TPS family except the adapters (see paragraph 10.3) and test program media

(see paragraph 10.4). Base numbers are NOT to be reused across different types of TPSs (i.e., diagnostic and screening). Each TPS type shall have a unique base number.

Example: TPSD No. - T-010-00045-0/0 (with diagnostics)

TPSD No. - S-010-00046-0/0 ("SCREEN ONLY")

TP No. - P-010-00045-0 (no change allowed)

TRD No. - D-010-00045-0/0

TRS No. - D-020-00045-0/0

TPS Spec No. - D-030-00045-0/0

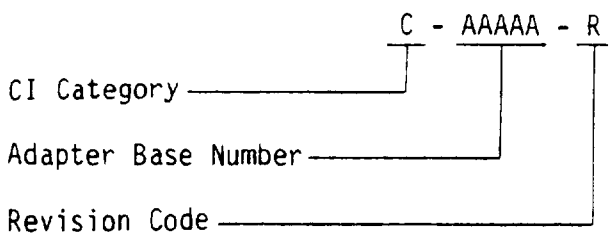
Illustration - D-070-00045-0/0

etc.

10.2.4 TPSD Revision code The initial release (no revision) of the TPSD will be revision code of "0" (zero). Each subsequent revision to a TPSD will replace the "0" with a single alpha character starting with "A" and incremented for any TPSD affected. Use of letters "I" and "O" shall be avoided.

10.2.5 Change number. The change number will apply to the "T," "S," and "D" categories (TPSDs and support documents) only. The initial release will be zero (0). Each subsequent change will replace the "0" with single numeric character starting with one (1) and incremented for each change of a unique document.

10.3 Adapter identification number. The adapter identification numbers will be structured in accordance with the following format:



The adapter identification device number does not track with the TPSD base number since a given adapter may be required to be used with more than one TPS. Some ATEs require special adapters (Family Boards or Power Modules) to be used with or without the Interface Devices (ID). The special adapters will have separate base numbers assigned by the developer from the adapter number block. Base numbers are NOT to be reused across different type adapters (i.e., ID and family boards). Each adapter type shall have a unique base number.

The associated documentation or drawing (D-060-AAAAA-0) for an ID or family board shall carry the appropriate adapter base number to show family relationship.

Example: I-00019-0 F-00056-0

D-060-00019-0/0 D-060-00056-0/0

10.3.1 CI category. The following single character alpha codes will be used for the associated CI category:

Code		CI
I	=	Interface Device or Intergrated ID, "F" or "P" devices
F	=	Family Board
P	=	Power Module/Power Boards

10.3.2 Adapter base number. The five digit numeric base number will be assigned by the developer from the blocks of adapter numbers allocated by the ATE/TPS Coordination Center. Separate base numbers will be assigned to each ID, Power Module or Family Board.

Example: ID No. - I-00022-0

Family Board No. - F-00023-0

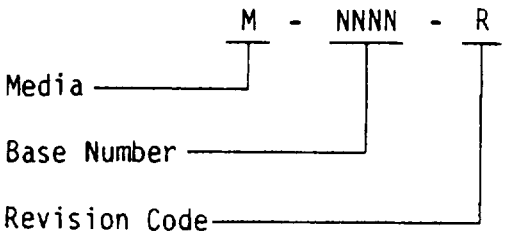
Note: If the TPS developer controls the duplication of adapters then each unique adapter family must be serialized for distribution tracking.

10.3.3 Adapter revision code. The initial release (no revision) single character alpha revision code will be the number "0" (zero). Each subsequent revision to an ID or Family Board will replace the "0" with a single alpha character starting with "A" and incremented for any ID or Family Board affected. Use of the letters "I" and "O" shall be avoided. No change incorporation will be allowed on deployed hardware because of inability to assure quality of or actual performance of change incorporation.

10.4 Mass media device. Mass media devices will be used as a means of providing users with TPs by utilizing the minimum amount of storage space. Mass media devices will be of three types; magnetic tape, ROMs, and paper tape. Magnetic tape and ROMs will be provided to the users with multiple TPs for cost effectiveness. Paper tapes (THREE PHOENIX) will contain single TPs. Paper tapes with single TPs will be labeled with the TP number only. The magnetic tapes and ROMs with multiple TPs will be labeled with a Mass Media Device number in addition to a complete list of the TPs stored on the device. TPs of different equipment types shall not be assigned to the same Mass Media Device except when the equipment types have common TPS. Automatic Test Equipment system software (TRAC) shall not be placed on the same tape with the test programs.

The Coordination Center will store, duplicate, and distribute the Test Program Media (TPM) with the TPS per the direction of the Focal Point Manager.

The magnetic tape or ROM will be assigned a mass Media Device identification number and will be structured in accordance with the following format.



The base number will be assigned sequentially by the TPS developer from block of base numbers allocated by the ATE/TPS Coordination Center.

Note: If the TPS developer duplicates Mass Media Devices then each unique device family must be serialized for distribution tracking. Master tapes or paper tapes do not require serialization.

10.4.1 Media. The Media entry will always be a single alpha character "M."

10.4.2 Media base number. The four digit numeric base number will be assigned sequentially by the TPS developer as each new or revised TPM is issued.

Example: M-0001-0

M-0002-A

M-0003-C

10.4.3 Media revision code. The initial release (no revision) single character alphanumeric revision code will be a number "0" (zero). Each subsequent revision to the TPM(s) will increment the revision code from "0" (zero) to "A" through "Z." Use of the letters "I" and "O" shall be avoided. A change in the revision code for a media unit will implement a distribution cycle of revised media units and an updated Master Test Program Set Index (MTPSI) to all applicable users. No change incorporation will be allowed on deployed Mass Media Devices because of inability to assure actual performance of change incorporation.

10.5 Special numbering instructions.

10.5.1 TPS for multiple equipment types. The special treatment of paragraph 10.5.1.1 or 10.5.1.2 will be required for TPSDs ("T" or "S") which tests a UUT common to more than one equipment type. If the equipment containing the UUT is not included in the TPSD during initial development of the TPS, then the

developer will have to request the TPS In-Service Engineering Agent to revise/change the TPSD to reflect the new equipment with references to the proper adapters and TPM in accordance with either Method One or Two of paragraphs 10.5.1.1 and 10.5.1.2.

10.5.1.1 Method One.

a. Where possible, revise the TPM to add all TPs for the NEW equipment on the same TPM and release under next revision level.

b. Revise/change the TPSD to reflect all equipment used by the TPS and release under the next revision or change level.

10.5.1.2 Method Two.

a. Release a new TPM with only the common TPs and TPs for the new equipment type on the TPM and assigning new TPM number.

b. Revise/change the TPSD to reflect all equipment using the TPS. Indicate by equipment type the required TPM and release TPSD under the next revision or change level.

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1. DOCUMENT NUMBER	2. DOCUMENT TITLE
MIL-STD-2077A (NAVY)	GENERAL REQUIREMENTS TEST PROGRAM SETS

3a. NAME OF SUBMITTING ORGANIZATION	4. TYPE OF ORGANIZATION *(Mark one)*
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