

SECTION 3

MAINTENANCE AND SYSTEM TEST CRITERIA

3-1. RESPONSIBILITY.

Chapter 67 of the Bureau of Ships Technical Manual states, in part: "Maintenance of electronic equipment, both corrective and preventive, is the responsibility of the commanding officer of the activity. The commanding officer shall have a preventive maintenance program. The degree of emphasis required on preventive maintenance due to complexity can be determined by reference to the technical manuals provided with the equipment. Most repairs can be accomplished by proper use of the information supplied therein and the judicious expenditures of repair parts carried aboard. Equipment abuse arises from lack of adequate preventive maintenance and from failure to follow proper operational procedures. The major factors involved in reducing these problems are set forth in the technical manuals for specific equipment, and various maintenance manuals and publications. The Maintenance Authority shall assist in formulating the program on request of the commanding officer, or spontaneously on a program wide basis as deemed necessary. . . ."

3-2. PROGRAM.

The goal of optimum operational reliability of electronic equipment cannot be approached without the implementation of a good effective program of preventive maintenance. Preventive maintenance is the systematic accomplishment of items deemed necessary to reduce or eliminate failures, and prolong the useful life of electronic equipment. Electronic equipment instruction books supplied with each equipment insure that information is always available on which to base a preventive maintenance schedule.

The preventive maintenance program is implemented by: (1) following procedures outlined in the equipment instruction books, (2) application of System Test Procedures, and (3) employment of POMSEE publications where applicable.

3-3. POMSEE.

The Performance and Operational Maintenance Standards of Electronic Equipment or POMSEE program as outlined in Chapter 67 of the Bureau of Ships Technical Manual, is an official method by which the Bureau of Ships promulgates performance standards and standardized test procedures for shipboard equip-

ment. The program may also serve as the basis for recommended preventive maintenance procedures for combined ship and shore types of electronic equipment used at Naval Shore Activities. In implementation of this program, the Bureau of Ships is the monitoring authority regarding the preparation and procurement of POMSEE manuals and publications. A description of the manuals and publications making a complete POMSEE package for an equipment is listed as follows:

Performance Standard Sheets provide the operational data and basic technical measurements indicative of the minimum acceptable level of performance for electronic equipment.

Maintenance Standard Books as prepared under specification MIL-M-21741(Ships) provide standard methods for determining measurements affecting the performance of a specific equipment, space to record measurements, and a preventive maintenance schedule for the equipment. The Maintenance Standards Books include Part I - Test Procedures and Maintenance References (originally published as Performance Standards Book) and Part II - Preventive Maintenance Check-Off (originally published as Maintenance Check-Off Book).

Operating Instruction Charts provide a summary of the procedures to be followed in starting, operating, and stopping the equipment. (This type of information is prepared in chart form on laminated plastic sheets for posting on or nearby the respective equipment. One chart should be convenient to each operating position. Operating Instruction Charts are not produced for all types of electronic equipment, but are produced generally on electronic equipment types having a complex operating nature or having high power output. However, whenever available, these charts should be employed.)

Industrial Managers, Ship Repair Facilities, etc., are available, upon request, to assist station forces in establishing the initial equipment performance standard. It will be necessary to first peak the equipment concerned before running through the complete check-out procedure as prescribed in the applicable POMSEE publication.

POMSEE publications may be requisitioned from the nearest Bureau of Supplies and Accounts Forms and Distribution Supply Point.

3-4. SYSTEM TEST PROCEDURES.

a. DEFINITIONS.—Chapter 67 of the Bureau of Ships Technical Manual states: "A system (electrical-electronics) is a combination of two or more sets, generally physically separated when in operation, and such other assemblies, subassemblies, and parts necessary to perform an operational function or functions. (Examples: AEW electronic system, anti-aircraft defense system, telephone carrier system, GCA electronic system, fire control system, including the tracking radar, computer, and gun mount.)"

Another example of a "system" is a complete full duplex multichannel SSB teletype communication system as employed on major point-to-point trunk service and which may include micro-wave link components and one or more long-haul propagation paths.

A "System Test" is defined as a procedure whereby system performance is measured. This measurement shall indicate quickly and effectively just how well a system is performing its specific function(s), and, where malfunctioning is apparent, to provide information which will permit localizing the cause. Where possible it is preferred that system test procedures will permit measurement of performance during operating periods without interruption to continuous normal function.

b. THE SYSTEM TEST MANUAL.—A System Test Procedure is prepared for each electronic system of the Naval Shore Establishment where system test techniques are applicable. Each system test bears a number for identification. Each of these numbered system tests are complete in themselves and contain all required information and directions for conducting the system test.

The "Naval Shore Electronics System Test Manual" will contain all current system test procedures. This publication is prepared in accordance with the military specification for technical manuals MIL-M-16616(SHIPS), as modified for this particular type of technical manual. As new system tests are developed or changes made to current system tests, the publication will be revised.

Optimum employment of illustration and text shall be used to present the system test in the simplest most readily understood form. The object of all system tests is to provide tests which may be performed by non-technical personnel whenever possible. Tests may be divided into two parts; an operator test with partial use of the system test, and a technician test utilizing the full system test facility upon operator call or on a routine scheduled basis.

c. APPLICATION.—System test procedures are applied to any one point in a system or at a number of

points where system performance can be effectively measured. A complete system such as a point-to-point SSB system is extensively complex and will include the propagation path as a "component" of the system. A single measuring device at the receiver end of such a system may be used to measure the over-all system performance. However, the complete system test procedure will include a separation of the over-all system into smaller segments with performance standards specified for such segments. Measurement of performance of the component segments will then serve to pinpoint causes of system performance degradation which will have been first indicated by the alarm mechanism of the over-all performance measuring device.

The establishment of standard System Test Procedures applies particularly to communication systems or segments of complete systems. System test procedures are also applicable to other electronic systems such as air surveillance radar and radar air traffic control systems having remote presentation. Because Navy electronic facilities are composed of a number of duplicated systems, standard system test procedures are established for each duplicated system in order to provide wide uniformity in meeting prescribed standards in the fulfillment of operational requirements.

d. GENERAL SPECIFICATION REQUIREMENTS.—In the preparation of a System Test Procedure for any particular system, the following must be considered:

(1) COMPONENTS.—The components of the system are listed and the boundaries of the system must be clearly defined.

(2) TEST EQUIPMENT.—The test equipment required for the measurement of system performance is often included in the composition of the system, or as a part of individual components. General purpose portable test equipment may be required. Certain systems may require special test equipment to be fabricated, installed in the system, or otherwise made available. Where such equipment is fabricated for a special system or procured for a specific application, the applicable portions of MIL-T-945A will be followed in the design of such equipment when practicable and economically feasible. The accompanying instruction manuals will be in accordance with applicable portions of MIL-M-16616(SHIPS).

In all cases, the prescribed test equipment required to perform the system test will be included in a list of requirements and will be made available.

(3) PROCEDURES.—The test procedures will contain precise instructions for conducting the system test. This will include the times for application of system test procedures. Some system test measuring

techniques may be applied continuously. Other systems will require periodic measurement and examination to insure optimum performance.

The procedures will describe the system test points and any special conditions which may be required when applying test procedures. Typical meter readings and tolerances will be specified. Where oscilloscope examination is part of a system test, a typical presentation will be illustrated.

(4) RECORDED DATA.—In order to detect gradual system performance degradation, a written record of system testing will be maintained where applicable. Forms will be made available for such purpose. The design of the forms will be such as to provide maximum utility combined with simplicity so that maintenance of records will not be excessively burdensome.

(5) PERFORMANCE STANDARDS.—Each component of a system has been designed or has the capability to perform individually to meet a specified operational requirement. A transmitter is designed for a certain frequency range, power output, frequency stability, type of emission, and with specified limits as to harmonic output and extraneous emission. A receiver will have a certain sensitivity, bandwidth, and other features which are characteristic. A landline will have a specified transmission characteristic with a limit to permissible attenuation. When such components have been integrated into a system, the design of the system will be such as to take into consideration the maximum capabilities of each component.

The limitations of each component are also considered so that the over-all performance of a particular system will satisfactorily meet its operational requirements. A system test procedure is therefore required upon the initial establishment of a system, and for periodic or continuous measurement of system performance thereafter.

Each component of a communication system and the system as a whole must be designed and operated to meet the requirements of MIL-STD-188A or current revision thereof. Other electronic installations will be operated so as to meet design or applicable military specifications. System test procedures are therefore based upon tests of performance to meet such performance standards as are prescribed for the particular system.

The preparation of a system test procedure will contain a discussion of the performance standards applicable to that system. Reference will be made to Section Four of this Publication and applicable military specifications and design specifications of components of the system where applicable.

e. FACILITIES.—Preparation of a standard System

Test Procedure is performed under direction of the Bureau of Ships. The contractor or other designated authority will be furnished with the following facilities to be used in the preparation of a System Test Procedure:

(1) INSTRUCTION BOOKS.—Equipment test data and other required publications will be furnished by the Government.

(2) SYSTEM AVAILABILITY.—The Government shall provide the prime equipments which comprise the system or the contractor shall be provided access to an existing Government system for measurements, tests, and demonstration of the proposed system test. Prior to acceptance of the system test and preparation of the system test instructions, the contractor shall provide opportunity for evaluation of the system test by the Government and shall incorporate such modifications as requested by the Government.

(3) TEST EQUIPMENTS.—Test equipments specified by the contractor for system tests shall be as selected from NAVSHIPS 3791(4-60). Recommended or Permanent Substitute type equipments will be used wherever such equipments will perform the required function. If the contractor considers that other test equipment is required he shall request Government authorization before proceeding with procurement or development of same.

f. SYSTEM TEST INTEGRATION.

(1) MANAGEMENT BUREAU OR OFFICE.—The operation of electronic equipment and systems is a responsibility of the Management Bureau or Office. The selection and design of this electronic equipment to meet operational requirements and the establishment of procedures for its maintenance are responsibilities of the Bureau of Ships. System tests are designed to measure operational performance and should be incorporated in routine station operation and integrated with prescribed maintenance procedures. All system tests which are applicable at any activity should be established as routine procedures. Operating personnel should be given thorough indoctrination into the application of system test procedures so that the burden of system testing does not rest entirely on maintenance personnel.

(2) MAINTENANCE AUTHORITY.—A system test procedure applied to any system is not designed to replace normal equipment maintenance checks. Instruction book procedures for preventive maintenance of individual components of a system and/or application of POMSEE procedures are essential at all times to obtain maximum utility of the equipment. System testing will provide a record of performance for early detection of system operational degradation. Correc-

tive maintenance procedures may then be applied to components of the system and/or substitution of equipment can be effected to forestall impending circuit or system outages.

In the exercise of technical control over Shore Electronic installations, it is a responsibility of the Maintenance Authority to insure that the equip-

ment and systems meet the performance standards which have been established. In new installations, standard system test procedures should be integrated with routine station maintenance to assist Management in the operation of the electronic facilities. Applicable system tests will be performed during the annual inspection of any activity.