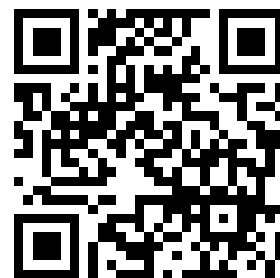

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BUREAU OF SHIPS MANUAL

CHAPTER 67 ELECTRONICS

NAVY DEPARTMENT,
Bureau of Ships,
19 June 1958

This chapter is a revision of Bureau of Ships Manual, Chapter 67, "Electronics," dated March 1955 and changes thereto incorporated.

This revised chapter becomes effective immediately and shall be inserted in its proper place in the Manual binder.

A.G. MUMMA
Rear Admiral, USN,
Chief of Bureau.

Approved:
F.A. BANTZ
Assistant Secretary of the Navy (Material).

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CHAPTER 67 ELECTRONICS**

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**INSTRUCTIONS REFERENCED IN CHAPTER 67
BUREAU OF SHIPS MANUAL (See Article 67-3)**

<i>Instructions</i>	<i>Number</i>	<i>Code Serial and Date</i>
Department of Defense	3232.1	11-3-55
Office of the Secretary of the Navy	4814.1	Op-311C of 2-6-57
Office of the Chief of Naval Operations	3300.6 3590.1A 4441.4 4700.9 5510.37A 09670.2 (STEP)	Op-09D of 12-9-55 Op-341G of 9-22-55 Op-412C of 12-20-56 Op-403C of 1-14-53 Op-304G of 10-7-55 Thru change Number 39 of 11-19-57
	10380.1A 10550.12	Op-09E of 10-21-53 Op-345 of 2-9-56
Military Sea Transportation Services	4700.2	MSTS 41D of 10-1-52 with changes 1 through 11

<i>Instructions</i>	<i>Number</i>	<i>Code Serial and Date</i>
Bureau of Ships	4441.33B 4441.44 4720.1	980-12 of 5-1-56 915-14 of 6-16-55 508-30 of 3-25-54 with BUSHIPS Notice 4720 Ser 518-547 of 11-4-55 and CH2 Ser 518-229 dated 6-28-56
	4910.8A 5450.14 5600.7B 9670.20B	989-380 of 7-29-57 741-720 of 2-3-54 7-1-57 965-351 of 12-8-55 with BUSHIPS Notice 9670 Serial 975-90 of 8-23-57
	09670.58B	980-01 of 1-10-56 with BUSHIPS Notices 980-012 of 3-26-56 and 980-032 of 7-30-56
	9670.80A 9670.88 09670.90	990-61 of 6-29-56 960-164 of 8-30-56 960-057 of 2-19-57 with BUSHIPS Notice 9670 Ser 960-023 of 3-6-57
	9671.11 9672.17 9674.12A 9674.25 10550.1B	982-711 of 12-11-53 884E-4-6604 of 11-5-55 883-3094 of 11-28-56 Ser 963-157 dated 8-7-57 880-250 of 12-21-55 with BUSHIPS Notices 880-558 of 6-19-56 and 880-859 of 11-5-56
	10550.10C CH3 10550.32A 10550.54 10550.60 11120.1	Ser 873-200 of 6-1-58 910-61 of 7-26-55 800-7 of 4-25-56 925-679 of 10-23-56 910-25 of 4-22-55

Electronic Supply Office	4410.45 4440.30A 4441.17A 10550.2A	810 of 11-21-57 811 of 1-30-53 810 of 6-28-57 2-20-57
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PUBLICATIONS AND MISCELLANEOUS MATERIAL REFERENCED IN CHAPTER 67 ELECTRONICS

- See Article 67-3
- Artificial Respiration NAVMED P 5002A
- Artificial Respiration NAVMED P 5003
- BUSHIPS Manual NAVSHIPS 250-000 thru Change No. 17 of 1 September 1957
- Bureau of Ships Journal NAVSHIPS 250-200 (Monthly)
- Bureau of Standards Handbooks (Radiological Safety) No. 23-42-48-52
- Detail Specification for Conversion
- Detail Specification for New Ships
- Directory of Communication Electronic Equipment JANAP 161
- Electronics Administration and Supply NAVPERS 10835
- Electronics Information Bulletin EIB NAVSHIPS 900022A (Biweekly)

Electronics Installation Practices Manual NAVSHIPS 900171 (21 Chapters including Change 1 of 9 April 1952 to Chapter 1)
Electronics Maintenance Book (EMB) NAVSHIPS 900000 thru Change 9 of 9 June 1956
Electronics Test Equipment Handbook NAVSHIPS 900155
General Orders (1948) No. 1 thru 20 and Changes No. 1 thru 3
General Specifications for Ships of the U. S. Navy and subsequent amendments thru October 1957
Handbook of Navy Shore Electronics Criteria NAVSHIPS 92675 and Supplement No. 1
Handbook of Test Methods and Practices NAVSHIPS 91828A
Index of Bureau Controlled Electronic Equipment NAVSHIP 92563
Joint Electronics Type Designation System, MIL-STD-196
List of Nomenclature Assigned to Electronic Equipment NAVSHIPS 900123B* dated 1 January 1956
Military Specification Preparation for Delivery of Electronic Equipment; Miscellaneous Electrical Equipment (Except Rotating Electrical Equipment) and Associated Repair Parts, MIL-P-17555D of 15 Feb 1957. (Packaging Packing and Container Marking of Electron Tubes, MIL-P-75 and MIL-STD-129B, Marking for Shipment and Storage)
MIL-M-15562B Matting-Floor-Rubber
Navy Stock List of the Electronic Supply Office
Radiological Safety Regulations NAVMED P 1325 (See above BuStds)
Registered Publications Manual
Reporting of Electronic Equipment Installations NAVSHIPS 900135B and changes Ser 990-81 of 12 June 1956 and Ser 990-1 of 15 March 1957

Security Classification of Electronic Equipment JANAP 140C and Supplement JANAP 140C1. An interim Navy supplement NAVSHIPS 93140 has been prepared covering additions and changes up to May 1957 pending issuance of a new joint publication.
Shipboard Antenna Details NAVSHIPS 900121A
Chapter 1 and Change 1 of 12 April 1956
Chapter 2 and Change 1 of Nov 1954
Chapter 3
Chapter 4
Chapter 5 and Change 3 of 30 April 1955
Chapter 6 and Change 1 of 1 January 1956
Chapter 7
Chapter 8 and Change 3 of May 1957
Shipboard Electronic Equipment Installation Plans NAVSHIPS 900153A thru Supplement No. 23
Shore Electronic Equipment Installation Plans NAVSHIPS 92326 and Supplement No. 1
Standard U. S. Naval Shipyard Regulations BUSHIPS Instruction 5450.14
U. S. Navy Regulation (1948) thru Change No. 7 of 4 June 57
U. S. Navy Safety Precautions OPNAV-34P1 of 8 June 1953 thru Change No. 2 of 1957
U. S. Navy Security Manual

* Manual for Supervisors of Shipbuilding USN and Naval Inspectors of Ordnance at Private Shipyards NAVSHIPS 250-120-1 of 15 Oct 1954 and Changes 1 thru 4 or reprint 1 July 1957 which includes the changes to earlier issue.

CHAPTER 67—ELECTRONICS

SECTION 1. GENERAL

Part 1. Authority and Purpose

67-1. AUTHORITY

This manual is published for the guidance of all persons in the Naval Establishment in accordance with Article 1201, U.S. Navy Regulations, 1948. Instructions contained herein are binding on all persons in the Naval Establishment.

67-2. PURPOSE

The purpose of chapter 67 is to provide the major policies and instructions pertinent to the proper handling of electronic work and electronic material under the cognizance or technical control of the Bureau of Ships. Appropriate Bureau of Ordnance publications provide information and instructions regarding the handling of electronic work and electronic material under the cognizance or technical control of the Bureau of Ordnance.

67-3. SCOPE

1. Chapter 67 is limited to major policies and instructions. Subordinate policies, installation, and maintenance standards, as well as procedures required to implement the policies of chapter 67 will be provided by The Electronics Installation and Maintenance Book (EIMB), (formerly EMB), NAVSHIPS 900,000. Detailed technical instructions, peculiar to the Navy and the equipment installation, maintenance, and operation will be found in the technical manuals (formerly instruction books) which accompany them. Technical information such as that contained in text books and reprints of technical papers or articles will be furnished by the Bureau of Ships or Bureau of Personnel. Familiarity on the part of users of chapter 67 with such *basic* publications as Navy Regulations, General Orders, Standard Shipyard Regulations, United States Navy Security Manual, U.S. Navy Safety Precautions, and other chapters of the Bureau of Ships manual will be generally assumed in the material following.

2. The information contained in the latest revision to *Manuals, Instructions, and Notices* referenced herein apply in all cases. In order to minimize the need for subsequent pen and ink changes throughout the text, the index includes a list of applicable Instructions, Notices, and publications currently in effect at the date of preparation of this chapter. This list will be revised, as necessary, as the semiannual changes to the manual are issued.

67-4. APPLICABILITY TO RESERVE COMPONENTS

Existing directives of the Secretary of the Navy require that the Naval Reserve and Marine Corps Reserve be developed and maintained as integral parts of the Naval Establishment. Further, they require that the various offices and bureaus of the Navy Department actively exercise their cognizant functions with respect to the Naval and Marine Corps Reserves. Such items, services, and equipment as are required by the Naval Reserve and Marine Corps Reserve will be provided by the bureau or office which provides those items for the Regular Navy and Marine Corps, respectively, except as otherwise specifically directed by the Secretary of the Navy. The reserve components must be integrated into the regular establishment so

completely that all agencies of the Department of the Navy will provide for them, in all respects, as they do for the regular components. Hence, both the instructions and the responsibilities set forth in this chapter apply with respect to the Naval and Marine Corps Reserves.

Part 2. Policies and Responsibilities

67-11. POLICY

1. *Maintenance.* To attain the best degree of operational and material readiness, all electronic material under the technical control of the Bureau of Ships must be maintained in a satisfactory operating condition, as well as being capable of rendering its designed performance. This performance must be as is prescribed in the applicable performance standard (POMSEE), or technical manual if the former is not available. In furthering this policy for equipment and systems, the following principles are paramount:

a. Installation, operation, and maintenance standards will be set, keeping in mind the expected level of trained personnel available. Equipment and systems will be designed, evaluated, and installed in order to provide consistent performance within these standards.

b. Maintenance considerations start with the basic design of an electronic piece of equipment and continue at each stage of its life until disposal.

c. Maintenance is performed on equipment at every echelon, starting with the user.

d. Ships must be as self-sufficient as possible.

2. *Alterations.* Alterations to electronic equipments and systems require specific approval of the Bureau of Ships. If accomplished under emergency conditions, where advance authorization is impossible, they must be reported to the Bureau at the earliest practicable time, and authorization requested.

3. *Unauthorized Modifications.* Unauthorized modifications to electronic equipment, or to cabling and wiring which affect existing systems or approved plans, must be reported to the Bureau upon their determination, and appropriate action taken to correct them or to obtain approval for them. Annual inspections and other inspections and tests performed must be carried out with a view to revealing unauthorized modifications and alterations.

4. *Performance, Operational, and Maintenance Standards for Shipboard Electronic Equipment (POMSEE) Program.* The POMSEE Program is the official method by which the Bureau of Ships promulgates performance standards and standardized test procedures, and will serve as the basis for a recommended preventive maintenance program for all shipboard electronic equipment under the technical control of the Bureau of Ships. POMSEE measurements will be accomplished aboard ship by the maintenance activities, as required, even though the ship may not have the required test equipment.

67-12. PROCEDURE

1. Naval shipyards, maintenance authorities, repair facilities, and other activities which may be designated are required to render assistance in the maintenance and repair of electronics equipment to the commanding officers or officers-in-charge of ships and shore activities. This includes, in general, tender/yard maintenance and repair beyond the capacity of the ship or station.

2. The determination of the capacity of a ship or shore activity to perform work is a matter of command responsibility.

3. The maintenance authority or his designated representative shall maintain close cooperation with commanding officers to insure that maintenance and operation of shore electronics activities are efficient and economical and that the standards of operation established by the Chief of Naval Operations are fulfilled. Inspection, tests, maintenance, and new construction which might cause interruption to naval communications or otherwise adversely affect the functioning of the activity shall not be undertaken without the approval of the officer responsible.

67-13. POLICY FOR ENGINEERING ASSISTANCE

1. Normally, the electronics engineering work assigned to or undertaken by the Bureau of Ships field activities shall be accomplished by Navy engineering personnel. However, when necessary to meet the needs of the naval service, the Bureau of Ships will provide additional engineering guidance, material, technical instructions and, where adequately justified and available, the professional services of commercial electronics technical personnel. Basically, these contract personnel are assigned to field activities in order to assist them to a position of self-sufficiency through training.

2. These contract personnel will provide technical information and services in connection with unusual design, planning, installation, and maintenance problems associated with the introduction of new procurement equipments. These personnel will be assigned by the contractor, as directed by the Bureau of Ships, to the maintenance yard, maintenance authority, or fleet command requiring their services. The services of the technical personnel will be coordinated by the command designated by the fleet commander, or by the shipyard or maintenance authority to whom the technical personnel are assigned, and are to be administered by the command to which assigned.

67-14. BUREAU OF SHIPS RESPONSIBILITIES

1. The Bureau of Ships responsibilities for, and technical control of, Bureau of Ships electronic equipment used by the Navy include: research, design, preparation of specifications, development, procurement, manufacture, testing, inspection, distribution, survey, alteration, repair, plant engineering, installation, maintenance, inactivation, preservation, preparation, and distribution of technical instructions pertaining thereto.

2. The Bureau of Ships is, in addition, responsible for:

a. Administration of the Bureau of Ships Electronics Maintenance Engineering Program.

b. Insuring the proper maintenance support for services beyond the capabilities of Forces Afloat.

c. Monitoring, inspection, and control of fleet maintenance of shipboard electronic equipment.

d. Coordination of the Bureau of Ships Electronics Maintenance Program with other agencies of the Navy Department and Department of Defense, in order to insure completeness and consistency.

e. Preparation and promulgation of the Ship Electronics Allowance List, SEAL (Groups S67 and S69 of the ships Revised Individual Allowance List, (RIAL)).

f. Research, development, design, specifications, and tests of electron tubes, electronics components, parts, and materials, except those peculiar to the needs of the Bureau of Ordnance and the Bureau of Aeronautics.

g. Standardization of electronics components and parts.

h. Preparation and promulgation of Electronics Repair Parts Allowance Lists (ERPAL). (Redelegated to Commanding Officer, Electronics Supply Office.)

i. Nomenclature, nameplates, and identification plates for all electronics parts, subassemblies, assemblies, units, groups, sets, systems, and accessories, except those nameplates and identification plates peculiar to the needs of the Bureau of Ordnance and the Bureau of Aeronautics.

j. Management control at its assigned shore activities of installation, maintenance, repair, alteration, and appropriate tests of ordnance electronics equipment, subject to technical control by the Bureau of Ordnance.

k. Procurement of cryptographic equipment (including special tools therefor), alterations authorized by CNO, and maintenance and repair of such equipment. Distribution and property accounting is under CNO cognizance.

1. Coordination within the Department of the Navy and liaison with other departments, offices, and agencies, as appropriate, of the technical and material phases of interference reduction.

3. With respect to Marine Corps electronics equipment, see section III, part 3, beginning of article 67-161.

4. With respect to Military Sea Transportation Service electronics equipment, see section III, part 4, beginning article 67-171.

5. With respect to United States Coast Guard electronics equipment, see section III, part 5, beginning article 67-181.

6. With respect to electronic equipment and support provided under the Military Assistance Program (MAP), see section III, part 6, beginning article 67-191.

7. With respect to training facilities, the Bureau of Ships is responsible for:

a. Providing and installing the necessary electronic equipment under Bureau of Ships cognizance.

b. Making major repairs to such equipment.

c. Insuring that adequate repair parts for the equipment are in the supply system. Financial responsibility for NSA material required from day-to-day operation and upkeep of electronic training equipment is assigned to the Bureau of Naval Personnel.

d. Replacing or reinstalling such equipment when necessary either within or remote from the activity or location at which previously installed. If the transfer, removal, or reinstallation of the equipment concerned is accomplished at the request of, or for the convenience of a Bureau having neither cognizance of the equipment nor responsibility for the training involved, the financial responsibility for the cost so incurred will be that of the requesting bureau or office.

8. *Training.* With respect to training, the Bureau of Ships will include, as a part of the equipment production contract, provisions for:

a. Training at factory, yard, or school for a nucleus of installation, maintenance, and instructor personnel prior

to the first installations of electronics equipments procured in production quantities and for those developmental equipments which are expected to culminate in production contracts.

b. A proposed training course to the Bureau of Naval Personnel, suitable for use in Navy Electronic Schools, on equipments procured in production quantities and for those developmental equipments which are expected to culminate in production contracts.

c. The professional services of commercial electronics technical personnel to assist in the training of military and civilian personnel. (See art. 67-13.)

d. Provide to the Bureau of Naval Personnel an estimate of the number of personnel, by rates, required to operate and maintain the equipment.

9. Advising the Bureau of Naval Personnel when training courses on specific equipments should be initiated or terminated.

10. Advising the Bureau of Naval Personnel, in a timely manner, of requirements for implementing study courses involving new or novel circuits and techniques which are expected to be incorporated in Navy electronics equipment.

67-15. RESPONSIBILITIES OF THE COMMANDANT, MARINE CORPS

The Commandant of the Marine Corps is responsible for the following in connection with Marine Corps electronics equipment:

- a. Determination of requirements and establishment of allowances.
- b. Development, procurement, and maintenance.
- c. Property accounting, distribution, and issue when in Marine Corps supply system. See section III, part 3, beginning article 67-161.

67-16. RESPONSIBILITIES OF SHIPYARD COMMANDERS, INDUSTRIAL MANAGERS, AND MAINTENANCE ACTIVITIES

The responsibilities of shipyard commanders, industrial managers, and maintenance activities include:

- a. Providing technical advice and guidance.
- b. Conducting electronics inspections when requested by type commanders or local shore communications authorities.
- c. Checking and making recommendations when needed on design specifications.
- d. Preparing tests, specifications, checkoff sheets, and inspection procedures.
- e. Developing local quality control procedure required for ready achievement of specified performance standards. Many of the measurements and tests required to insure proper quality control are contained in the Electronic Maintenance Standards, part I.
- f. Developing circuitry or field change recommendations to overcome deficiencies.
- g. Evaluating systems, sets, and circuits.
- h. Introducing new equipment and techniques to personnel of shore and fleet activities.
- i. Conducting and coordinating final systems tests, inspections, and calibrations, as required.
- j. Establishing priorities of electronics work.

k. Conducting work-in-progress inspections, as required.

l. Conducting final inspections, as required.

m. Operating systems and analyzing deficiencies.

n. Insuring compliance with applicable technical directives and specifications.

o. Providing maintenance instruction on newly installed electronic equipments and systems to technical personnel.

p. Exercising (except at activities under the management control of the Marine Corps) the same supervision over all electronic material matters pertaining to electronic equipment used by police, fire, and industrial departments of the Naval Establishment, for internal security, and other purposes as for other Navy electronic equipment.

q. Render assistance, on request, in the maintenance and repair of electronics equipment to the commanding officers or officers-in-charge of ships or shore activities. This includes tender/yard maintenance and repair beyond the capacity of the ship or station.

67-17. RESPONSIBILITIES OF SUPERVISORS OF SHIPBUILDING, USN, AND NAVAL INSPECTORS OF ORDNANCE

The responsibility of Supervisors of Shipbuilding include:

- a. Providing technical advice and guidance.
- b. Conducting electronics inspections when requested by Board of Inspection and Survey.
- c. Checking and making recommendations, when needed, on design specifications.
- d. Reviewing test memoranda, checkoff sheets and inspection procedures prepared by commercial shipbuilders.
- e. Developing local quality control procedures required for ready achievement of specified performance standards. Many of the tests required to insure proper quality control are contained in the Electronic Maintenance Standards, part I, beginning article 67-54.
- f. Conducting and coordinating final systems tests, inspections, and calibrations, as required.
- g. Conducting work-in-progress inspections, as required.
- h. Conducting final inspections, as required.
- i. Insuring compliance with applicable technical directives and specifications. (See manual for Supervisors of Shipbuilding and Naval Inspectors of Ordnance at private shipyards, NAVSHIPS 250-120-1.)

67-18. RESPONSIBILITY OF FORCES AFLOAT

Forces afloat are responsible for:

- a. Operational maintenance.
- b. Technical maintenance.
- c. The tender portion of tender/yard maintenance.
- d. Preventive maintenance.
- e. Repair within their capacity.

67-19. RESPONSIBILITY OF COMMANDING OFFICERS

The commanding officer or officer-in-charge of a ship or shore activity is, in accordance with Navy Regulations, responsible for the proper operation, care, and maintenance of electronic equipment assigned in accordance with existing instructions. When work beyond the capacity of the ship or

activity is required, the commanding officer or officer-in-charge is responsible for initiating the necessary work request to the cognizant tender/yard maintenance or repair activity, or maintenance authority.

67-20. RESPONSIBILITIES OF RATINGS

With respect to operational use and maintenance of electronics equipment, responsibilities have been assigned to rating types as follows:*

a. *Operational Ratings.* Operational use, manipulation, and operational maintenance of electronic equipment associated with the technical specialties of the ratings and such portions of preventive maintenance as do not require realignment after accomplishment.

b. *Technical Ratings.* Manipulation, technical and tender/yard maintenance, repair of electronic equipment, and preventive maintenance which requires realignment after accomplishment.

*See OPNAVINST 10380.1

67-21. TECHNICAL CONTROL (SHORE)

1. The Bureau of Ships exercises technical control of design, development, procurement, installation planning, and installation and inspection of electronic equipment used ashore. It establishes maintenance, repair, and overhaul policies. Control is exercised through the cognizant maintenance authorities.

2. Technical control of communication matters, such as methods, procedures, military characteristics, and operational requirements is exercised by the Chief of Naval Operations (DNC).

3. Technical control of communication equipment and material other than airborne is exercised by the Bureau of Ships.

4. Technical control of airborne communication equipment and material is exercised by the Bureau of Aeronautics.

5. Technical control of the public works aspects of communication installations is exercised by the Bureau of Yards and Docks.

6. Technical control of ordnance electronics equipment is exercised by the Bureau of Ordnance.

67-22. DESIGNATION OF MAINTENANCE AUTHORITIES (SHORE)

<i>District or Area</i>	<i>Maintenance Authority</i>
First	Industrial Manager, USN, First Naval District
Third	Industrial Manager, USN, Third Naval District
Fourth	Industrial Manager, USN, Fourth Naval District
Fifth	Industrial Manager, USN, Fifth Naval District
Sixth	Industrial Manager, USN, Sixth Naval District
Eighth	Industrial Manager, USN, Eighth Naval District
Ninth	Industrial Manager, USN, Ninth Naval District

Tenth	Industrial Manager, USN, Tenth Naval District
Eleventh	Resident Industrial Manager, USN, Naval Station, San Diego. INDMAN 11th ND has delegated responsibility for all Shore electronic functions in the 11th ND, except the Long Beach Naval Shipyard and policy effecting district wide electronic procedures, to the Resident Industrial Manager, USN, Naval Station, San Diego.
Twelfth	Industrial Manager, USN, Twelfth Naval District
Thirteenth	Assistant Industrial Manager, USN, Seattle, Washington (The Industrial Manager Thirteenth Naval District has delegated responsibility for all shore electronic functions in the Thirteenth Naval District to the Assistant Industrial Manager, Seattle.)
Fourteenth	Industrial Manager, USN, Fourteenth Naval District
Fifteenth	Industrial Manager, USN, Fifteenth Naval District
Seventeenth	Industrial Manager, USN, Seventeenth Naval District
PRNC and SRNC	SUPT U.S. Naval Gun Factory, Washington, D. C.
*COMNAVMAR- IANAS	Commanding Officer, U.S. Naval Ship Repair Facility, Guam
*COMNAVPHIL	Commanding Officer, U.S. Naval Ship Repair Facility, Subic Bay
*COMNAVFE	Commanding Officer, U.S. Naval Ship Repair Facility, Yokosuka
Atlantic Ocean Area	Industrial Manager, USN, 6th Naval District
CINCNELM	Industrial Manager, USN, Third Naval District

*Projects of an extensive nature which are beyond the capabilities of local facilities should be referred to the Commander Service Force, Pacific Fleet. Upon request for assistance, the Bureau of Ships will make a task assignment to the Industrial Manager, 14th Naval District for such specific projects.

Part 3. Definitions

67-31. GENERAL

NOTE: Definitions preceded by an asterisk have been approved by competent authority for joint service use.

1. **Electronics* is the science and technology which is concerned with devices involving the emission, behavior, and effect of electrons in vacuums, gases, and semiconductors. Technically, electronics is a broad term extending into divergent fields of endeavor. To delineate, it is necessary to define the scope covered by electronics in terms of "electronics equipment."

2. **Electronic Material*; from a military point of view generally includes those electronic devices employed in the field of detection and tracking (underwater, sea, land, and air), recognition and identification, communication, aids to navigation, weapon control, and electronic countermeasures. In every case, electronic devices are understood to include the nonelectronic components required to complete their individual operational efficiency, such as power supplies, hoist mechanisms, antennas, etc., but to exclude associated nonelectronic equipment in certain overall systems.

3. *Ships electronics* includes, but is not necessarily limited to, the following categories: radio, radar, sonar, teletype, facsimile, industrial, radiac, invisible light (infrared and ultraviolet), television, IFF, telemeter systems, direction finders, electronic countermeasure systems, and electronic test equipment when on shipboard.

4. *Shore electronics* includes all electronics equipment and ancillary equipment for use ashore.

5. *Command*. See General Order 19.

6. *Management Control*. See General Order 19.

7. *Technical Control*. See General Order 19 and U. S. Navy Regulations, 1948; chapter 4.

8. *Maintenance Authority* is an Industrial Manager, or other shore command suitably equipped and manned, to whom the Bureau of Ships delegated technical control over shore electronic installations. The Maintenance Authority exercises this control with respect to electronic equipment and those environmental factors which affect its operational characteristics.

9. *Interference* is an electromagnetic disturbance which causes undesirable response or malfunctioning of electronics equipment.

67-32. SYSTEMS

1. 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, antiaircraft defense system, telephone carrier system, GCA electronic system, fire control system, including the tracking radar, computer, and gun mount.)

2. A *Naval Weapon System* encompasses the weapon or weapons and the equipment employed to bring the destructive power of the weapon against the enemy. The system, for proper application, requires detection, location, identification of a target, and delivery and control of the destructive units (weapon).

3. *Air Surface Electronic Systems* consist of airborne and surface (ships or ground) electronic equipment which must be complementary and interdependent for performance of an overall function; viz, IFF, AEW.

4. *Ship-Shore Electronic Systems* consist of shipborne and shore installed electronics equipment which must be complementary and interdependent for performance of an overall function; viz, loran.

5. *Transmission System* for radio frequency power cover all methods of transferring energy from the generating component to the radiating elements.

6. A *Central* is a grouping of sets, with or without other major units, which are operated conjunctively in the same location for a common tactical purpose. It may provide

facilities for controlling, switching, and monitoring electronic and electrical equipment and/or systems.

7. An *advanced base functional component* is a grouping of personnel and/or material designed and assembled to perform one or more of the specific tasks of an advanced base.

67-33. EQUIPMENT

1. *Bureau of Ships electronic equipment* is that which has been placed under the cognizance of the Bureau of Ships by competent authority. At present, it generally includes equipment used in the fields of detection and tracking, recognition and identification, aids to navigation, communications electronics and electronics countermeasures thereto. This includes test and measuring equipment. For further details see JANAP 140 ().

2. *Ordnance electronic equipment* is that which forms an integral part of, or is essential to the operation of ordnance equipment, and has been placed under the cognizance of the Bureau of Ordnance by competent authority. At present, it includes generally, but is not limited to, fire control radar, some target indication systems, influence fuses, sonar devices included in ordnance equipments, etc. See also JANAP 140 ().

3. *Airborne electronic equipment*. Electronic equipment as defined above, designed to be fitted or carried in aircraft.

4. *Aircraft electronic equipment*. Airborne electronic equipment, as defined above, together with additional equipments or accessories specifically required for the installation or maintenance thereof.

67-34. MODELS OF EQUIPMENT

1. *Breadboard model*. An assembly of preliminary circuits and parts to prove the feasibility of a device, circuits, equipment, system, or principle in rough or breadboard form, without regard to the eventual overall design or form of parts.

2. *Experimental Model*. A model of the complete equipment to demonstrate the technical soundness of the basic idea. This model need not have the required final form or necessarily contain parts of final design.

3. *Development Model*. A model designed to meet performance requirements of the specification or establish technical requirements for production equipment. This model need not have the required final form or necessarily contain parts of final design. It may be used to demonstrate the reproducibility of the equipment.

4. *Service Test Model*. A model to be used for test under service conditions for evaluation of suitability and performance. It must closely approximate the final design, have the required form, and employ approved parts or their interchangeable equivalents.

5. *Prototype (Preproduction) Model*. A model suitable for complete evaluation of mechanical and electrical form, design, and performance. It must be of final mechanical and electrical form, employ approved parts, and be completely representative of final equipment.

6. *Production Model*. A model in its final mechanical and electrical form of final production design, made by production tools, jigs, fixtures, and methods.

67-35. UNITS OF EQUIPMENT

1. *Set*. A unit or units and necessary assemblies, sub-assemblies and parts connected or associated together to perform an operational function. ("Set" is also used to denote a collection of like parts such as a "tool set" or a "set" of tires.) (Examples: radio receiving set; sound measuring set, which includes such parts, assemblies, and units as cable, microphone and measuring instruments; radar homing set.)

2. *Group*. A collection of units, assemblies, or sub-assemblies, which is a subdivision of a set or system, but which is not capable of performing a complete operational function. (Examples: antenna group, indicator group.) (A group may be a subdivision of a complete electronic set, may be designed to be added to or used in conjunction with an electronic set to extend its function(s), or add additional facilities to the electronic set. A group does not include one or more electronic sets.)

3. *Unit*. An assembly or any combination of parts, sub-assemblies, and assemblies mounted together, normally capable of independent operation in a variety of situations. (Examples: electric motor, electronic power supply, internal combustion engine, electric generator, radio receiver.) **Note:** The size of an item is a consideration in some cases. An electric motor for a clock may be considered as a part inasmuch as it is not normally subject to disassembly.

4. *Accessory*. A part, subassembly, or assembly designed for use in conjunction with or to supplement another assembly, unit, or set, contributing to the effectiveness thereof without extending or varying the basic function of the assembly or set. An accessory may be used for testing, adjusting or calibrating purposes. (Examples: test instrument, recording camera for radar set, headphones, emergency power supply.)

5. **Subassembly*. Two or more parts which form a portion of an assembly or a unit, replaceable as a whole, but having a part or parts which are individually replaceable (i.e., IF strip, terminal board with mounted parts).

6. **Assembly*. A number of parts, subassemblies, or any combinations, thereof, joined together to perform a specific function (i.e., audio-frequency amplifier).

***NOTE:** The distinction between an assembly and a sub-assembly is not always exact; an assembly in one instance may be a subassembly in another where it forms a portion of an assembly.

7. *Part*. One piece, or two or more pieces joined together which are not normally subject to disassembly without destruction of designed use. (Examples: electron tube, composition resistor, screw, gear, mica capacitor, audio transformer.)

8. *Repair Part*. A part which may be required for repair or maintenance purposes during the life of the set(s) or major units with which used. The term "repair part" will apply in lieu of all previous designations such as spare part, replacement part, maintenance part, or maintenance repair part.

9. *Part Common*. A part common is an item listed in the Electronic Supply Office publication, "Common Electric Parts in the Electronic Supply System."

10. *Part Peculiar*. A part peculiar is a part designed specifically for a particular set. It is distinguished by its

basic identification of where it fits and its uniqueness. Such parts are primarily designed for use in only one set and are generally obtained from the manufacturer of the basic set into which the part fits. A part peculiar may eventually become a part common through usage.

11. *Equipment Repair Parts Set*. This designation, formally repair parts kit, covers three types:

a. Type 1. Equipment repair part sets. Boxed sets of parts peculiar for either permanently installed or portable equipment which is normally supported by an Electronic Repair Parts Allowance List (ERPAL).

b. Type 2. Equipment repair sets for support of mobile type equipment.

c. Type 3. Equipment repair parts sets for support of experimental type equipment.

See ESO Instruction 4410.45 for further details.

12. *Stock Repair Parts (Formerly Stock Spares or Bulk Spares)*. Stock repair parts consist of those repair parts peculiar and common, assemblies, accessories, and complete sets which are furnished in bulk, to the supply system for allowances, load lists and system stocks.

67-36. FUNCTIONAL CLASSIFICATION OF EQUIPMENT

1. *Standard (STD)*. Classification denoting the most advanced and satisfactory equipment approved for service use. These are preferred for procurement.

2. *Substitute Standard (SUB STD)*. Classification denoting that equipment approved for service use which do not have as satisfactory military characteristics as standard equipment, but which when necessary, may be procured to supplement the supply of standard equipment.

3. *Limited Standard (LTD STD)*. Classification denoting that equipment approved for service use which do not have satisfactory military characteristics as standard or substitute standard equipment, but which are usable substitutes. Complete major units will not be procured, but component parts, accessories, and complementary articles, even though they too may be limited standard equipment, may be procured if necessary and economical, to maintain complete major units in serviceable condition throughout a reasonable life expectancy.

4. *Obsolescent (O)*. Classification denoting those equipment which no longer have satisfactory military characteristics but which must be continued in service pending availability of improved replacements. Complete units, component parts, accessories, and complementary articles will normally *not* be procured for the specific purpose of maintaining this equipment. Spare parts common to other equipment in the supply establishment may be used, however, for their maintenance.

5. *Obsolete (OBS)*. Classification denoting those equipment which has been declared unsuitable for their original military purpose. Disposal of stocks of obsolete equipment will, in all cases, be expedited.

6. *Planned Standard (PLN STD)*. Classification denoting those equipment under evaluation or consideration. Approval for service use and clarification is required for equipment in this category prior to installation.

67-37. INSTALLATION

1. *Type installation*. An installation common to a specific type ship.

2. *Typical Installation.* An installation representing the essential characteristics of a type installation, except that it is not necessarily associated with a specific type of ship.

3. *Trial installation.* Installation for trial purposes for such periods as may be required to determine usefulness and adaptability of the installation prior to acceptance and more general application.

4. *Test installation.* Installation for purpose of determining performance and other specification requirements of the equipment under test.

5. *Developmental installation.* Installation of a model to determine potential value, or to explore possibilities and obtain data for further development.

67-38. ALTERATIONS

1. *Alterations.* An alteration is any change in hull, machinery, fittings, or equipment which involves changes in design, materials, number, location, or relationship of the component parts of an assembly or system, regardless of whether undertaken separately or in conjunction with repairs.

2. *Alteration equivalent to a repair.* An alteration may be so designated if it meets one or more of the following conditions:

a. The substitution without other change in design of different materials which have previously been approved by the Bureau for similar use and which are available from standard stock.

b. The replacement of worn out or damaged parts requiring renewal by those of later and more efficient design, and previously approved by the Bureau.

c. The strengthening of parts which require repair or replacement in order to improve reliability, provided no other change in design is involved.

d. Minor modifications involving no significant changes in design or functioning of equipment, but considered essential to prevent recurrence of unsatisfactory conditions.

3. *Field change* is any modification or alteration made to an electronic equipment subsequent to delivery to the Government and authorized by the Bureau or agency concerned.

67-39. MAINTENANCE

Maintenance is the function of retaining material in, or restoring it to, a serviceable condition. Its phases include servicing, repair, modification, modernization, overhaul, rebuild, test, reclamation, inspection, condition determination and the providing of support items. (See Art. 67-39.g) This is accomplished under several main categories:

a. **Operational Maintenance* consists normally of inspection, cleaning, servicing, preservation, lubrication, and adjustment as required, and may also consist of minor parts replacement not requiring high technical skill or internal alignment.

b. **Technical Maintenance* will normally be limited to maintenance consisting of replacement of unserviceable parts, subassemblies, or assemblies and the alignment, testing, and adjustment (internal) of equipment. (This work in general requires skill and detailed knowledge of equipment.)

c. **Tender/Yard Maintenance* is maintenance which requires a major overhaul or complete rebuild of parts, sub-assemblies, or the end items, as required.

d. *Preventive Maintenance* is the systematic accomplishment of items deemed necessary to reduce or eliminate failures, and prolong the useful life of the equipment. (These items are more specifically defined and outlined by the technical manual furnished with each equipment. This work, in general, requires skill and detailed knowledge of the equipment.)

e. *Repair* is the correction of damage incurred through long use, accident, or other causes.

f. *Shore Maintenance Support* consists of shore based repair, evaluation, installation and maintenance design, overhaul, test, and calibration facilities to support fleet maintenance of electronics equipment.

g. *Providing of support items* consists basically of two processes; First, provisioning of repair parts to support an end item at the time of procurement, and second, providing these repair parts to the ships and other consumer activities. Provisioning is the process of determining, during the procurement cycle, the range and quality of items required to support and maintain a given end item of material for a specified period of service, and provides for the procurement of repair parts either as part of the end item contract or by direct procurement from the vendor by a supply demand control point. Phases of provisioning include the identification of the items of supply, establishment of data for catalogs, technical manuals and allowance list, and the preparation of instructions to assure delivery of the necessary support items with relayed end articles. Material is supplied to the using activity by means of an ERPAL. (See ARTS. 67-101.4) for ships ERPALS and 67-102.3 for shore ERPALS.) The parts peculiar to fill the ERPAL's are normally provided by means of repair parts kits shipped with the end item while the parts common are provided from system stocks. CNO considers that all items on the allowance list are essential to the readiness of ships to fulfill their designed and contingent tasks. Such material, therefore, should be on board.

h. *Maintenance Engineering* is the function of providing policy guidance for maintenance activities, and exercising technical and management review of maintenance programs.

i. *Class A maintenance (rebuild) (restoration)* is the act of overhauling, repairing, modifying (field changing) and/or restoring a specific electronic equipment, group, unit assembly, or subassembly so as to place it in a condition such that it meets its most recent equipment design and technical specification and is essentially as good as new in physical appearance.

j. *Class B maintenance (overhaul)* is the act of repairing and/or modifying (field changing) a specified equipment, group, unit, assembly, or subassembly such as to restore its operating characteristics to the extent required to meet its most recent design and technical specification.

NOTE: The definitions used in article 67-39, marked with an asterisk (), have been approved by competent authority for interservice use. However, in the degrees of maintenance, the joint terms used are (1) organizational for operational, (2) field for technical, and (3) depot for tender/yard.

k. *Class C maintenance* is the act of repairing a specific equipment, group unit, assembly or subassembly to correct on board a ship those deficiencies specified by a particular job order or work request.

67-40. STANDARDS

1. *Maintenance standards* are published by the Bureau of Ships and contain instructions and requirements setting forth the features, procedures, methods, and techniques applicable to the servicing, repair, modification, modernization, overhaul, rebuild, test, reclamation, and condition determination of electronic equipment.

2. *An Equipment maintenance standard* is a document which provides standard reference measurements and procedures in graphically illustrated steps, together with a preventive maintenance checkoff list based on these measurements and procedure.

3. *Performance standards* are published by the Bureau of Ships and contain instructions and requirements setting forth the procedures, methods, and techniques for measuring the designed performance of electronic equipments or systems in terms of the minimum number of essential technical measurements required for a specific operational capability.

4. *A Performance standard sheet* is a sheet containing the operational capability for a type of electronic equipment, together with the essential technical measurements indicative of satisfactory performance.

5. *Installation Standards* are published instructions and requirements setting forth the features, procedures, methods, and techniques applicable to the installation of electronic equipment which provide the maximum performance and maintenance capabilities for a given installation.

6. *Operational Standards* are published instructions and requirements setting forth the procedures, methods, and techniques for operating electronic equipment in such a way as to provide the maximum performance from that equipment.

67-41. MANIPULATION

Manipulation is the manual process involved in starting, stopping, calibrating, turning, and the general handling of the equipment's external controls for the purpose of extracting usable data from the equipment. External controls include adjusting mechanisms which can be reached or used without breaking the seal in hermetically sealed equipment, or without using special shorting devices, such as "Battle Short Switch."

67-42. TESTING

Examination and adjustment until established performance standards are met. Testing normally involves the use of instruments and test equipment.

67-43. INSPECTION

Critical examination for comparison with approved standards. This may include testing.

Part 4. Publications and Their Handling

67-51. PROCUREMENT

All requests for technical manuals for electronic equipment and other NAVSHIPS publications must be made to the

appropriate Forms and Publications Supply (FPS) Distribution Point. All items are assigned stock point indicators called "fraction codes." Items of high quantity and universal demand are assigned fraction code "F" and will be stocked at all FPS distribution points. Items of restricted demand are assigned fraction code "C" and will be stocked and issued only at the distribution carrying points, NSC Norfolk and NSC Oakland. The Stock List issued to all Ships and Stations by the Forms and Publications Supply Division of the Bureau of Supplies and Accounts indicates the fraction code assigned to each stocked publication. Fleet units and shore activities west of the Mississippi, except those in the EIGHTH and NINTH Naval Districts, will submit requisitions for fraction code "C" items to NSC, Oakland; while those east of the Mississippi, and all those in the EIGHTH and NINTH Naval Districts will submit their requisitions for fraction code "C" items to NSC, Norfolk. All publications, whether identified as fraction code "F" or "C," required for Marine Corps use shall be requisitioned only from NSC, Oakland or NSC, Norfolk. Separate requisitions are required for each bureau or office, of each fraction code. Navy fleet units, shore activities, and Marine Corps activities shall use DD Form 1149. Requests in excess of allowance will not be approved except in cases where the requesting activity expects to install the equipment in the near future, or submits other adequate justification for the request. Requests for technical manuals shall state the reason why they are required. Manuals for instruction and study purposes can be issued only to Naval and Marine Corps schools, and then in quantities consistent with the stock of books available.

67-52. CORRECTION AND REVISION

1. It is mandatory that all users of electronics equipment maintain the associated technical manuals and other publications correct and up-to-date. Currency and correctness of publications will be an item on all periodic inspections.

2. Notice of corrections, changes, and issuance of final or revised versions will be included in the Electronics Information Bulletin (EIB). These notices shall be meticulously reviewed upon receipt of each issue, and prompt action taken to obtain the latest information.

3. When field changes are accomplished on equipment, associated technical manuals shall be simultaneously revised as provided for in the field change bulletin.

67-53. TECHNICAL MANUALS

1. Initial distribution of equipment technical manuals is made part of the equipment procurement contract. Normally, two copies are packed with each new equipment. Additional distribution includes installation, maintenance, operational and logistic support activities, and the publications stock points. Whenever technical manuals are not received with new equipment, report of incomplete shipment should promptly be made to the shipping activity, copy to the Bureau of Ships and action be taken to obtain required publications from stock. (See Art. 67-51.)

2. Ships or stations are allowed, and shall maintain up-to-date, an inventory of one technical manual per equipment; up to a maximum of five identical manuals. Departures from this allowance may be authorized by the Bureau of Ships

when required for proper installation, operation, or maintenance of the equipment.

3. Copies in excess of needs shall be turned in to the nearest Forms and Publications Supply Distribution Point.

4. Advance preliminary manuscript, or temporary technical manuals may be furnished where a delay in completing final technical manuals is anticipated. Such publications shall be destroyed upon receipt of final editions. If classified, disposal shall be in accordance with existing Navy regulations covering destruction of classified material. The instructions accompanying changes to technical manuals will also indicate the desired disposition of superseded technical manuals material.

67-54. OTHER EQUIPMENT BOOKS

In addition to the technical manuals, other publications associated with particular equipments are issued in some cases. These include:

a. *Performance Standard Sheets (POMSEE)* provide the operational and technical data indicative of the minimum acceptable level of performance for electronic equipment. Distribution will be directly to the ships concerned and to cognizant maintenance support activities. The short title number for each sheet will consist of the NAVSHIPS number of the basic technical manual, plus the decimal number ".32" (i.e. 9xxx.32). A binder titled, "Electronics Equipment Performance Standard Sheets (NAVSHIPS 93000)," for incorporating all sheets under one cover, will be distributed to all ships and cognizant maintenance activities. Additional copies of these binders may be obtained from the nearest Forms and Publication Supply Distribution Point.

b. *Maintenance Standards Books (POMSEE)* are furnished to provide standard methods for determining measurements affecting the performance of a specific equipment, space to record such measurements, and a preventive maintenance schedule for the equipment. For equipment under new procurement (after 1 January 1957), one copy of the approved manuscript of the book is packed with each equipment and an advance distribution made to cognizant maintenance activities. For older equipments, distribution of books will be directed to the ships concerned and to cognizant maintenance activities. Final books or changes are published after evaluation of the summary sheets provided in each book. Accordingly, copies of these summary sheets shall be forwarded to the Bureau of Ships as soon as the maintenance standards have been established for an equipment. The short title number for each book will consist of the NAVSHIPS number of the basic technical manual, plus the decimal number ".42" (i.e. 9xxx.42). Information regarding the availability of these books is published in the Electronics Information Bulletin (EIB). (Maintenance Standards Books were formerly issued as two separate publications, Performance Standard Books (NAVSHIPS 9xxx.31), and Maintenance Checkoff Books (NAVSHIPS 9xxx.41). However, the title of the Performance Standard Books has been officially changed to Maintenance Standards Part I, Test Procedures and Maintenance References; and the title of the Maintenance Check-Off Books has been changed to Maintenance Standards Part II, Preventive Maintenance Checkoff.)

c. *Operating Instruction Charts* provide a summary of the procedures to be followed in starting, operating, and

stopping the equipment. A chart is provided for each operating position. One set of charts is to be shipped with each equipment procured after 1 January 1957.

67-55. INSTALLATION AND MAINTENANCE MANUALS

The publications listed below provide much general and specific material helpful to all personnel engaged in the installation and maintenance of electronics equipment. Each may be obtained by activities having a definite need for the material from the appropriate publications stock point.

a. *The Electronics Installation and Maintenance Book (EIMB)*, (Formerly EMB), NAVSHIPS 900,000.

This book provides subordinate policies, installation, maintenance standards, and procedures required to implement the policies of Chapter 67. EIMB also provides general information for handling electronics matter and material. For convenience, the EIMB consists of several volumes, covering each major electronics field.

b. *The Electronics Information Bulletin (EIB)*, NAVSHIPS 900,022A, is a biweekly authoritative publication containing advance information on field changes, installation techniques, maintenance notes, beneficial suggestions, and technical manual distribution. The EIB is widely distributed to the forces afloat and ashore in a form suitable for binding. Copies should be reviewed by interested parties and be filed in a notebook or folder by consecutive numbers.

c. *Handbook of Test Methods and Practices*, NAVSHIPS 91828A, gives all personnel concerned with the maintenance of electronic equipment, a convenient, concise reference on the applications of test equipment to electronic equipment. It discusses the various types of test equipment, their basic uses, the selection of a suitable equipment for a given test, how to make various tests and the interpretation of test results. It is designed to bridge the gap between individual test equipment technical manuals and prime electronic equipment technical manuals. Publication will be discontinued when material is incorporated in the Electronics Installation and Maintenance Book.

d. *The Electronic Installation Practices Manual (EIPM)*, NAVSHIPS 900,171, is for use of the electronic installation worker and serves as a source of information on desired or standard methods of making electronic installations. The subject matter in this manual is supplementary to, but does not supersede, existing applicable specifications.

e. *Shipboard Electronic Equipment Installation Plans*, NAVSHIPS 900,153() and *Shore Electronic Equipment Installation Plans*, NAVSHIPS 92326.

These are loose leaf publications containing plans for use by electronics installation planners. Plans are issued in reduced form for this publication as they become available in the Bureau. The plans contain engineering information such as outline and mounting information, external cabling data, and other data necessary to installation activities.

f. *Shipboard Antenna Details*, NAVSHIPS 900,121(), serves as a source of information for those concerned with installing and maintaining ship antennas. Information in this manual supplements, but does not supersede, existing specifications.

g. *Handbook of Navy Shore Electronics Criteria, NAVSHIPS 92675* furnishes a comprehensive guide to procedures, practices, and criteria for all those concerned with planning, installing, operating, and maintaining shore electronics facilities.

h. *BUDOCKS Publications* contain information of value to those engaged in planning electronics shore facilities. Examples of Bureau of Yards and Docks publications are:

- TP-PW-17 Training Facilities
- TP-PW-20 Communication Facilities
- TP-PW-25 Air Stations
- Facilities Planning Standards Booklet (Communication Facilities) (In Preparation)

i. *BUPERS Publications* contain information of value to all engaged in the administration of electronics work. The general manual is NAVPERS 10835, "Electronics, Administration and Supply."

67-56. CATALOGS AND LISTS

The Federal Cataloging program provides for the establishment within the Department of Defense of a single cataloging system. This system provides for a common supply language under which the same description and stock number will be used by all services to identify any one item of supply. It also provides that only one Federal Supply Catalog shall be published and maintained. The distribution of this catalog, which is published in card form, is strictly limited. Therefore, Navy Stock Lists have been published to provide the information needed for the logistics support of each type of material in current use. The following publications contain information of interest to personnel engaged in electronic work:

a. *Preliminary Data on Shipboard Electronic Equipment.* This is a confidential booklet containing preliminary data on new equipments for which catalog sheets have not been issued for inclusion in the Navy Stock List of the Electronic Supply Office Equipment Section. The preliminary information furnished on the separate NAVSHIPS 4457 forms is issued shortly after nomenclature, for an equipment, is assigned. Each equipment sheet is revised as additional data becomes available until the catalog sheets for the Navy Stock List of the Electronic Supply Office Equipment Section are issued at which time the Preliminary Data Sheet will be cancelled. Although the information contained on these sheets is strictly preliminary and subject to change, it has proven valuable as a source of advance details. Distribution for this publication will in general, be limited to shore activities and fleet commands.

b. *The Navy Stock List of the Electronic Supply Office Parts, Descriptive Section* (formerly part II of the Bureau of Ships Catalog of Naval Material) contains complete electrical and physical characteristic descriptions of those electronic parts for which the Electronic Supply Office has Navy-wide support responsibility, and for which a high degree of substitution potential exists. Applicable federal stock number, JAN/MIL type designations, and manufacturers' and contractors' reference numbers are associated with the descriptions.

c. *The Electronic Test Equipment Handbook, NAVSHIPS 900,155*, provides technical descriptions of Army, Navy, Air Force, and commercial test equipment. It is a

confidential publication, primarily for use of personnel at planning levels. The confidential volume on military test equipment will be cancelled when this information is included in the Navy Stock List of the Electronic Supply Office Equipment Section.

d. *The Catalog of Navy Type Electronic Material, NAVSHIPS 900,109(A)* is an eight-volume, loose-leaf, confidential publication. It includes complete descriptions of electronic material to which Navy type numbers have been assigned. It contains equivalent JAN designations, Electronic Supply Office stock numbers, Aviation Supply Office stock numbers, standard Navy stock numbers, Signal Corps stock numbers, manufacturers' and contractors' numbers, equipment in which items are used, and the quantity per set. Although the complete publication is classified confidential only volume 8, which covers major units, contains confidential material. Although this publication has been superseded by the Navy Stock List of the Electronic Supply Office, Parts, Descriptive Section, as far as new items are concerned, a copy of this publication should be retained by activities who have need for information concerning items identified by Navy type numbers.

e. *The Navy Stock List of the Electronic Supply Office, Electronic Equipment Section* (formerly part III of the Bureau of Ships Catalog of Navy Material), is a definitive catalog of information covering all electronic equipment produced by, or for, the Bureau of Ships. This publication contains technical descriptions of those Bureau of Ships controlled equipments for which the Electronic Supply Office has program support. This publication supersedes the Catalog of Electronic Equipment, NAVSHIPS 900,116; Catalog of Electronic Test Equipment, NAVSHIPS 900,105; and the Catalog of Radiac Equipment, NAVSHIPS 900,141. Distribution is limited to activities responsible for planning.

f. *The Index of Bureau Controlled Electronic Equipment, NAVSHIPS 92563*, (formerly NAVSHIPS 4460) is a listing of electronic material which is under the Inventory Control of the Bureau of Ships (F cognizance). The listing includes stock number, nomenclature, noun name, special requisitioning instructions, cognizant Bureau of Ships Code and standard price of each item.

g. *List of Nomenclature Assigned to Naval Electronic Equipment, NAVSHIPS 900,123B*, is a confidential publication containing descriptive data on all electronic equipments to which Navy model letter and "AN" designations (Navy developed only) have been assigned. This publication has been superseded by the Navy Stock List of the Electronic Supply Office Descriptive Section and will not be re-issued. A copy of NAVSHIPS 900,123B should be retained by those activities having a need for descriptive data on older equipments.

h. *The Security Classification of Electronic Equipment JANAP 140 ()* is a confidential-modified-handling authorized publication covering the security classifications of government identified electronic equipments of the military services arranged in alphabetical and numerical order by type or model designation. In addition, there is included indication of the service responsible for the nomenclature. The security classifications listed apply also to other elements of security associated with the equipments as outlined in the introduction. See also JANAP 140 in index and

reference to supplements JANAP 140 C 1 and NAVSHIPS 93140.

i. *Master Cross Reference List (MCRL)*, formerly *Master Cross Index*, is an unclassified publication which provides the most recent reference number to stock number and stock number to reference number. The MCRL supplements other electronic stock lists.

j. *Navy Stock list of the Electronic Supply Office, Major Units Section*, formerly Part IIIA of the Bureau of Ships Catalog of Navy Material, contains descriptions of those major units which are purchased as an item of supply by, or for, the Bureau of Ships. Distribution is normally limited to the same activities who receive the Navy Stock List of the Electronic Supply Office Electronic Equipment Section.

k. *Stock Number Identification Tables (SNIT Lists)* is a publication which lists in reference designation sequence, all repair parts used in an equipment. Federal stock numbers are applied for items of supply and appropriate support data for all other items.

67-57. REFERENCE TO OTHER CHAPTERS OF THIS MANUAL

1. In addition to the information contained in Chapter 67, the following chapters of this Manual should be of interest to electronics personnel:

- Chapter 1—Introduction.
- Chapter 2—Publications and Plans.
- Chapter 3—Administration of Funds.
- Chapter 4—Allowances, Surveys, and Requests for Material.
- Chapter 6—Inspection, Records, and Reports.
- Chapter 8—Trials.
- Chapter 9—Readiness and Care of Vessels in Inactive Status.
- Chapter 14—Deck Coverings.
- Chapter 15—Gasoline Stowage and Equipment.
- Chapter 18—Rigging.
- Chapter 19—Painting Ships in Service.
- Chapter 21—(Section VI) Hydraulic Systems.
- Chapter 29—Weights, Stability, and Integrity (Seaworthiness).
- Chapter 31—Repair Parts.
- Chapter 38—Ventilation and Heating.
- Chapter 40—Tables of Technical Data.
- Chapter 45—Lubricants and Lubrication System.
- Chapter 60—Electric Plant - General.
- Chapter 61—Electric Generators and Voltage Regulators.
- Chapter 62—Electric Power Distribution.
 - Section I—Distribution Systems.
 - Section II—Portable Storage Batteries and Dry Batteries.
- Chapter 63—Electric Motors and Controllers.
- Chapter 64—Lighting.
- Chapter 65—Interior Communication Installations.
- Chapter 69—Electrical Measuring and Test Instruments.
- Chapter 88—Damage Control.
- Chapter 91—Workshop Equipment on Ships.
- Chapter 93—Fire-Fighting, Ship.
- Chapter 97—Service Craft.

2. Current revision dates for manual chapters will be found in front of manual under "Contents." These are revised as necessary through the manual change system. Chapters are available at all FPS distribution points and may be requisitioned in accordance with article 67-51.

3. Maintenance of Electrical Equipment Fittings, and Cables.

The following items of Chapter 60 of this Manual are of particular interest:

- Section II—Electrical Safety Precautions.
- Section III—Electrical Insulation and Insulation Resistance.
- Section IV—Maintenance of Electrical Equipment.
- Section IV, Part 5—Maintenance of Cables and Cable Fittings.
- Section IV, Part 6—Maintenance of Electric Generators and Motors.
- Section V—Reconditioning Electrical Equipment which has been Damaged by Sea Water.

Part 5. Security

67-61. RESPONSIBILITY

Safeguarding the security of electronics equipment installed or located in a command, afloat or ashore, is an inherent command responsibility. Safeguarding the security of electronic equipment in the hands of civilian contractors, whether under development, construction, or repair, is the responsibility of the cognizant naval inspector.

67-62. REGULATIONS

Security regulations and criteria are covered in detail in:

- U. S. Navy Security Manual
- Security Classification of Electronics Equipment—JANAP 140() See JANAP 140 in index and reference to supplement JANAP 140C1 and NAVSHIPS 93140.
- Registered Publications Manual

67-63. ACCESS

1. *Authority to Enter Spaces Where Classified Electronic Equipment is installed.*

No persons, unless specifically authorized by the Chief of Naval Operations or the cognizant Bureau, shall have access to any electronic equipment installed on board ship or at shore electronics activities, except the following:

- a. Officers and enlisted personnel of Army, Navy, Air Force, Coast Guard, and Marine Corps as required by their duties.
- b. Civilian personnel of the Navy and employees of contractors as required by their duties when actually engaged in authorized work on or in the space housing electronic equipment.

2. *Identification and Restriction of Visitors.* Persons authorized to visit spaces in which electronic equipment is installed must satisfactorily identify themselves. When persons are authorized to visit such spaces for a specific purpose, their authority carries no privilege to visit or to see equipment other than that specified.

3. In carrying out the preceding procedure, if the equipment involved has a confidential or secret classification, only those civilian or Military personnel who are cleared for that security classification will be given access.

67-64. PHOTOGRAPHING ELECTRONIC EQUIPMENT

Photographing electronic equipment is permitted only for official purposes, and must be specifically authorized by

the Chief of Naval Operations, the Bureau having cognizance, or by the officer responsible for the security of the equipment. This article applies to unclassified equipment where such equipment is installed on naval ships or shore stations.

67-65. CRYPTOGRAPHIC EQUIPMENT

Special instructions covering security of cryptographic equipment are issued by the Chief of Naval Operations.

67-66. CLASSIFIED PUBLICATIONS

1. The criteria for access to classified electronics publications are parallel to those governing access to equipment. (See Art. 67-63.) The twin requirements of "need to know" and appropriate clearance must be satisfied in each case.

2. The security classification of technical manuals for Navy electronic equipment is specified in the current edition of Security Classification of Electronic Equipment, JANAP 140(), and supplements thereto. Certain equipment is listed with a symbol (#) indicating that the classification of the technical manual (and the associated literature) differs from the classification given for the equipment.

SECTION II. LOGISTICS OF EQUIPMENT

Part 1. Procurement

67-81. PROCUREMENT OF ELECTRONICS EQUIPMENT

Procurement of electronic equipment i.e., major units or sets (art. 67-35) for electronic use is initiated by the Bureau of Ships to meet specific requirements afloat and ashore. These items, identified by an "F" prefixed stock number, are commonly referred to as Bureau controlled. Detailed distribution to using activities will be effected by instructions issued by the Bureau of Ships. (See BUSHIPSINST 10550.1().)

67-82. BUREAU CONTROLLED ITEMS

When material procured for the Bureau of Ships is required for forces afloat or Bureau of Ships activities ashore, the Bureau of Ships exercises direct control over its distribution and issue. Other shore activities will obtain this class of material in accordance with instructions from their managerial activity. Requisitions to supply activities must cite the authority for issue in each instance wherein such equipment is desired. Requests for approval of issue, when required by Bureau of Ships Instruction 10550.1() are to be addressed to the Bureau of Ships via the chain of command.

67-83. ELECTRONICS SUPPLY OFFICE CONTROLLED ITEMS. (IDENTIFIED BY "N" PREFIXED STOCK NUMBER)

The procurement, stocking, distribution, and issue of "N" cognizant material is the responsibility of the Electronics Supply Office.

67-84. RESTORATION PROGRAM

Restoration of electronics equipment is that program whereby used or not ready for issue equipments are placed in same as new condition ready for issue from the Bureau

industrial activities. It is used as a means of providing a source where new equipments are not available, and also where it is economically sound as opposed to procuring new equipments. Bureau of Ships Instruction 10550.10() covers the restoration program in detail. Procurement of parts identified by N prefix stock number is the responsibility of the Bureau of Supplies and Accounts.

67-85. CANIBALIZATION

Canibalization of "F" cognizance material is to be in accordance with Bureau of Ships Instruction 10550.10() or Electronic Supply Office Instruction 10550.2() as appropriate.

Part 2. Transfer

67-91. PREPARATION OF EQUIPMENT FOR TRANSFER

In the absence of any indications to the contrary, new or restored equipment, already boxed for shipment may normally be assumed to be in condition for transfer. In all other cases in order to obviate delay in placing equipment in operation after transfer from one activity to another the ship or station making the transfer shall exercise all possible care in the removal, handling, storing and shipment to avoid damage which would delay and increase costs of subsequent installation due to the need for repair. In any instances other than transfer of equipment from one installation to another the equipment shall be handled in accordance with the Bureau of Ships Instruction 10550.1() or subsequent revisions thereto. Appropriate action shall be taken to insure to the maximum extent practicable that:

a. The specified equipment is complete, clean, and in operative condition.

b. Each set of equipment is accompanied by all units, accessories, tubes, etc., comprising a complete equipment.

c. Repair parts, when not a part of the integrated maintenance repair parts system, will accompany the equipment.

d. Each set is accompanied by the applicable electronic equipment history cards NAVSHIPS 536 and other available informative data showing record of field changes, such as NAVSHIPS 537 alterations, and modifications made, defects known to exist, and any deficiencies in repair parts and accessories.

e. Each set is carefully and suitably packed for domestic or ocean shipment, as applicable, in a manner to insure against damage in transit and is properly marked (See MIL-P-17555 Military Specification - Preparation for Delivery of Electronic Equipment, Miscellaneous Electrical Equipment (except for Rotating Electrical Equipment) and associated Repair Parts. See Military Specification MIL-P-75 regarding electron tubes and see Military Specification MIL-STD-129 Marking for Shipment and Storage.)

f. All technical manuals pertaining to the equipment are included in a sealed envelope in the shipment with the equipment.

g. Invoices and bills of lading reflect the exact accounting, shipping, and marking instructions provided by the Bureau, the Electronics Supply Office, or other requesting or authorizing activity; and that package marking conform to the marking instructions provided.

h. All offices and activities having an interest in the movement of any specific shipment are advised promptly regarding any specific shortages, deficiencies, or non-compliance with the requirements of this article in order to expedite any further action necessary.

i. *Vouchers for Adjustments between Appropriations.* Standard Form 1080 or other appropriations adjustment documents are prepared, certified and submitted as directed by the authorizing or funding activity, and in accordance with applicable regulations.

67-92. EQUIPMENT REQUIRING SPECIAL HANDLING

The replacement of all radiac and infrared equipment is a matter to be handled through the cognizant radiac and infrared repair facility to advise the Bureau of feasibility of repairing radiac or infrared equipments and to replace those determined to be beyond repair. The Bureau initiates action to supply replacement equipments and provides the radiac and infrared repair facilities with disposition instructions for the defective equipments. Radiac and infrared repair facilities are authorized to exchange radiac and infrared equipments for ships, when such exchange is necessary due to limited availability of the ship.

Part 3. Allowance

67-101. SHIP

1. *Allowance Source Documents.* The functional types and numbers of electronics equipments to be installed in ships are part of each ship's characteristics. Ships' characteristics are established by the Chief of Naval Operations through the Ship Characteristics Board (SCB). The electronics portion of ships' characteristics is the Electronics Installation Plan (EIP). When a ship's characteristics are to be changed by reason of material improvements, CNO (SCB) issues a Class Improvement Plan (CIP). The ship Type Electronics Plan (STEP) is a complete and current plan for each ship type reflecting EIP as modified by CIP. Since generally there is not enough money or material to accomplish all CIPs, the CNO issues annually a priority list of individual CIP items known as the Material Improvement Plan (MIP). A similar priority list, the Operational Improvement Plan (OIP), is prepared by the Bureau for programs under Bureau cognizance such as the Material Replacement Programs.

2. *Ship Electronics Installation Plan (SEIP).* The SEIP is distributed to naval shipyards, type and fleet commanders and certain other activities concerned with planning. It is prepared on a ship class basis. It projects what the anticipated equipment allowances of ship classes will be for each year for approximately five years in the future. It takes into account all known factors available on the *allowance source documents*, the Bureau's electronics Material Replacement Program (MRP), (BUSHIPS INST 09670.90) plus predictions of electronic equipment availability. It is revised annually.

3. *Ship Electronic Allowance List (SEAL (formerly BHEA)).* The Bureau distributes to each ship a firm allowance (SEAL), which takes into account any or all of the *allowance source documents* discussed above. The SEAL is groups S67 and S69 of the ship's Revised Individual Allowance List (RIAL). It is in terms of specific models author-

ized and directed to be installed aboard each ship. Changes to the SEAL may be requested of the Bureau by letter through the normal chain of command. Changes to the SEAL may be authorized only by the Bureau and will be effected by the issuance of a revised page or pages. Revised pages will be issued at each regular overhaul, and between overhauls as necessary. Part II of the SEAL is intended to be used as authority to requisition the necessary items from the supply system. Part I lists items installed only by the Bureau through ShipAlts. These items are not to be requisitioned. BUSHIPSINST 4441.33() covers the SEAL in detail.

4. *Electronics Repair Parts Allowance List (ERPAL).*

The ERPAL is a machine-made integrated listing of all repair parts required for maintenance support for BUSHIPS Electronics Equipments, Fire Control Radars (less Mk 56 system), certain IC equipments, and all known applications of tubes. The ERPAL is designed for a minimum of 90 days support at full operation. Electronics items on NAVORD lists (Mk 56 and other ordnance equipments) are included in the ship's ERPAL. The ERPAL is prepared by ESO in accordance with current procedures set forth in instructions as follows: ESO Instruction 4441.17(). For shore electronic repair parts allowance lists see Article 67-102.3. The ERPAL is an authoritative allowance for "N" cognizance parts. The Type Commander may authorize additions to meet special nonrecurring needs on a case basis. Recommendations for permanent changes in allowances are to be forwarded, via type commander to ESO (copy to BUSHIPS). It is imperative that the provision of NAVSHIPS 900,135() be followed for accurate and timely installation record. ESO will initiate action to prepare revised or new ERPALS on regular overhauls and new construction and conversion in accordance with the instructions mentioned above, but in the event specific equipments are inadvertently omitted supplemental ERPALS' should be requested of ESO (copy to BUSHIPS) listing equipments to be covered in the supplement. The cost of parts added to the ERPAL as the result of equipment changes is financed by an allotment held by the ERPAL processing activity.

5. *Crystal allowances.* Crystals for communication and navigation equipments are allowed each ship by BUSHIPSINST 09670.58(). Changes to the allowance involving numbers of allowed crystals may be requested of the Bureau of Ships via the chain of command. Changes which involve new frequencies shall be justified to the Chief of Naval Operations via the chain of command.

67-102. SHORE

1. *Shore Electronic Equipment Allowances.* Allowances of shore electronic equipment under the technical control of the Bureau of Ships, other than test equipment, are established as follows:

a. The Chief of Naval Operations establishes allowances for the activities under his management control. Additionally, allowances for the Advanced Base and Harbor Defense programs are established by CNO.

b. Allowances for activities under the management control of other bureaus and offices, with the exceptions noted above, are established by the Bureau or office concerned.

c. Requests for changes in allowance which originate at shore activities are to be submitted via the maintenance authority, other appropriate commands and the Bureau of Ships for technical comments and recommendations and in accordance with other instructions from the management bureau or office. Refer to article 67-102.5 for procedures for radiac equipment allowances.

d. These requests must contain complete justifying data including JANAP 195 or other operational requirements. In addition, the intended employment of the equipment must be indicated under the appropriate category listed in BU-SHIPSINST 10550.32() or appropriate management Bureau or office instruction. The major categories are:

(1) Administrative and general operational employment.

(a) Equipment for communications, radar, aid to navigation, etc.

(b) Teletypewriter equipment required for support of special communications of the naval communication system or of the station under the following subcategories:

1. Authorized radio and landline channels, weather circuits and special purpose circuits.
2. Spares (normal standby).
3. Intrastation circuits.
4. Rotational maintenance (for maintenance authorities only for district use).

(2) Internal Security, Industrial Control, Passive Defense, and Crash Communications.

(3) Radiac Equipment.

(4) Production Test and Incident Training Equipment (repair activities only).

(5) Training (major electronic equipment for Naval Reserve and Training Activities). Requests for allowance modifications are normally submitted in letter form. Dispatches are used only in emergencies. Shipment requests/order forms are not to be used for ordering class cognizance symbol "F" material carried as allowance items by the management bureau or office. The maintenance authority or the Bureau will return such forms for resubmission in proper format. The maintenance authorities are to screen all allowance requests to determine conformance with the foregoing. Requests which are received without complete justifying data are to be returned to the originating activity. The maintenance authority is to provide technical comments and recommendations by endorsement.

2. *Shore Electronic Test and Measuring Equipment Allowances.* Allowances of electronic test and measuring equipment for naval shore activities, with the exception of naval laboratories and other research and development activities are established by the management bureau or office. Requests for changes in allowances which originate at shore communication stations, air stations, naval training and naval reserve activities, and other activities ashore, except naval laboratories, should be submitted to the management bureau or office via the maintenance authority, other appropriate commands, and the Bureau of Ships for technical comments and recommendations.

3. *Shore Electronics Repair Parts Allowance List (ERPAL),* is provided by ESO in accordance with current instructions (BUSHIPSINST 4441.44); (ESO INST 4441.17) (See Art. 67-101.4).

4. *Crystal Allowances.* (a) *Shore Station.* Crystal units for communication equipment will be restricted to frequencies authorized in JANAP 195 or as otherwise authorized by the Chief of Naval Operations.

a. Allowances of crystal units for UHF are limited to two complete sets for each shore station regardless of the number of equipments authorized.

b. Allowances of crystal units for all other communication equipment are limited to two crystals per equipment per frequency for each shore station.

5. *Radiac Equipment Allowances.* The Chief of Naval Operations determines the operational requirements for radiac equipment for shore activities. These requirements are defined in terms of functions to be performed by each category of radiac equipment. For shore activities the Bureau of Ships interprets the operational requirements and establishes and promulgates the allowances to the Industrial Manager, commandant or area commander, as applicable, in terms of quantities of equipment in each category. All activities desiring an allowance of radiac equipment or modifications of an existing allowance should address requests to the Chief, Bureau of Ships via the cognizant maintenance authority and chain of command. Requests for allowances should be based on functional categories of equipment rather than by specific equipment.

Part 4. Installation

67-111. INSTALLATION PLANNING, SHORE

Installation planning for shore activities is to be accomplished in accordance with the Handbook of Shore Electronics Criteria, NAVSHIPS 92675 and articles 67-162 and 67-163.

67-112. INSTALLATION PLANNING, SHIP

1. *General.* To assist in the development of detailed ship plans for electronic equipment, the Bureau of Ships will provide guidance plans showing antenna arrangement, remote control interconnection wiring and interconnection wiring for each major set or system. In addition a plan showing the outline and mounting dimensions of the major units will be supplied for each equipment. Guidance plans covering the general arrangement of ships' major electronic spaces will be provided on a case basis.

2. *New Construction and Conversion.* Electronics installations in new construction and conversion ships are accomplished at builders' yards from detailed installation plans prepared by the design activity.

The Bureau of Ships will issue - General Specifications for Ships of the U.S. Navy, Detail Specifications for Building _____ or Detail Specifications for Conversion of _____. (In earlier procedure such specifications were previously referred to for new construction as Special Specifications for Machinery and Detail Specifications and referred for conversion as Contract Conversion Specifications, Circular of Requirements Machinery and Circular of Requirements Hull.) The requirements of the General Specifications for Ships of the U.S. Navy apply unless exception is made in the Detail Specifications. These publications will state requirements and objectives desired in the completed ship and will contain instructions regarding the work to be accomplished. In general, these publications will

delinate the individual responsibilities of the shipbuilder and the Bureau of Ships. Normally these publications are not supplied to forces afloat.

3. *Ships in Commission.* Electronics installations in ships in commission are accomplished at a naval shipyard, naval station, or other installation activity from detailed installation plans prepared by the planning yard. These detailed plans are based upon information supplied by the Bureau in the letter/ or ShipAlt authorizing their preparation and the data contained on plans furnished by the Bureau, referenced in article 67-103(1). Normally these detailed plans are developed for use in the accomplishment of a ShipAlt on a specific class of ship. The installing activity, if different from the plan development activity, is required to check the detailed plans against the ship to receive the ShipAlt and make such plan revisions as necessary. Where major revisions are necessary, approval of the changes must be obtained from the planning yard or the Bureau. If installation plans are prepared by an activity other than the planning yard, the antenna arrangement plans and equipment arrangement plans should receive approval, prior to use, from the planning yard or the Bureau. Advise the planning yard of all changes that were required.

67-113. ALTERATION (SHIPS)

Broadly speaking, any change in ship's allowance of machinery, equipment, supplies or complement is an alteration. See BUSHIPINST 4720.1() for information regarding policies and procedures involving alterations and ShipAlts. (See article 67-38)

67-114. INSTALLATION LOGISTICS FORMS, SHIPS

The Bureau uses the following NAVSHIPS forms to plan for, distribute, and release electronics equipments. A brief description is included here as information:

a. *Ship Electronic Installation Record, NAVSHIPS 4110.* THIS IS THE INVENTORY OF ELECTRONICS EQUIPMENT ABOARD EACH SHIP. IT IS THE RESPONSIBILITY OF THE SHIP, ALTHOUGH OVERHAUL ACTIVITIES MAY BE REQUESTED TO ASSIST THE SHIP IN PREPARING OR REPORTING CHANGES. ITS ACCURACY AND COMPLETENESS ARE OF EXTREME IMPORTANCE SINCE IT IS TAKEN INTO ACCOUNT WHEN THE BUREAU ALLOCATES NEW EQUIPMENTS, ACCESSORIES, AND OTHER ASSOCIATE ELECTRONICS MATERIAL. IT IS ALSO THE BASIS FOR PREPARING ERPAL. NAVSHIPS PUBLICATION 900,135() PROVIDES INFORMATION ON HOW TO CORRECT NAVSHIPS 4110, WHEN TO SUBMIT AND OTHER DETAILS.

b. *Bureau Responsibility Material, NAVSHIPS 3855.* As applied to electronics the NAVSHIPS 3855 is a complete and current list of Bureau controlled electronic items, by name and nomenclature, source of supply, and required shipment date, which are authorized to be released for a *new construction or conversion* ship. To assist ESO and other activities concerned, certain ESO cognizant items are also included (NAVSHIPS 3855C) although the ESO portion will by no means be complete. Currency is maintained by timely reissues to ESO and other interested activities during the building and conversion period. The *official*

copies will be furnished to interested activities by ESO. The copies supplied to ESO six months prior to the earliest Component Percentage and Shipment Schedule (CPSS) date will be annotated (by ESO) to show the stock number of the item and the exact model number in a given series to be issued, and the shipping action or other firm logistics remarks, such as EMSR numbers, bills of lading numbers, etc. for all items under ESO redistribution control. (The Bureau will have already included information on the F items for which it has not delegated redistribution control to ESO.) The issuing activity will issue only the specific items authorized. (See BUSHIPSINST 9670.80().) Authority to issue an item whose stock number differs from that specified on the NAVSHIPS 3855 shall be requested of ESO by message with a copy of the message to the Bureau. Emergency issues shall be reported promptly to the Bureau and ESO. (See BUSHIPSINST 105550.1().)

c. *Ship Alteration Material Summary, NAVSHIPS 4661.*

The NAVSHIPS 4661 provides a list of electronic equipment authorized for installation on an individual ship during its scheduled availability. It also lists the electronic equipment to be removed. The NAVSHIPS 4661 is the electronics portion of the 90 day letter to naval shipyards and industrial managers and is the authority to issue and install the material specified therein. Equipment availability, exact model number, standard navy stock number, shipping information and source of supply is indicated by the Bureau on Bureau controlled critical material only. ESO provides firm logistics information on ESO controlled items and Bureau controlled noncritical material which is under redistribution control by ESO. The copies of the NAVSHIPS 4661 forward to the shipyards or industrial managers are for information purposes only. ESO furnishes exact or other firm logistics remarks, Federal or standard Navy stock numbers, and model designations on appropriate items and transmits "action" copy of NAVSHIPS 4661 to the Shipyard or INDMAN as the official equipment issue document. The issuing activity will issue only the specific items authorized. Authority to issue a substitute item shall be requested of ESO by message, with a copy to the Bureau. (See BUSHIPSINST 9670.80().) Emergency issues shall be reported promptly to the Bureau and ESO. (See BUSHIPSINST 10550.1().)

d. *Electronic Distribution Schedule, NAVSHIPS 4311.* This is a gross material shipping request (EMSR) issued by the Bureau quarterly on the Electronic Supply Segment of the Navy Supply System to permit advance positioning of stock to meet overhaul requirements for the succeeding quarter. It is the authority to ship required material, and to obligate and follow up on material due. The NAVSHIPS 4311 is not authority to issue or release material.

e. *Electronics Overhaul Planning for Installation.*

ACTIVITY	MO. PRIOR TO	
	START OVERHAUL	BUSHIPS ACTION
BUSHIPS		Issues SEIP annually.
BUSHIPS	6 mo.	Prepares NAVSHIPS 4311. Distributes to Electronics Supply System.

ACTIVITY	MO. PRIOR TO		ACTION
	START	BUSHIPS	
	OVERHAUL		
BUSHIPS	6 mo.		Prints corrected copies of NAVSHIPS 4110. Distributed to ESO, SHIPYARD, Type Commands, and others.
BUSHIPS	4 mo.		Compares SEIP with Installation Record (NAVSHIPS 4110) 120 day letter, MIP Part III and OIP Part III Prepares detailed list of required equipments and associated material (NAVSHIPS 4661) plus removals.
BUSHIPS	3 mo.		Distributes NAVSHIPS 4661 to SHIPYARD, ESO and others.
ESO	2 mo.		Redistributes any last minute equipment/materials not on NAVSHIPS 4311. Uses NAVSHIPS 4110 and NAVSHIPS 4661 to prepare ERPAL. Sends ERPAL to ship.
SHIPYARD	60-0 days		Completes planning, follows up on all required equipment/material deliveries. Assists ship with ERPAL "add" and "delete" lists.
BUSHIPS	After Start		Distributes revised SEAL.
SHIPYARD	After Start		Removes and installs equipments/materials listed per NAVSHIPS 4661.
SHIP	After Completion		Corrects post overhaul NAVSHIPS 4110 and submits to BUSHIPS.

Part 5. Maintenance.

67-121. PERFORMANCE STANDARDS MEASUREMENTS

All ShipAlts and job orders for the installation, or Class A or B maintenance repair of shipboard, electronic equipment and systems or major units, thereof, shall include a requirement to take and record performance standard measurements and to calibrate the ships test equipment required to accomplish these measurements. This will consist of one of the following:

a. Make the measurements required to complete the Maintenance Standards Part I book, enter these measurements in the book for the equipment and calibrate the ship's test equipment required to accomplish these measurements.

b. When the Performance Standard Sheet is available, take the basic measurements listed in Table II of the Per-

formance Standard Sheet for the equipment, enter these measurements in the Maintenance Standards Part I book for the equipment and calibrate the ship's test equipment required to make these measurements.

c. When the Performance Standard Sheet is not available, take the measurements required to complete the Maintenance Standards, Part I, enter these measurements in the book for the equipment, and calibrate the ship's test equipment required to accomplish these measurements.

67-122. REPAIR

1. *General Policy.* Electronic equipment shall be repaired at the lowest echelon practicable considering repair parts, tools, test equipment, personnel and facilities available.

2. *Equipments Requiring Special Consideration.*

a. *Radiac Repair*

(1) In consideration of the dangerous radioactive materials used as standard calibrating sources, maintenance and calibration of radiac equipment has been restricted to specially equipped facilities established by this Bureau for that purpose. The Bureau has provided these radiac repair and calibration facilities at each of the major Bureau of Ships industrial repair activities and has assigned to these activities the responsibility for maintaining radiac equipment in a state of operational readiness for activities under their maintenance cognizance and for naval vessels.

(2) Afloat activities using radiac equipment shall repair such equipment only to the extent where recalibration is not required. Full use shall be made of the radiac maintenance facilities for any repairs requiring recalibration.

b. *Infrared Repair.* Bureau of Ships policy on the repair of infrared equipment is given in BUSHIPSINST 9672.17 (formerly 9670.50).

c. The directives pertaining to the installation and maintenance of Sonar equipment are listed in BUSHIPSINST 9674.25.

d. *Test Equipment Repair.* Electronic test equipment shall be repaired aboard ships, tenders, repair ships, and repair activities to the extent that facilities and repair parts are available. The test equipment shall also be recalibrated if the nature of the repair affects calibration. The repair shall be done by the using activity whenever possible.

67-123. ALTERATIONS

All alterations to electronic equipments and systems are either ShipAlts or alterations-equivalent-to-a-repair as described in BUSHIPSINST 4720.1. (See article 67-38)

a. *ShipAlts.* The procedure for approval and authorization of ShipAlts is described in BUSHIPSINST 4720.1. Electronic field changes which are accomplished as a ShipAlt must be authorized by the Bureau before accomplishment.

b. *Alterations-equivalent-to-a-repair and Field Changes.*

(1) Alterations or Class A field changes may be performed by field and fleet personnel as authorized on the approval document without referral to the Bureau prior to accomplishment.

(2) Class B field changes must be specifically authorized in accordance with the instructions on the field change prior to their accomplishment.

c. **Field Changes** to electronic Equipments are mandatory and shall be accomplished at the earliest opportunity in accordance with the instruction contained therein. Field changes are furnished in kit form and are further identified by Type and Class designations as an abbreviated method of relating the information and material (if any) included in the kit and to the applicability of the field change to specific equipments. The class designation is added as a hyphenated suffix to the type designation.

(1) Type I - A Type I field change kit includes a publications package and all parts, materials, and special tools required to accomplish the change to a single equipment and to revise equipment nameplates and manuals.

(2) Type II - A Type II field change kit consists of a publications package which provides instructions for accomplishing the change and revising equipment nameplates and manuals. Type II field changes may or may not require that parts be requisitioned.

(3) Type III - A Type III field change kit is similar to a Type I, the difference being that all necessary material is not supplied. The basis for such exclusion normally concerns advantages by reducing weight and bulk of the kit or by affording better quality control of short shelf items by open stocking these parts in the supply system. The publications package furnished with each field change is an assemblage of all printed matter and instructions necessary in accomplishing the change and for revising affected equipment manuals and nameplates.

(4) Class "A" field changes - Installation funding is not required. These field changes are approved for accomplishment by forces afloat or station personnel without further reference to the Bureau under conditions stated in the field change bulletin. Typical conditions include cases where equipments affected are identified by serial numbers group or application description (e.g. all ship equipment, all destroyers, all SG radar used with VF, one ship in each Destroyer Division, etc., as designated by Type Commanders or the Bureau).

(5) Class "B" field changes - Fleet funding is required. These field changes are approved for accomplishment by naval shipyards or repair facilities without further reference to the Bureau under conditions stated in the field change Bulletin when authorized by Type Commanders.

(6) Class "C" field changes - Bureau of Ships funding is required. To meet urgent operational commitments the Bureau may approve accomplishment of Class "C" field changes subject to Type Commanders funding. This class of field change includes, but is not limited to those changes of an operational improvement nature and is accomplished in order of priority of the material improvement program. These field changes are approved for accomplishment by naval shipyards or repair facilities under the conditions stated in the field change bulletin.

d. **Emergency Alterations.** When circumstances warrant emergency alterations, adequate considerations should be given to the safety of personnel and equipment and to the basic equipment performance requirements. (See article 67-11.2.

67-124. MAINTENANCE CATEGORIES

1. **Class A Maintenance** will be performed only by shore based activities. Normally, this class of maintenance will be performed only in the Restoration Program and in accordance with a Bureau of Ships authorization. Class A Maintenance for electronic equipment, as a part of the Material Replacement Program, will be scheduled by the Bureau.

2. **Class B Maintenance** will be performed on all units and equipments removed from a ship by a repair activity.

3. **Class C Maintenance** will be performed only while the equipment is aboard the ship to which it is assigned. This class of maintenance may be accomplished by a repair activity.

67-125. PREVENTIVE MAINTENANCE PROGRAM

1. Each ship and shore command shall establish a Preventive Maintenance Program for electronic equipment under their control. This program shall be based on Maintenance Standards-Part II when this standard is available. Locally devised standards and the technical manuals, should be used until Maintenance Standards-Part II becomes available.

2. The Operational Maintenance Program shall be accomplished by operational ratings and shall include all items designated as *routine* or operator in Maintenance Standards-Part II plus increasingly technical items as the training of operational personnel in this area is increased.

3. Past experience has shown that preventive maintenance in its proper application is a valuable method of maintaining an equipment's performance. However, this is only valid when applied to parts which obey a wearout law of failure, such as mechanical parts and rotating electrical machinery. Thus, lubrication, cleaning, brush checking, etc. should be continued.

4. Preventive maintenance is an invalid procedure for all items for which an exponential failure law prevails. These items presently include electron tubes, resistors, capacitors, inductors, transformers, and most electronic parts. It fails for this category because their failures cannot be localized in time in order to present a uniquely advantageous period for maintenance.

5. Preventive maintenance by the periodic replacement or removal for check of electronic parts should be avoided because it causes man made malfunctions. Tubes are replaced in the wrong sockets, connectors and cables damaged, circuits are detuned, servos unbalanced, thus emergency maintenance is often necessary as soon as equipment has undergone this type of preventive maintenance.

67-126. TESTING

1. Standard test methods and practices as given in the Handbook of Test Methods and Practices (NAVSHIPS 91828) and the Equipment Maintenance Standards shall be used.

2. When a required method or practice is not shown in either of the above publications other sources such as technical manuals, standard textbooks, etc. shall be used and recommendations sent to the Bureau to modify the handbook or standard as applicable.

3. Tube Testing

a. The practice of wholesale removal and test of electron tubes on a periodic basis is not to be done. Action is being taken to revise technical manuals which specify

such routine. If routine test of an electron tube in a designated application is necessary, the revised technical manual will specify an exception to the rule.

b. The following maintenance procedure is strongly recommended as general practice:

(1) When a performance deficiency is detected, make an attempt to isolate the specific cause.

(2) When the trouble has been localized and a tube is suspected, remove and test that tube. If found good, replace in the same socket. Interchange of tubes between sockets should be avoided.

(3) If repair by tube substitution is necessary as a last resort, test a new tube (within the capability of the tube tester) before placing it in service.

(4) If a new tube tests good but will not work in a particular socket, make note of this fact and save the tube for use in another application where it will work.

c. The Bureau of Ships is particularly interested in receiving information on cases (such as described in Article 67-126.b where extensive selection of tubes for a particular socket is necessary for proper operation. Failure Reports (DD-787) and Electronics Performance and Operational Reports (NAVSHIPS 3878) are convenient ways to do this.

67-127. RECORDS AND REPORTS

Records shall be kept in accordance with these articles and other publications as noted:

a. *Electronic Material History and Current Ships Maintenance Project.* The following forms are required and may be obtained from the nearest Forms and Publications Supply Distribution Point:

- NAVSHIPS 529, Repair Record
- NAVSHIPS 530, Alteration Record
- NAVSHIPS 531, Resistance Test Record
- NAVSHIPS 536, Electronic Equipment History Card
- NAVSHIPS 537, Record of Field Changes
- NAVSHIPS 538, Electron Tube Performance Record (Limited Application only see Article 67-243)

These cards are designed to fit into a visible slide lock ring type binder, available from standard stock, under Federal stock number G 7520-494-2456. The Electronic Equipment History Card (NAVSHIPS 536), and the Resistance Test Record (NAVSHIPS(531)), constitute the Material History. The Equipment History Card gives the past history and thus, is of great help in trouble shooting and correcting repetitive failures. It also indicates the general equipment reliability. The Repair Record (NAVSHIPS 529); Alteration Record (NAVSHIPS 530), and Record of Field Changes (NAVSHIPS 537), constitute the Current Ships Maintenance Project (CSMP). Besides insuring the accomplishment of outstanding repairs, alterations, and field changes, these cards also facilitate the preparation of tender and shipyard work lists. These cards will be inserted in the binder in the following manner, allotting one complete page to each type of equipment:

(1) *Electronic Equipment History Card, NAVSHIPS 536.* One NAVSHIPS 536, Electronic History Card, is to be filled out for the complete equipment and inserted in the binder. Immediately following this will be additional Electronics History Cards filled out for each part of the subject equipment, such as starter, motor-generator, remote control,

modulator, and receiver. These cards shall remain with the equipment throughout its normal service life. When an equipment is processed thru restoration procedure a new history card will replace the previous card.

(2) *Resistance Test-Record, NAVSHIPS 531.* A NAVSHIPS 531, Resistance Test Record, will be prepared for every equipment or unit for which resistance readings are required. This includes motors and generators (armature and field readings as applicable), antennas (long wire, whip and dipole), and sonar and fathometer transducers. Technical manual procedure for each equipment is to be followed. Resistance readings shall be taken at least once a month. The Resistance Test Records may be filed either in their own section of the CSMP, or bound together in a book. The latter is recommended as it facilitates the taking of the readings. These records are not required of shore activities.

(3) *Record of Field Changes, NAVSHIPS 537.* One NAVSHIPS 537, Record of Field Changes, will be filled out for the complete equipment and inserted in the binder, immediately following the first or index Electronic History Record. As field changes are authorized, the number, title and authority should be entered in the Record and the rest of the Record should be filled out when the field change has been completed. Field changes should be listed numerically, with proper notation where not applicable to a particular equipment. Some minor alterations and modifications to electronic equipments are specified in EIB and by BUSHIPS letters and directives. Examples of these are the replacing of a resistor with one of equal value but higher rating and the replacement of a crystal with a new type requiring a different holder. While these modifications are not promulgated as a field change such modifications should also be logged in the field change record.

(4) *Repair Record, NAVSHIPS 529.* As a repair item becomes necessary, a NAVSHIPS 529, Repair Record, be filled out and placed in the Electronic Equipment History Binder adjacent to the proper history card. The wording of the repair record may be in the form of a job order so that the repair record can be copied exactly in preparing shipyard or tender repair work list. One of the most common faults in the fillings out of this form is failure to give sufficient information as to the work required. When the item of work has been completed and a proper notation is made on the electronic equipment history card, and on the repair card, the repair card should be removed from behind the history card and placed in a "completed work" file. This Repair Record is not required of shore activities.

(5) *Alteration Record, NAVSHIPS 530.* When an alteration is authorized, a NAVSHIPS 530, Alteration Record, should be filled out and placed in the Electronic Equipment History Binder adjacent to the proper history card. Filling out of this form and its disposition are the same as for a Repair Record. This Alteration Record is not required of shore activities.

(6) *Shore Installation Cable and Cross-Connect Records.* Lack of current cable cross-connection records causes confusion and may result in loss of available cable pairs by reason of lack of knowledge as to which pairs are being used. (Refer BUSHIPSINST 10550.60) Shore activities shall maintain the following records:

(a) Cable Pair Record, NAVSHIPS 4690(9-56) - a record of outside plant cable data.

(b) Transmission Characteristic Record, NAVSHIPS 4689(9-56) - a record of the frequency response characteristic and normal resistance of each loop.

(c) MDF/IDF Cross Connection Record, NAVSHIPS 4692(9-56) - record suitable for general cross-connection purposes. It forms a record of the physical cross-connection made to any terminal strip, locates the other end of the cross-connection and identifies the circuit to which connected.

(d) Circuit Record, NAVSHIPS 4691(9-56) - used at large stations only to locate the cable and pair to which a circuit is cross-connected to aid in rapid location of troubles.

(b) *Electronic Material Reports.* Each activity is responsible for the timely submission of the following reports:

(1) *Ships Electronics Installation Record, NAVSHIPS 4110.* (Report BUSHIPS 9670-2) The Ship's Electronic Installation Record is the record of the electronic equipment installed aboard a ship. The ship is completely responsible for its preparation and revisions. (See article 67-114)

(2) *Electronic Failure Report: Form DD787.* (Report BUSHIPS 10550.1)

(a) The information derived from the Electronic Failure Reporting System is used for:

1. Correcting deficiencies on either an "equipment" or "part" basis (e.g. field changes).
2. Invoking contractual guarantees.
3. Quality control changes in current or subsequent production.
4. Repair part stock control.
5. Guidance for initial provisioning of repair parts.
6. Evaluating equipment reliability and maintainability.
7. Establishing one of the factors used in determining equipment life.

(b) Electronic Failure Reports (DD787) are available at Forms and Publications Supply Distribution Points. The Defense Department Electronics Failure Report, DD-787 which superseded the NAVGEN 1025, and the earliest NAVSHIPS 383 Electronic Failure report card, is the document on which failures are to be reported. The earlier failure report forms should be destroyed when the new DD787 technician, mechanic, or engineer who repairs the failure as soon as possible after repair has been made. Fill out the form completely in conformity with the interleaved instructions included with the pads of forms. All electronic failures occurring or repair aboard ship, at shore activities, in the electronics shop, or elsewhere in the field must be reported. A separate form DD787 should be filled out for each failure, including each tube failure. The reports should be mailed promptly to the Bureau without a covering letter unless it is determined that an explanatory letter is required to discuss circumstances surrounding a failure or to make recommendations for correcting the deficiency encountered. Ordinarily, the remarks portion of the report form should be used to insert explanatory comments. For electronics equipments other than fire control, the DD787 is mailed

direct to BUSHIPS without covering letter. For electronic fire control equipments, refer to the Bureau of Ordnance Manual.

(3) *Electronics Performance and Operational Report NAVSHIPS 3878 (Ships only)* (Report BUSHIPS 9670.1) The importance of the Electronics Performance and Operational Report which is submitted monthly, for selected equipments, is that information on the operational capabilities and reliability of new electronic equipments is immediately available for evaluation by BUSHIPS. It also enables the Bureau to check or originate the applicable portions of the Performance Standard Sheets. Complete information on how to fill out this report is found in the Electronic Installation and Maintenance Book (NAVSHIPS 900,000) Chapter 1, Section 3. BUSHIPSINST 9070.20 lists the equipments for which monthly reports must be submitted. The report is submitted directly to BUSHIPS.

(4) *Report of Annual Inspection (Inspections of Electronics at Shore Activities).* Report Symbol BUSHIPS 4730-2. An annual inspection shall be made of all shore electronics equipment and systems under the technical control of the Bureau of Ships by qualified technical personnel of the cognizant maintenance authority. A report of each annual inspection is to be submitted by the maintenance authority to the Bureau of Ships via the Commanding Officer of the station and the Commandant of the District, or other appropriate commands, with an advance copy to the Bureau of Ships, and to the management bureau of office concerned. The report is to contain appropriate comments and recommendations as to what corrective measures should be taken to eliminate deficiencies. The Commanding Officer of the station is to indicate corrective action by endorsement. The required information to be included in the report is outlined in Article 67-169.

(5) *Shore Electronics Projects-Quarterly Status Reports.* (Report Symbol BUSHIPS 10550-2)

(a) A Quarterly status report is required from maintenance authorities showing the status of all electronics projects being accomplished by them at shore activities. This report, which is to be submitted on NAVSHIPS 4536 4536 form, is to include the following types of projects.

1. Installations, major maintenance, improvement and public works items.
2. New electronics projects now in the planning stage.
3. Major field change programs. The report should show the total number of each field change to be accomplished and the percent of total completion. It is not necessary to report on each individual activity at which a field change is being accomplished, nor to report on isolated changes of a routine nature.

(a) The report is to be submitted to the Bureau of Ships with copies to the management bureaus and offices whenever items listed in the report include work at activities under their management control.

(a) The report is to be submitted to the Bureau of Ships with copies to the management bureaus and offices whenever items listed in the report include work at activities under their management control.

67-128. MATERIAL REPLACEMENT PROGRAM

This program establishes a systematic review of the material condition of major ship electronic equipment in order to provide for advance planning for equipment replacement;

provide logistic support guidance for repair and overhaul activities; and provide information for installation policy. (See BUSHIPSINST 9670.90)

SECTION III. IMPLEMENTATION OF POLICIES AND REGULATIONS

Part 1. For Ships Electronic Equipment

67-141. RESPONSIBILITIES

The Bureau of Ships is responsible for the alteration, repair, and upkeep of electronics equipment in naval ships, and for the operating standards and procedures pertinent thereto. (See also articles 0445 and 0446, Navy Regulations.)

67-142. REPAIR ACTIVITY RESPONSIBILITIES (NAVY INDUSTRIAL ACTIVITIES, INDUSTRIAL MANAGERS, REPAIR SHIPS AND TENDERS)

1. When the measurements required by Articles 67-121 indicate that an equipment or system does not meet the established performance or maintenance standard, the accomplishing activity is responsible for performing the work required to meet the standard.

2. Accomplishing the performance standard measurements specified in Article 67-121.a for equipments or systems installed under Bureau of Ships funded Ship Alts.

67-143. TYPE COMMANDER RESPONSIBILITIES

1. Continue to expedite the completion of the measurements required by Equipment Maintenance Standards—Part I.

2. Specify Maintenance Standards—Part II as the basis for shipboard electronic equipment preventive maintenance programs.

67-144. NAVAL SHIPYARD RESPONSIBILITIES

1. Accomplishing, prior to shakedown, those performance Standard Measurements as specified in Article 67-121.a for all ships either converted or built at the shipyard, or for which the yard has fitting out responsibility.

67-145. RESPONSIBILITY OF COMMANDING OFFICERS

1. *Maintenance.* Implementation of maintenance policies and maintenance directives received from higher authority.

2. *Field Changes.* Perform all field changes within the capability of ships force. Keep up-to-date lists of field changes applicable to equipments aboard. Enter field change information on Electronic Equipment History Card, NAVSHIPS 536, and Record of Field Changes, NAVSHIPS 537.

3. *Maintenance Standards.* Take the measurements required to complete Maintenance Standards—Part I and enter them for all Bureau of Ships allowed equipments on board.

4. *Preventive Maintenance Program.* Establish a preventive maintenance program which will incorporate the areas specified in each equipment technical manual.

5. *Operational Maintenance Program.* Establish an operational maintenance program as a part of the preventive maintenance program.

6. *Training.*

a. Establish and conduct on-the-job training in the operation and maintenance of shipboard electronic equipments.

b. Report to the Bureau of Ships and the Bureau of Naval Personnel any deficiencies in the scope of the training of operators and technicians.

7. *Ships Force Repair* perform all repairs within the capacity of ships force.

67-146. PROCEDURES

Articles 67-147 through 67-154 include procedures not covered elsewhere which are specifically applicable to ship electronic equipment.

67-147. PERFORMANCE STANDARD MEASUREMENTS

1. The accomplishing activity shall certify that the measurements of the Performance Standard Sheet or the Equipment Maintenance Standard Book—Part I, taken in accordance with Article 67-121, were taken after the equipment was placed in operating condition and if the standards were met or exceeded.

2. The accomplishing activity shall notify the commanding officer, type commander and the bureau when corrective measures are not taken to bring equipment which has been repaired or installed, up to or exceeding performance standards.

67-148. ALTERATIONS OR MODIFICATIONS

Requests for approval of alterations or modifications to ship electronic equipments or systems shall be forwarded to the Bureau via the applicable type commander (with an information copy to the opposite fleet type commander). The two type commanders will then forward to the Bureau of Ships their recommendations concerning the proposed alteration together with a list of the ships affected. A justification of any variation from the standardization policy expressed in article 67-11.2 shall be specifically included, if applicable. (See articles 67-38, 67-113, and 67-123)

67-149. INSPECTION AND TEST

Inspection and Tests of electronic equipment and systems shall be made at least once during each ships training cycle and at each other times as necessary to determine the state of readiness of equipment in questionable condition, to compare its condition with previously established standards for the purpose of detecting deterioration (e.g. preventive maintenance checks), or to demonstrate the readiness of equipment after installation, overhaul, repair, or alteration e.g., post overhaul inspection. All tests are considered to include some inspection, and vice versa. The words are used herein are not mutually exclusive unless so specified.

67-150. CONDITION OF TEST

1. *For equipment.* Equipment tests shall be conducted as specified in the applicable POMSEE publication, or technical manual if the former or other bureau approved standard is not provided.

2. *For systems.* Insofar as is practicable and feasible, all systems tests shall be conducted under controlled condition, e.g. at a test and calibration facility. When it is necessary to test a system under other than controlled conditions, e.g. at sea, the test should be so conducted that it will simulate a repeatable test.

67-151. KINDS OF TESTS

1. *Basic Tests.* These are the measurements and observations which are taken to determine agreement or nonagreement with previously established references or standards for any portion of an electronic equipment or system e.g. Electronic Maintenance Standards, Part I, for the purpose of locating and correcting malfunctioning of the equipment or system.

2. *Equipment Tests.* These are the measurements taken to determine agreement or nonagreement with established standards for a complete equipment, e.g. accomplish performance standard sheet measurements.

3. *System Tests (Ships).* As used in this chapter these tests are those which are made to determine the overall performance capabilities of a system on a specific ship.

a. For systems wholly contained *within* the ship (e.g. radio remote control system; radar repeater system etc.) this normally involves "proof of operation" by the manipulation of the various units of the system and the measuring and recording the levels of control and signal voltages received and emitted, e.g. continuity and attenuation measurements.

b. For systems (both active and passive), whose efficiency is dependent on antennas, transducers, etc. to radiate or receive energy, these tests involve the determination of the efficiency of the devices and their associated signal conducting hardware e.g. waveguide, antenna trunk, R.F. cable, multicoupler, etc. and the recording of the radiation and receiving pattern of the specific ship. These tests will normally be conducted at a test and calibration facility.

4. *Acceptance Test.* This is a test conducted by the repair activity in the presence of the ship's representative for the purpose of demonstrating the satisfactory completion of a work item.

a. For new equipment and systems installations accomplished as the result of a Bureau of Ships funded SHIPALT, the installation activity shall certify that the equipment meets the standards specified in the Electronics Maintenance Standards—Part I and meets or exceeds the measurements in Table II of the Performance Standard Sheet where the latter is available. (The information in Table I of the Performance Standard Sheet is normally obtained during the Post Overhaul Inspection.)

b. For job orders involving Class A or Class B Maintenance (See article 67-39) on equipments or systems, and for new equipment and system installations funded by the fleet, the repair or installation activity, as appropriate, shall certify that the equipment meets or exceeds the standards provided in Table II of the applicable Performance Standard Sheet. (The information for Table I of the Performance Standard Sheet is normally obtained during the Post Overhaul Inspection.)

c. For job orders involving Class C Maintenance (See article 67-39) the repair activity shall demonstrate satisfactory completion of work by accomplishing, certifying and recording the Maintenance Standards—Part I measurements for the units in which the repairs were accomplished.

67-152. INSPECTIONS (SHIPS)

1. *Material Inspections.* Material readiness inspections are conducted approximately three months prior to scheduled shipyard overhauls. This inspection includes the preparation of a work list of electronics items to be accomplished. (See latest revision OPNAVINST 3590 1(A).)

2. *INSURV Inspections.* Triannual Material Inspections are conducted by the Board of Inspection and Survey to determine the material readiness of electronics equipments and systems and to establish Work Requests covering deficiencies (See Article 2016-Navy Regulations). Whenever practical these inspections are held in advance of the regular overhaul and in lieu of the material inspections.

3. *Arrival Inspections.* Arrival inspections for electronic equipments and systems are conducted upon or before the arrival of a ship for overhaul. This inspection is authorized by the type commander and includes the determination of the condition of the equipment and system, and the preparation of a list of the repairs required to insure effective electrical and mechanical operation, for inclusion in Work Requests.

4. *Material Readiness Inspection (Electronics).* It is the purpose of this inspection to insure compliance with article 0417, Navy Regulations, as it applies to determining the material readiness of shipboard electronics equipment installations under the technical control of the Bureau of Ships. This inspection should be conducted once during each ships training cycle and shall be supervised by an officer, qualified in electronics, who, if practicable, will be assisted by an engineer furnished by the Bureau. In the interest of reducing costs and conserving manpower, it is recommended that this inspection be conducted concurrently or as a part of the Material Inspection, INSURV Inspection, or Arrival Inspection as applicable. In performing this inspection, the following should be included:

a. *Performance Inspection.* A performance inspection includes but is not limited to the following:

(1) Make the basic measurements listed in Table II of the Performance Standard Sheet for those equipments and systems designated by the inspecting officer as being essential in carrying out the primary mission and task of the ship (See NWIP 1-1) being inspected.

(2) Conduct system tests on designated systems at a test and calibration facility. If any of these tests are not done at the time of the inspection, they should be accomplished shortly before or shortly after the inspection, in this event additional Performance Standard Sheet Table II measurements shall be taken at the time of the system test.

(3) Accomplish Performance Standard Sheet—Table II measurements on representative quantity of multiple installed equipments if not included in a. above.

(4) Conduct interference tests to determine:

(a) Compatibility of operation with other installed electronic equipment.

(b) Source and amplitudes of electronics interference caused by nonelectronic equipments.

(5) Listing all approved modifications (field changes, SHIPALTS, NAVALTS, etc.) required, but not accomplished.

(6) Listing all unauthorized modifications that have been made on installed equipments.

b. *Physical Inspection.* A physical inspection includes but is not limited to the following:

(1) Visually inspected and determine condition and adequacy of all:

- (a) Repair parts.
- (b) Test equipment.
- (c) Allowance documents.
- (d) Tools.
- (e) Equipment.
- (f) Ventilation of equipment spaces.
- (g) Safety signs and features in electronic spaces and topside area.

(2) Visually inspect communication antenna system for broken or frayed wires, insulators, cross arms, stays, etc.

(3) Determine:

- (a) Condition of internal wiring and harnesses.
- (b) Condition of cables which are exposed to stack gases and weather.
- (c) Condition of internal mechanical gearing assemblies.
- (d) Adequacy of arrangement for equipments and systems.

c. *Maintenance Administration Inspection (Electronics).*

(1) Does ship have an established procedure for:

- (a) Submitting timely revisions to NAVSHIPS 4110.
- (b) Submitting all electronic equipment failure reports on DD 787.
- (c) Submitting performance and operational reports on NAVSHIPS 3878.
- (d) Submitting record of field change NAVSHIPS 37.

(2) Does ship have an established procedure for maintaining the currency of electronics publications, i.e. technical manuals, notices, etc?

(3) Does the ship have an established and operating Preventive Maintenance Program?

(4) Determine:

(a) Currency of Resistance Test Record (NAVSHIPS 531) files and report any cases of noncompliance with standards.

(b) Percentage of failure reports submitted vs actual failures.

(5) Is the ship maintaining a "Current Ship Maintenance Projects (CSMP) file in accordance with Chapter 6 Article 6-53 of the Bureau of Ships Manual?

(6) Is the ship maintaining the Repair Record, NAVSHIPS 529?

(7) Is the ship maintaining the Alteration Record, NAVSHIPS 530?

(8) Is the ship maintaining the Electronic Equipment History Card, NAVSHIPS 536?

d. *Personnel Inspection (Electronics).* This inspection shall include but is not limited to the following:

(1) Information regarding whether the quantity and rates of electronics personnel on board meets the ship's allowance.

(2) Information regarding whether the electronics personnel provided to the ship are capable of supporting the allowed equipment.

(3) Does ship have an established program for on-the-job electronics training?

(4) Does the ship have an established program and schedule for the attendance of onboard personnel at fleet and BUPERS electronics schools?

e. *Reports.* The report prepared as the result of the inspection shall:

(1) State whether the condition of each electronic equipment, installation, and system inspected is *satisfactory or unsatisfactory*. An equipment or system is considered to be satisfactory if it meets or exceeds the requirements prescribed in article 67-152.4.a(1) and (2) above, and unsatisfactory if any of these requirements are not met.

(2) List complete details on known defects and the action required to correct deficiencies.

(3) Include comments regarding any good or bad features noted during the inspection of the ships electronics installation.

(a) The commanding officer shall be advised of the results of this inspection as soon as practicable in order that the list of deficiencies may be included in work requests.

(b) Copies of the inspection report shall be furnished to the Bureau, the overhaul activity, and the appropriate service force and type commanders. The inclusion of the inspections listed in (1), (2), (3), and (4) or any part thereof in the Material, INSURV, Arrival, or other inspection and the submission of a copy of that inspection report to the Bureau and scheduled overhaul activity complies with that specific requirement of the Electronic Material Readiness Inspection.

(c) This procedure does not relieve the ship of the responsibility for submitting work requests covering *all known* defects and deficiencies in the ships electronics equipments, installations and systems.

f. *Post Overhaul Inspection (and Test).* (Also refer BUSHIPS Manual, Chapter 8.) This inspection is for the purpose of furnishing the commanding officer of a ship a report on the condition, capabilities, and limitations of his electronic equipment and systems. This inspection is normally made at a test and calibration facility and shall include new installations of equipments and systems and those equipments and/or systems which were included in Class A or B maintenance job orders. In addition, ships desiring this service on equipments and systems not included above should include it as an item in the work list.

67-153. WORK BEYOND CAPACITY OF FORCES AFLOAT

Electronics maintenance or repair work, which is beyond the capacity of forces afloat, will be accomplished by naval shipyards, naval stations or ship repair facilities upon receipt of approved work requests from the vessel concerned or in accordance with approved arrival conference reports.

67-154. INTERFERENCE REDUCTION PROGRAM

1. The increased number of electronic and electro-mechanical equipments required to meet modern military

needs has placed great importance on the elimination or suppression of interference produced and/or received by these equipments. The Interference Reduction Program provides for the investigation and correction of interference, and the establishment of standards and criteria which will apply to all equipment and devices installed or operated in areas under investigation.

2. The shipboard interference reduction program is described and outlined in Bureau of Ships Instruction 9671.11. The principles and practices underlying shipboard interference and its suppression are included in NAVSHIPS 900,171 (Electronic Installation Practices Manual, Ch 19). Measuring and locating techniques are also contained in NAVSHIPS 91828 (Test Methods and Practices). Forces afloat should make every effort to locate and suppress interference that becomes manifest during a ship's training cycle.

Part 2. Shore Electronic Equipment

67-161. RESPONSIBILITIES

1. *General.* Operational and training requirements for electronic equipment under the technical control of the Bureau of Ships are stated or approved by the Office of the Chief of Naval Operations. These requirements reflect the electronic needs of an activity to perform its mission. A statement of requirements involves departmental action by OPNAV, a management bureau, and a technical bureau. When new or expanded public works facilities are needed, the Bureau of Yards and Docks also becomes involved. The Bureau of Ships acts as the coordinator in electronics matters at the departmental level and provides guidance to the cognizant maintenance authority for project implementation. Electronic equipment under the technical control of the Bureau of Ships is used in practically all shore activities. The major portion is installed in:

- a. Activities of the naval communication system under the management control of the Chief of Naval Operations.
- b. Naval air activities under the management control of the Bureau of Aeronautics.
- c. Training activities under the management control of the Bureau of Personnel or the Bureau of Aeronautics.
- d. Fleet activities based ashore.
- e. Naval shipyards, laboratories, and other activities under the management control of the Bureau of Ships.
- f. Naval stations under the management control of various bureaus and offices.
- g. Advanced base functional components (assembled) at naval supply depots.

2. *Departmental Responsibility.* The Division of responsibilities for shore electronic material matters at the departmental level is as follows:

- | | |
|---|------------------------------|
| a. Statement of requirements. | OPNAV |
| b. Programming, funding, justification, and administrative coordination. | *Management Bureau or Office |
| c. Design, development, technical evaluation, procurement, installation, maintenance, and technical coordination. | BUSHIPS |

*Exceptions to this division of responsibility exist for Training, Radiac and Cryptographic equipments for which the Bureau of Ships has certain budgetary responsibilities.

3. *Field Responsibility.* Certain authority and duties in connection with technical control over all items affecting shore electronic material matters which are the responsibility of the Bureau of Ships are delegated to the maintenance authorities. (See article 67-21 and 67-22). The responsibilities and authority of the maintenance authority apply to all electronic equipment and systems under the technical control of the Bureau of Ships. These responsibilities include, but are not limited to the following:

- a. Program implementation
- b. Site surveys
- c. Installation planning
- d. Systems design
- e. Engineering and technical consulting
- f. Maintenance standards
- g. Acceptance tests and adjustments
- h. Inspections and tests
- i. Installation and/or maintenance assistance when requested.

These responsibilities may be extended to certain equipment under the technical control of other Bureaus by specific assignment by the Bureau of Ships or on request of the district commandant, area, sea frontier or fleet commander, or the commanding officer of an activity. Work requests may be received from the district command, area, sea frontier or fleet commander, commanding officers of activities, the Bureau of Ships, other bureaus or offices of the Navy Department and other government agencies with the approval of the Bureau of Ships. If a request that is not covered by a Bureau of Ships assignment is received for work on equipment or systems not under the technical control of the Bureau of Ships, the work may progress at the discretion of the maintenance authority, but the Bureau shall be advised of the request and action taken. For example, the AN/FMQ-2, AN/GMD-1, and AN/CPS-9 are under the technical control of the Bureau of Aeronautics, but assistance may be requested of the maintenance authorities for installation or maintenance. In accordance with BUSHIPSINST 11,120.1, close coordination is to be maintained between the maintenance authorities and the District Public Works Offices to insure proper guidance in the advance planning of shore electronic facilities.

67-162. CHANGES TO EXISTING FACILITIES

1. Changes in or additions to existing installation of electronic equipment and systems under the technical control of the Bureau of Ships are sometimes needed to meet changing operational requirements. When this occurs, the following action shall be taken.

a. The Commanding Officer will initiate a request to the cognizant maintenance authority for recommendations, preliminary plans, and cost estimates to accomplish the work desired. The request shall contain information regarding the operational requirements for the proposed change, extent of the work to be accomplished by station forces, if any, and the availability of equipment required.

(1) Comments and recommendations regarding the suitability of the proposed change to meet operational

requirements, availability of equipment and material required, alternative methods of meeting the operational requirement more economically, and technical information which may be of value to the Commanding Officer in evaluating the information provided.

b. Upon receipt of a request, the maintenance authority shall make the necessary investigation site survey, prepare preliminary plans and specifications, prepare cost estimates, and forward this information to the commanding officer of the activity concerned. Information to be furnished shall include, but not be limited to, the following:

(1) An equipment layout plan, showing the location of the change or addition in relation to other equipments in the building, or in the case of changes not affecting equipments, such as an addition to an antenna system, the complete system will be shown with the change or addition indicated thereon.

(2) If appropriate, a single line or block diagram depicting the operational capability of the change or addition.

(3) A plan showing the location of the change or addition in relation to other facilities on the station. This may be included on the equipment layout plan or on a marked up copy of the latest General Development Plan, Part III, Section 2.

(4) An estimate of the cost of accomplishing the work, based on the information provided by the activity as to the desired method of accomplishment. Engineering costs for preparation of detailed plans shall be shown as a separate item.

c. For very new equipments or systems for which advance technical information is not available in the field, the maintenance authority may request the Bureau of Ships to provide initial engineering assistance in siting, planning and estimating.

2. Upon receipt of the recommendations and cost estimates from the maintenance authority, commanding officers shall take action in accordance with one of the following alternatives if they wish to continue with the project.

a. In the event station forces are to accomplish the work, the following procedure is to be used:

(1) The commanding officer shall prepare complete installation plans, including cabling and wiring diagrams, material lists, and a proposed installation schedule. This data shall be forwarded to the cognizant maintenance authority for approval prior to start of work. Upon receipt of maintenance authority approval, station forces shall accomplish the installation.

(2) Upon completion of the installation, the maintenance authority shall be advised and shall then conduct acceptance tests in accordance with article 67-168.1 and 2 prior to placing the equipment in an operational status.

(3) Upon successful completion of the acceptance tests, the maintenance authority shall advise the commanding officer, in writing, that the installation is satisfactory. (See article 67-167 for turnover procedure)

b. In the event that the commanding officer desires that station forces accomplish the work but that installation plans be prepared by the maintenance authorities, the following shall apply:

(1) A request and funds shall be forwarded to the latter who shall prepare the plans. Plans shall be approved by the commanding officer prior to release to the activity to perform the work.

(2) Upon completion of the installation, the commanding officer shall notify the maintenance authority who shall conduct acceptance tests and advise that the installation is satisfactory in accordance with paragraphs 2.a(2) and 2.a(3) above.

c. If the commanding officer desires that the maintenance authority prepare installation plans and accomplish all, or any part of the work, the following procedure is to be used:

(1) A request and funds shall be forwarded to the maintenance authority. The request shall contain a realistic completion date requirement with sufficient justification to support material and labor priorities, if required.

(2) Upon receipt of the request, the maintenance authority shall integrate the project into workload schedules. At any time, if it appears that the completion date requested cannot be met, the commanding officer shall be so advised.

(3) Upon completion of the installation and acceptance tests, the maintenance authority and the commanding officer or his designated representative shall inspect the installation. If corrective measures are required, appropriate action shall be taken and another inspection conducted. When the installation is considered to be satisfactory, the maintenance authority shall prepare a completion report, including test data and as installed plans, and forward them to the station with request for formal acceptance of the installation.

d. If the commanding officer desires to accomplish the project but funds are not available locally, he shall initiate a request for funds to his management bureau or office via the Bureau of Ships, with copies to the maintenance authority. The maintenance authority's recommendations and cost estimates, prepared in accordance with paragraph 1.b above, may be used as an enclosure to eliminate the necessity of routing the request via the maintenance authority. Upon receipt of funds, the commanding officer shall proceed as outlined in paragraph 2 above.

3. In the event of an emergency which precludes following the procedures outlined above, the commanding officer shall advise the maintenance authority by telephone, message, or other means as promptly as possible of the action taken and shall follow up with written requests in accordance with procedures outlined.

67-163. MILITARY CONSTRUCTION PROJECTS

The maintenance authority through coordination with the District Public Works Officers, DIRPACDOCKS and DIRLANTDOCKS, shall insure that Master Shore Station Development Planning is complete from a shore electronics standpoint. Preferably there should be a maintenance authority designee to review all planning of this type to determine that new electronics facilities are included and that proposed new facilities will not jeopardize the integrity of existing electronics facilities. At the time a project which includes electronics is authorized for advanced planning by the Chief of Naval Operations Shore Station Development Board, the sponsoring bureau or office furnishes the requirements and scope of the project to the

Bureau of Ships as a basis for planning. The Bureau of Ships determines space, equipment and other technical requirements and forwards same to the maintenance authority. The maintenance authority then prepares detailed technical information and cost estimates and provides necessary technical assistance to the District Public Works Office. The maintenance authority shall insure conformance to established criteria in NAVSHIPS 92675, Handbook of Naval Shore Station Electronics Criteria, and shall conduct site surveys and engineering studies as necessary. The data shall be recorded in detail but not made a part of the advance planning document. The detailed study and supporting information shall be retained on file for Bureau call if required for project justification. Projects in the shore station development program are handled at the departmental level through the Chief of Naval Operations Shore Station Development Board in the manner prescribed in current documents. Projects must be defended by the sponsoring management bureau with the assistance of the technical bureau involved. Projects which are approved for implementation shall be accomplished under the terms of the responsibilities stated in article 67-161.

67-164. MAINTENANCE

1. 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. See article 67-11.1. 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 expenditure 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. Corrective maintenance, except Tender/Yard maintenance shall be the responsibility of the respective commanding officers. When personnel are not available, the commanding officer shall request assistance from the cognizant maintenance authority. If it is determined to be more economical to accomplish maintenance by contract, it shall be done in accordance with technical specifications provided by the maintenance authority. The maintenance authority will pass on the technical competence of the prospective contractor.

2. Guides used in maintenance shall include, but not be limited to the individual technical manuals, performance standards, current maintenance bulletins, Electronics Information Bulletin, and applicable articles of the Bureau of Ships Journal.

3. Providing funds for maintenance of electronic equipment is the responsibility of the activity requiring the maintenance except for radiac, cryptographic and major maintenance on electronic equipment under the Bureau of Ships technical control which is used for training at USN

schools (including those of the Naval Air Training Command), Naval Reserve Training Activities and Naval Reserve Officers Training Corps Units. Therefore, except as noted, activities obtain their funds for maintenance of electronic equipment from their respective management bureaus.

67-165. USE OF CONTRACTS

The maintenance authority may use locally negotiated contracts for design, installation, and maintenance. In the use of contract services provided by the Bureau, the maintenance authority shall be guided by the policy of the Bureau of Ships. Refer to article 67-13.

67-166. FUNDING

In estimating requirements for funds for any type of work, it is necessary that the maintenance authorities consider the funding procedures and limitations imposed on the use of funds. Estimates for projects of a public works nature which require Congressional approval must take into consideration the time that elapses between the original submission and final allocation of funds. On other types of projects, not only should the amounts be clearly indicated, but also how the work is to be accomplished; i.e. by station or shipyard forces or by contract. It should also be indicated when the work will commence and be completed. This information must be made available to the management bureau so that it may be determined whether allotments or project orders should be used or whether further budgetary action in subsequent years will be necessary.

67-167. TURNOVER OF COMPLETED PROJECTS

The maintenance authorities shall follow the procedure outlined in the Handbook of Naval Shore Station Electronics Criteria, NAVSHIPS 92675 for turnover of a completed project to an operating command. This procedure shall be used for complete new facilities and for installation of a system or system modernization. For installation of replacement equipments, the procedure in article 67-168.1 and 2 shall be used, i.e., operational check-out of the equipment, acceptance signature by the commanding officer or his authorized representative, provision of as installed plans, and familiarization of operating and maintenance personnel with equipment characteristics and functions.

67-168. INSPECTION AND TESTS

1. *Equipment Tests (Shore)*. Each equipment installed or placed in operation shall undergo tests to insure that its actual performance conforms to its specified performance. The cognizant maintenance authority shall prescribe the required tests to be performed.

2. *Systems Tests (Shore)*. In addition to the equipment tests prescribed, a system test shall be performed to ascertain that the system performs the intended function, meets the specifications of the system design and is capable of meeting the operational or training requirement. The tests to be performed shall be those prescribed by the maintenance authority and they shall satisfy the requirement of demonstrating to the commanding officer or his authorized representative the systems satisfactory performance. (See article 67-162.2.c(3).)

67-169. ANNUAL INSPECTIONS

Article 67-127.2.e establishes the requirement for an annual inspection of all shore electronics equipment and systems under the technical control of the Bureau of Ships, and the submission of a report thereon. (Report Symbol BUSHIPS 4730-2). The Commanding Officer of the activity to be inspected shall be advised in advance of the time and scope of the inspection. Special requirements regarding security clearance and advance notice of inspections of shore Security Group Departments or detachments are contained in OPNAVINST 5510.37. The following guides are to be used where applicable:

a. The inspections shall cover all electronic equipment under the technical control of the Bureau of Ships. It shall also include all electronic equipment regardless of type, ground or airborne, employed in crash vehicles and AVR rescue boats located at naval air stations or facilities.

b. A report which summarized the findings of the inspection and provides discrete recommendations for corrective actions shall be made. In addition, a summary of the remedial action taken on deficiencies reported in the previous year's inspection report should be attached to the report in order that reviewing authorities may observe the improved conditions of the activity. The summary shall include recommendations, as appropriate, for overhaul of equipment, the need for replacement of old equipment with equipment of new design, and the need for additional investigation. It should also include an estimate of funds required to correct existing deficiencies when such costs are of a magnitude that exceeds the normal day to day expenditure from the activities' maintenance and operating allotments. It is intended that this be confined to approximate on the spot estimates made at the time of inspection and not of the type that requires planning or design work.

c. No tabulation of data is required. Detailed data that may be accumulated as a result of the inspection should be retained in the files of the maintenance authority performing the inspection and should not be forwarded to the Bureau as part of the report.

d. The report of an annual inspection is to be submitted to the Bureau of Ships via the commanding officer of the station and the Commandant of the District, with an advance copy to the Bureau of Ships and to the management bureau of office concerned. The report is to contain appropriate comments and recommendations as to what corrective measures should be taken to eliminate deficiencies. The above annual inspection report is not intended to include data normally included in the Annual Inspection of Public Works and Public Utilities initiated by the Bureau of Yards and Docks nor is it intended to include data that may be requested by the Chief of Naval Operations under a separate report. Reference shall be made to such reports where appropriate and essential to a more complete understanding of matters covered by the annual shore electronics inspection.

e. The inspection and tests shall include the following:

(1) *Interference.* Make spot checks on or near all the receiving frequencies of the station being inspected to determine if interference is present, which is detrimental to communications. (Include radar, direction finders, and

sonar receivers where applicable.) No meter measurements need to be included in the report. If interference is noted, recommended corrective steps should be included. If operating personnel are aware of any past interference, the information should be recorded for future action, but need not be included in the inspection report. Any special conditions should be noted including specifically those not under Navy control.

(2) *Receiver sensitivity.* Check local maintenance records to determine if receiver sensitivity checks are being made. (This should include sonar, direction finder, and radar equipments where applicable.) If not, spot receiver sensitivity checks should be made as necessary to determine overall conditions. Report unsatisfactory performance, inoperative receivers, and what steps are being taken to correct the conditions.

(3) *Status of encroachment.* Check visually for actual new construction as well as plans for proposed construction which might encroach on the proper operation of electronic equipment. Electrical or electromagnetic interference created by new construction, actual or proposed, should be noted in item (1).

(4) *Antenna fields.* Visually inspect antenna fields and transmission lines to ascertain continuity between the antenna and the equipment. Inspect for broken wires, insulators, cross arms, and supports. Determine if periodic impedance measurement is made on all antenna transmission lines to determine if the VSWR is within specified limits. Refer to NAVSHIPS 92675, Handbook of Naval Shore Station Electronics Criteria. Report conditions observed and steps being taken to rectify same. Report any design deficiencies or suggested improvements. Ascertain that the surrounding area is maintained in a manner which will not adversely affect the operation of the system.

(5) *Shielding, bonding, and grounding.* Inspect bonds and grounds visually and report any deterioration. Correction of deterioration should be accomplished locally. Recommend improvements or modification.

(6) *Conditions and adequacy of repair parts.* The Bureau of Ships can no longer exercise control over using activities' requisitions. However, from an advisory standpoint, the report should include a statement as to whether or not the shore integrated electronic repair parts system has been implemented, if the present allowance of repair parts appears inadequate, adequate, or excessive, and whether or not the parts are efficiently and properly stowed and identified. For mobile equipments such as GCA, which have separately stowed parts, the percent of authorized equipment repair parts on board should be reported.

(7) *Condition and adequacy of radiac equipment and systems.*

(a) Ascertain that operational checks are being performed periodically at all activities having radiac equipment and that adequate maintenance is being accomplished.

(b) Report unsatisfactory equipment and submit recommendations for replacement.

(8) *Condition and adequacy of test equipment.*

(a) Check frequency meters for accuracy against WWV.

(b) Spot check several tube checkers against tubes of known characteristics.

(c) Spot check voltmeters, ohmmeters, and millammeters against known voltages and resistors.

(d) Visually check the condition of other equipment. Report to the Bureau unsatisfactory equipments, recommendations for replacement, and recommendations for increased or decreased allowance.

(9) *Reliability and flexibility of Communication Control Links (CCL) and control circuits.* Make operational check and advise the Bureau of any unusual difficulties encountered with either CCL or land lines used for control. Report the number of channels in CCL or the number of pairs in cables which are available for control circuits and the percentage of loading and adequacy of the system, the efficiency of installation for operational use and the availability of suitable test and monitoring facilities.

(10) *Condition and adequacy of primary power supplies.* Condition of the power equipment is the responsibility of the District Public Works Officer. Advise the Bureau of suggested modifications or additions to this equipment including standby and emergency supplies. Include a statement as to stability and regulation at the point of delivery. This should be provided as information only. Project requests for increased capacity are to be submitted in accordance with management bureaus' instructions.

(11) *Unauthorized modifications.* Report on unauthorized modifications.

(12) *Frequency stability.* No specific checks required. If any equipment is giving continuous trouble, as shown by station logs or frequency discrepancy reports, the Bureau should be so advised with a copy of such reports.

(13) *Harmonic and spurious radiation.* No specific checks required. If certain equipments are creating excess harmonics or spurious radiation, tests should be made and repairs effected as soon as possible. If there is a recurring problem, the Bureau should be so advised.

(14) *Adequacy of personnel.* Report specific shortages of maintenance personnel, in terms of allowance, and comment on adequacy of allowance.

(15) *Safety features.* Advise Bureau of Ships if design changes are recommended to improve safety features including stowage of radioactive materials. Advise commanding officer of the station of unreported minor discrepancies that are noted that may be corrected locally.

(16) *Electronics maintenance records.* Spot check to determine if records are being maintained, with special emphasis on, "Electronic Equipment History Cards NAVSHIPS 536," "Cable Assignment and Cross Connect Records NAVSHIPS 4689 thru 4692 series" and "Record of Field Changes NAVSHIPS 537." (See article 67-127.) Daily maintenance records are an important indication of the thoroughness of maintenance and should be examined for completeness.

(17) *Failure reports.* Determine whether Electronics Failure Reports, DD787, are being submitted for all parts and electron tubes which fail.

(18) *Major outages.* Determine if major outages have occurred as the result of improper design and if a field change is recommended. Reports of outages due to power failures are not required.

(19) *Technical manuals.* Spot check technical manuals to see if they are being kept up to date. The report should merely state satisfactory or unsatisfactory.

(20) *Test and inspection procedures.* Check and advise the station commanding officer if maintenance test and inspection procedures are proper and recommend essential changes to these procedures.

(21) *Use of electronics facilities.* No direct responsibility of the Bureau of Ships but the commanding officer of the station should be advised of discrepancies noted.

(22) *Equipment in excess of allowance.* Spot check and list any electronic equipment (including test equipment) in excess of need. Also report allowance in excess of need.

(23) *Internal security equipments.* Determine material condition of fixed, mobile, and portable internal security, industrial control, and passive defense equipments.

(24) *Facsimile systems.* Determine quality of reproduced copy and average outage per month in hours of leased facsimile equipment.

(25) *Direction finder systems.* Determine that the performance of direction finding equipment and site area meet the following requirements:

(a) Equipment and siting errors do not exceed the requirements for the specific equipment on local calibration curves.

(b) Antenna collector system is maintained in good condition and is kept free of tall plant growth and obstruction.

(c) The requirements set forth in NAVSHIPS 92675 are complied with, as appropriate.

(26) *Air navigational aid equipment*

(a) In addition to the checks required above for all shore installed equipments, a special navigational aid report is required covering the following:

1. Major content of summary of past year's flight tests of air navigational aids; including minimum and maximum ranges determined by such tests, as an indication of overall system equipment performance. Indicate date of last test report included in summary.

2. Reliability of system operation to include reported major outage time.

(b) Comments and recommendations to improve the reliability of service of shore air navigational aid systems are invited when applicable.

1. *Inspection of GCA equipments.* The reports of inspection of GCA equipments made by the overhaul yards may be included by the reporting activities in lieu of a local inspection report.

(27) *Teletype and multicannel telegraph terminal equipment.* Determine if teletype equipment is in proper working order and that routine and major maintenance procedures are being conducted. Inspect multicannel telegraph terminal equipment to insure proper operation of all channels with patching contiguous thereto to permit complete flexibility.

(28) *Miscellaneous.* Determine material condition of other items of electronic material not covered elsewhere in the inspection, such as IFF equipment, infrared, sonar, harbor detection, trainers, etc.

(29) *Facilities.* Consistent with the mission of the station and in the light of the latest technical developments report the present condition of facilities and the need for construction, modernization, or rehabilitation such as; transmitter building, receiver building, antennas, control tower, control cables or CCL, standby power, etc. (It should be noted that the inclusion of such an item in the inspection report does not constitute a project request. The Commanding Officer of the activity concerned should submit these project requests in accordance with the methods and in the format prescribed by the management bureau or office.) For all operational activities (exclude regular and reserve training activities) provide a copy of the latest General Development Plan, Part III, Section 2, marked up to show the location of facilities, buildings with electronic equipment installed, antenna systems, the route of control cables with their sizes, and number of pairs.

67-170. INTERFERENCE REDUCTION PROGRAM (SHORE)

1. The policy governing the shore interference reduction program was promulgated by BUSHIPSINST 10550.54. The objective of this program was to achieve a satisfactory engineering solution consistent with economic considerations and the end use of electronic equipment.

2. The Bureau of Ships coordinates all of the technical and material phases of the program within the Department of the Navy. Corrective action is based on action by the technical or management bureaus. The Bureau of Ships issues standards, specifications, and criteria applicable to all shore electronic facilities and all devices and equipment installed or operated ashore.

3. The maintenance authorities shall provide engineering personnel for assistance in conducting surveys and investigations as required, and shall delineate all electronic areas within which interference control is to be established and maintained. The Bureau of Ships will promulgate standards and criteria governing equipment and devices installed on or operated in sensitive electronic areas.

4. All shore activities shall take all possible action to attain and maintain the required degree of interference control on equipment or devices installed or operated in sensitive areas designated by the maintenance authorities. The activities shall consult the cognizant maintenance authority as to the degree of interference control to be exercised with respect to all devices and equipment installed, to be installed or operated which may adversely affect equipment under the technical control of the Bureau of Ships.

5. All stations shall report to the maintenance authority any interference problems as it arises. If the interference can be, or has been, reduced to an acceptable level by station action the details should be stated. Otherwise, a request for engineering assistance is to accompany the report.

Part 3. For U. S. Marine Corps Equipment

67-181. MARINE CORPS RESPONSIBILITIES

The Commandant of the Marine Corps is responsible for the readiness and total performance of the Marine Corps, including the development and procurement of equipment

and material to meet the overall requirements of the Marine Corps, together with the development of equipment employed by landing forces in amphibious operations. In the implementation of this responsibility it is the policy of the Commandant of the Marine Corps to utilize the facilities and services available within the Bureaus and Offices of the Navy Department to the maximum extent practicable for applied research, engineering study, design, laboratory tests, production planning, contract supervision and other related tasks.

67-182. BUREAU OF SHIPS RESPONSIBILITIES

The Bureau of Ships *has* technical responsibility for and cognizance of Marine Corps electronic equipment within *the* scope of responsibility *assigned by the Marine Corps.*

67-183. RESEARCH AND DEVELOPMENT

1. Upon request of the Commandant of the Marine Corps, the Bureau of Ships accepts technical direction of Marine Corps Research and Development Projects. The Bureau performs the following functions:

- a. Search for technical approaches to the problem.
- b. The translation of military or development characteristics into engineering specifications.
- c. Contractual action and contract administration.
- d. Engineering coordination with other services.
- e. Advising the Commandant of the Marine Corps of progress and funding requirements.
- f. Direction of contractor and/or laboratory effort.
- g. Engineering tests of models.
- h. Shipment of models to service test agencies specified by the Marine Corps.

i. Assistance in obtaining necessary technical instruction of Marine Corps service test personnel.

j. Engineering and maintenance support during Marine Corps service test.

k. Engineering evaluation of test reports.

l. Upon approval for service use by the Marine Corps, preparation of procurement specifications.

2. With reference to Research and Development projects, the Commandant of the Marine Corps performs the following function:

- a. Establishment of a Marine Corps Research and Development Project.
- b. Determination of military or development characteristics and necessary coordination of these with other services.
- c. Budgetary planning and funding.
- d. Monitoring of engineering progress.
- e. Service test.
- f. Approval for service use.

67-184. PROCUREMENT

1. Upon request of the Commandant of the Marine Corps, the Bureau accepts procurement responsibility for appropriate items over which the Bureau exercises technical cognizance. The Marine Corps specifies the exact items desired, the quantities of those items, the applicable overall specifications, and the funds made available for the procurement. Changes affecting operational performance or physical characteristics must be approved by the Commandant of the Marine Corps.

2. In such procurement Bureau of Ships functions include:

- a. Production planning.
- b. Preparation of contract specifications.
- c. Contractual action and contract administration.
- d. Supervision of contractor's performance.
- e. Engineering tests of preproduction and production models.
- f. Coordination of provisioning with designated Marine Corps agency.
- g. Review and approval of technical manuals.

3. Functions of the Commandant of the Marine Corps include:

- a. Approval for service use of the item to be procured.
- b. Budgetary planning and funding.
- c. Establishment of allowances and determination of requirements.
- d. Storage, distribution and issue of the item when delivered to the Marine Corps supply system.
- e. Property accounting for equipment after delivery to the Marine Corps supply system.

67-185. MAINTENANCE

1. Maintenance of Marine Corps electronics equipment is a responsibility of the Marine Corps. This includes procurement and distribution of *repair* parts and crystals, well as all *categories* of maintenance - organizational, field, and depot. *To more accurately define the maintenance operations concerned, these categories are further subdivided into five echelons, which are numbered consecutively from one through five.*

2. The Marine Corps assumes responsibility for procurement and allowances of test equipment and tools required, as well as obtaining and analyzing maintenance records and failure reports.

3. Bureau of Ships technical cognizance includes the responsibility to investigate failures reported to the Bureau, as warranted, and to recommend corrective action.

4. The Bureau of Ships has technical responsibility for alterations and modifications to existing equipment. Decision as to whether to adopt an alteration or modification, with respect to Marine Corps equipment, is made by Commandant, Marine Corps.

Part 4. Military Sea Transportation Service (MSTS)

67-191. BUREAU OF SHIPS RESPONSIBILITIES

The Bureau of Ships is assigned responsibilities in connection with technical and material matters of all commissioned (USS) and in-service (USNS) ships administratively assigned or to be assigned to MSTS as outlined in OPNAV INST 4700.9. These responsibilities are limited to "military features" or "military installations" of the type not found in commercial ships, but which are present aboard MSTS ships for defensive purposes, or to permit activities peculiar to naval employment. COM MSTS INST 4700.2 further delineates the administrative procedures for the maintenance and repair of MSTS ships.

Part 5. U. S. Coast Guard

67-201. BUREAU OF SHIPS RESPONSIBILITIES

The Bureau of Ships shall furnish to the Coast Guard on a loan basis, without payment therefor, all cognizant electronic equipment deemed necessary (by the Navy) to enable the Coast Guard to readily amalgamate with the Navy in time of war.

67-202. U. S. COAST GUARD RESPONSIBILITIES

The Coast Guard is responsible for the installation, operation, upkeep, transportation and maintenance of all Navy owned electronic equipment and parts in its possession.

67-203.

The Coast Guard is authorized to turn in for repair or exchange Navy-owned items of radisc equipment, sonar transducers, bathythermographs and infra-red equipment in accordance with the same instructions and authority applicable to the Navy.

Part 6. Military Assistance Program (MAP)

67-211. FOR MILITARY ASSISTANCE PROGRAM (MAP)

1. The Bureau of Ships shall provide those items of Bureau cognizant electronic equipment needed to fill the requirements for ships being prepared for transfer under MAP.

2. On board electronics repair parts are to be provided as outlined in BUSHIPS INST 4910.8. Procedures for U. S. Navy new construction and overhaul ships shall be used as applicable to furnish ESO with the required data for development of the integrated parts allowance.

SECTION IV. SPECIAL INSTRUCTIONS

Part 1. Crystals

67-221. ISSUE CONTROL

Issues of complete sets of hermetically sealed crystals are controlled by the Bureau of Ships. Issue of individual hermetically sealed crystal units, sets of nonhermetically sealed units and individual nonhermetically sealed units are controlled by the Electronic Supply Office.

67-222. DISTRIBUTION

1. Crystal units under issue control of the Electronic Supply Office are distributed to:

SSD NSC	Norfolk, Virginia
SSD NSC	Oakland, California
SSD NSC	Pearl Harbor, T.H.
NSD	Bayonne, New Jersey
NSD	Newport, Rhode Island
NRF	San Diego, California

2. Complete sets of crystals under the issue control of the Bureau of Ships are distributed to naval industrial activities as required to implement new construction, conversion, and overhaul programs.

67-223. REQUISITIONING

Requisitions for all crystal units shall be submitted in accordance with BUSANDA Manual, paragraph 23888. Crystals required to complete new construction on Public Works Projects shall be ordered by the maintenance authority prior to turn over to the operating activity.

67-224. EXCESS OR DEFECTIVE

1. All crystals returned by ships or stations are to be considered unfit for issue as returned regardless of apparent condition and shall not be placed in stock until tested and found to meet the applicable performance specification by a Bureau of Ships quartz manufacture and repair-facility.

2. Excess or defective crystal units shall be disposed of in accordance with Electronic Supply Office Instruction 4440.30 and modifications thereto.

67-225. BUREAU OF SHIPS SUPPORT FACILITIES

Bureau of Ships crystal unit support facilities are located at Mare Island and Norfolk Naval Shipyards. These are the only facilities authorized to provide the following services:

- a. Test and rehabilitate crystal units returned from ships or stations prior to placing them in stock as issuable units.
- b. Fabricate crystal units.
- c. Salvage usable crystal unit parts.

Part 2. Guaranteed Equipment and Parts**67-231. CONTRACTUAL GUARANTIES ON ELECTRONIC EQUIPMENT, ETC.**

It is the policy of the Bureau, when purchasing electronic equipment, to include in the contract, a guaranty which covers defects in design, material, workmanship, and manufacture of each set of equipment and the major units, parts and repair parts thereof, except batteries, rubber, electron tubes, piezo electric crystals and material normally consumed in operation. The guaranty, in general, covers hidden defects and defects which are not apparent in inspection. In recent contracts it is the practice to require a 1 year guaranty which becomes effective from the date of acceptance of material by the cognizant Inspector of Naval Material.

67-232. FIELD INFORMATION REQUIRED IN EXERCISING GUARANTIES

In the event that defects are discovered, which fall under the guarantee as outlined in Article 67-231, the Bureau should be immediately advised of the nature of the defect and all pertinent information pertaining thereto. This information should be complete and described so that the Bureau can conduct an analysis which would provide basis for claim under the applicable guaranty. If, within 1 year of the acceptance date of an equipment or of components of an equipment, other than the non-guaranty items listed in Article 67-231, any items are found to be defective or fail in service, the failure will be reported to the Bureau by Failure Report Forms DD787 which shall be filled out in detail. Major component and system defects or failures are to be reported to the Bureau by Electronics Performance and Operational Reports NAVSHIPS 3878. Where claim is war-

ranted, the Bureau will advise the cognizant Inspector of Naval Material and the contractor. The activity reporting the defect or failure may be requested to furnish additional information to enable the Bureau to pursue claims under contractual guaranties. Instructions will be provided by the Bureau after a complete analysis of the defects reported.

Part 3. Guaranteed Tubes**67-241. ELECTRON TUBE GUARANTIES**

1. As a general rule, there is no life guaranty on MIL type tubes because each lot of tubes is accepted through a lot life test. In a very limited number of cases, special type tubes are covered by a life guaranty. These are identified by a life hour guaranty certificate which is shipped with the tube by the manufacturer. The life performance records of these tubes should be maintained on this certificate by the user throughout the guaranty period. In case of failure during the guarantee period, the instructions contained on the certificate should be carefully followed.

2. If a ship or activity should, for no apparent reason, experience a series of premature failures of a specific type or types of tubes, such information, along with a brief description of the failure conditions should be immediately forwarded to the Bureau of Ships. Samples of the failed tube should be retained by the activity until reply from the Bureau is received. In many cases such failed tubes may convey valuable information to the manufacturer and their return for examination may be requested.

67-242. ELECTRON TUBE, SPECIAL CASES

If, for information purposes, it is necessary or desirable for the Bureau to receive service life or performance data on new tubes or tubes of a specific type, such information will be requested by special correspondence with the ships or activities operating equipment containing such tubes.

67-243. TUBE LIFE PERFORMANCE RECORDS

The Bureau does not require activities or ships to maintain tube-life performance records except as noted in Article 67-241 above. Such a record card NAVSHIPS 538 is available for employment at the discretion of the activity.

67-244. DISPOSAL OF FAILED ELECTRON TUBES

All failed electron tubes except those the Bureau or the Electronics Supply Office may have expressed interest in (See art. 67-261) may be disposed of without notification of the Bureau of Ships. The Bureau does not require survey action prior to disposal of failed tubes. Special instructions for disposition of radioactive tubes are contained in article 67-314 (Safety Section V) See also Article 67-245 and 67-246.

67-245. DEMOLITION OF ELECTRON TUBES

In disposing of other than radioactive electron tubes, they shall be destroyed to the degree that they are obviously unfit for reissue. When afloat, the envelope shall be broken to assure the tube will sink. The disposition of radioactive tubes shall be in accordance with Article 67-314. (Safety Section V)

67-246. DEMOLITION OF TUBES CONTAINING CRITICAL MATERIAL

All electron tubes contain critical material, but in general, in quantities insufficient to justify an attempt to salvage these materials. Some tubes used in the shore plant and some magnetrons and klystrons contain critical material in quantities which make salvage procedures worthwhile. A list of such tubes and recommended salvage procedures for each will be found in EIB, Bureau of Ships and Electronics Supply Office notices and instructions.

Part 4. Survey and Disposition

67-261. GENERAL

Survey of electronic material (See Article 67-262) under the technical control of the Bureau of Ships is to be accomplished in accordance with the general instructions on survey issued in the United States Navy Regulations, Chapter 19, Section 3 and the Bureau of Supplies and Accounts Manual, paragraphs 26127 through 26137. Approval of the local Bureau of Ships "Maintenance Yard or Maintenance Authority" MUST be obtained prior to disposal action in accordance with recommendations of the survey. Except in cases covered by special correspondence, surveys need not be referred to the Bureau of Ships for approval. The "List of equipment by restoration categories" Bureau of Ships Instruction 1055.10 as published jointly by the Bureau of Ships and the Bureau of Supplies and Accounts under the Restoration Program for Electronics Material shall be used as the guide in preparing surveys.

67-262. ELECTRON TUBE SURVEYS

The Bureau of Ships no longer requires surveys on failed electron tubes.

Part 5. Nomenclature

67-271. JOINT ELECTRONICS TYPE DESIGNATION SYSTEM. (AN SYSTEM) (For more complete details see JANAP 196)

1. Electronic equipments and units are identified in the Joint Electronic Type Designation System ("AN" System) which is controlled by the Joint Communications Electronics Committee (JCEC) of the Joint Chiefs of Staff.

2. AN nomenclature consists of an approved name followed by the type number. For a complete set, the type number will consist of three indicator letters and an assigned number. In the three letter group the first letter designates the type of installation, i.e. "A"=Airborne, the second letter designates the type of equipment, i.e. R=Radio; and the third letter designates the purpose, i.e. R=Receiver. The parenthesis () sometimes referred to as "bowlegs" is used in the type number assignment to provide a more general identification than that provided by a type number assigned to specific designs of the item. A series of sets or units may be identified by the use of the parenthesis after the identifying number, for example, the AN/APS-2(XA-1), AN/APX-2, AN/APX-2A and AN/APX-2B may all be given the more general identification of AN/APX-2().

3. For breadboard, experimental, developmental, and service test equipments (all of these are considered previous to production), a two letter developmental organizational indi-

icator followed by a number is inserted in the parenthesis (i.e. AN/SPS-99(XN-1)). The first letter (X) designates the previous-to-production status and the second letter designates the cognizant developing activity. Successive versions are identified by progressive numerals, for example, (XN-1), (XN-2), (XN-3), etc.

4. When more than one noninterchangeable production version evolves from a developmental project, only one of these will retain the basic identification of the board identification of the previous-to-production nomenclature and the other(s) will get completely new identification. For example, if AN/SPS-99(XN-1) and AN/SPS-99(XN-2) are non-interchangeable developmental models with different characteristics and it is decided to go into production on both, one would be identified as AN/SPS-99 and the other possibly as AN/SPS-114.

5. The omission of the number within the parenthesis broadens the identification to include all breadboard, experimental, developmental and service test versions of a given type number. The type number of an independent major unit, which is not part of or used with a specific set, will consist of a component indicator, a number, the slant, and such of the set or equipment indicators as apply.

6. Component modification suffix letters will be assigned for each modification of a component when detail parts and subassemblies used therein are no longer interchangeable, but the component itself is interchangeable physically, electrically, and mechanically.

7. Set modification letters will be assigned for each modification not affecting interchangeability of the sets of equipment as a whole, except that in some special cases they will be assigned to indicate functional interchangeability and not necessarily complete electrical and mechanical interchangeability. Modification letters will only be assigned if the frequency coverage of the unmodified equipment is maintained.

8. The suffix letters X, Y, and Z will be used only to designate a set or equipment modified by changing the power input voltage, phase or frequency. X will indicate the first change, Y the second, Z the third, XX the fourth, etc., and these letters will be in addition to other modification letters applicable.

SECTION V. SAFETY

Part 1. Safety Precautions

67-281. SAFETY-GENERAL

THE VOLTAGES ENCOUNTERED IN ELECTRONIC EQUIPMENT ARE DANGEROUS-DO NOT WORK ALONE.

1. All electronics personnel must read and become familiar with U.S. Navy Safety Precautions OPNAV 34P1 1953 (8 June 1953), changes 1 and 2 of 1955 and 1957 respectively and subsequent changes as issued.

2. The subject matter of articles 67-281 through 67-314 with the exception of articles 67-290, 67-307, 67-309, 67-311, 67-313 and 67-314 have been included in the various chapters of U.S. Navy Safety Precautions.

3. Safety from the viewpoint of electronics personnel requires full appreciation of various factors and hazards involved: i.e., the precautions necessary in the work of the electrician (ch. 60, sec II); the special precautions due to the employment of power-supply circuits of 5,000, 20,000,

and 44,000 volts, or special precautions due to the use of even higher radio frequency potentials often much in excess of the power-circuit voltages indicated above; the effect of fields existing in the vicinity of antennas and antenna leads which introduce fire hazards, danger of shock to personnel, explosion hazards where ammunition or explosive vapors are present, and hazards (injuries due to falls) incident to men working aloft complicated by possible presence of stack gases and by possible shock, etc. Adequate safety features such as the use of suitable enclosures, provision for grounding, protective interlocks, etc., are required by specifications for electronic equipment. (Military specification MIL-E-16400 (Ships) Electronic Equipment, Naval Ship and Shore General Specification). Specifications for electronics installations require similar protective features or additional features such as the installation of protective coverings (rubber matting in accordance with Military Specifications MIL-M-15562A) on deck areas which may be contacted by personnel engaged in operating and servicing radio, radar, sonar, or countermeasures equipment or associated test equipment where nominal voltage of 115 volts or greater are employed and on operating spaces in the front and rear of power and lighting switchboards. REGARDLESS OF EFFORTS MADE DURING DESIGN AND INSTALLATION, SAFETY DEPENDS ON THE USER BEING CONTINUALLY AWARE OF HAZARDS AND ALERT TO GUARD AGAINST THEM.

4. PERSONNEL MUST ALWAYS REMEMBER THAT THE REMOVAL OF A UNIT OR PART FROM THE NORMAL LOCATION WITHIN AN ASSEMBLY AND THE ENERGIZING OF THE UNIT OR PART, WHILE IT IS OUTSIDE OF THE NORMAL ENCLOSURE, REMOVES THE PROTECTION GIVEN BY BUILT-IN PROTECTIVE FEATURES SUCH AS INTERLOCKS, GROUNDS, AND ENCLOSURES. SINCE THESE SAFETY FEATURES THEN NO LONGER EXIST, SPECIAL PRECAUTIONS AND SAFETY MEASURES MUST BE TAKEN.

5. In addition to hazards referenced above an additional category now being investigated is in the field of microwave radiation hazards to personnel. (See Article 67-309)

67-282. SCOPE OF THESE SAFETY PRECAUTIONS- ADDITIONAL INSTRUCTIONS

The safety precautions contained herein and those contained in equipment technical manuals and the U.S. Navy

Safety Precautions comprise a nucleus for the promulgation of detailed instructions for the safe installation, maintenance, and operation of electronics facilities ashore and afloat. In the event of nonagreement between the safety precautions contained herein and those contained in equipment technical manuals and the U.S. Navy Safety Precautions, see article 01103 of OPNAV 34P1. Commanding Officers afloat and ashore shall issue such additional orders and instructions as are deemed necessary for the protection of personnel.

67-283. DANGEROUS VOLTAGES AND CURRENTS

1. Fundamentally, current, rather than voltage, is the criterion of shock intensity. The passage of even a very small current through a vital part of the human body will cause DEATH. The voltage necessary to produce the fatal current is dependent upon the resistance of the body, contact conditions, the path through the body, etc. When a 60 cycle alternating current, for example, is passed through a man from hand to hand or from hand to foot and the current is gradually increased from zero it will cause the following effects: at about 1 milliamperes (0.001 ampere) the shock is perceptible; at about 10 milliamperes (0.01 ampere) the shock is of sufficient intensity to prevent voluntary control of the muscles and a man may be unable to let go and free himself; at about 100 milliamperes (0.1 ampere) the shock is fatal if it lasts for one second or more. The above figures are the results of numerous investigations and are approximate only because men differ in their resistance to electrical shock. It is imperative to recognize that the resistance of the human body cannot be relied upon to prevent a fatal shock from 115 or lower voltages - FATALITIES FROM AS LOW AS 30 VOLTS HAVE BEEN RECORDED. Tests have shown that body resistance under unfavorable conditions may be as low as 300 ohms and possibly as low as 100 ohms from temple to temple if the skin is broken. Volt for volt DC potentials are normally not as dangerous as AC as evidenced from the fact that reasonably safe "let-go current" for 60 cycle alternating current is 9.0 milliamperes for men and 6.0 milliamperes for women while the corresponding values for direct current are 62.0 milliamperes for men and 41.0 milliamperes for women. The following is a table listing the possible results of a brief contact with 60 cycle alternating current:

BODY AND CONTACT RESISTANCE	CIRCUIT VOLTAGE		
	100 VOLTS	1,000 VOLTS	10,000 VOLTS
Low-500-1000 ohms	Certain Death, Slight burns	Probable Death, Marked burns	Possible Survival, Severe burns
5,000 ohms	Painful shock, no injury	Certain Death, burns probably slight	Probable Death, Severe burns
High - 50,000 ohms	Scarcely felt	Painful shock, no injury	Certain Death, burns probably slight

2. THE VOLTAGES ENCOUNTERED IN ELECTRONIC EQUIPMENT ARE DANGEROUS. The actual value of the voltages involved are indicated in equipment technical manuals. The voltage encountered in receiver installations may be dangerous. Plate voltages up to 180 volts are used with battery operated receivers, and with a.c. line operated receivers higher voltages are used. The precautions herein shall be observed, insofar as they are applicable. Oscilloscope circuits employ voltages corresponding to those used in transmitting equipment. Therefore, similar safety precautions should be observed.

NOTE: Additional hazards may be introduced if personal radio or electronic equipment is used. In certain types of this equipment, the metal chassis or parts of the cabinet may be ALIVE. (See ch. 60, art. 60-28)

67-284. WARNING SIGNS AND GUARDS

Warning signs and suitable guards should be provided to prevent personnel from coming in accidental contact with dangerous voltages, for warning personnel of possible presence of explosive vapors, for warning personnel (working aloft) of poisonous effects of stack gases, etc. Certain types of standard electronics warning signs are available for procurement from the Commander, Philadelphia Naval Shipyard. A list of signs that are available has been distributed to all ships, commands and shore activities. Any warning signs not listed should be ordered on a separate requesting document. The following Bureau drawings have been prepared for activities wishing to make their own signs:

- a. Drawing RE 10B 608B - Warning Regarding High Voltage.
- b. Drawing RE 10AA 529A - Warning Regarding Stack Gases.
- c. Drawing RE 10A 589A - Warning Regarding Explosive Vapors.

67-285. ELECTRICAL FIRES

1. In case of electrical fire:
 - a. De-energize the circuit for equipment involved.
 - b. Sound alarm in accordance with station regulations or ship's fire bill.
 - c. Secure ventilation.
 - d. Report fire to officer of the day, or other designated duty officer by messenger or telephone in accordance with local instructions.
 - e. Attack the fire with equipment available in the immediate vicinity such as portable 15-pound CO₂ extinguishers.
2. When extinguishing an electrical fire, it should be remembered that quick action is required only to de-energize the circuit. When this has been done-STOP! LOOK! THINK! The use of CO₂ (carbon dioxide) fire extinguisher directed at the base of the flame is always best for all electrical fires. (See chapter 93)
3. Vaporizing liquid extinguishers although approved by the Fire Underwriters Laboratory for extinguishing an electrical fire create certain hazards when used. The material is toxic if breathed, absorbed or ingested and the thermal breakdown products are also toxic. The physiological effects are for the most part cumulative. For these reasons among others, this type of fire extinguisher is no longer permitted by the Navy. A solid stream of salt water

or other conducting liquids when directed on energized electrical circuits is dangerous to personnel and extreme care must be exercised to use only fresh water and a fog or spray type applicator. Where voltages exceed 1000 volts, water should not be used on live electrical parts from portable extinguishers.

4. In case of cable fires in which the inner layers of insulation, or insulation covered by armor, support combustion, the only positive method of preventing the fire from running the length of the cable is to cut the cable after it has de-energized, and separate the two ends. (See ch. 60, arts. 60-42 and 60-43.)

67-286. ELECTRIC SHOCK-FIRST AID: TREATMENT: RESUSCITATION-PRONE PRESSURE METHOD

All personnel shall familiarize themselves with the various methods of artificial respiration as shown in NAV-MED publications and the technical manuals for electronic equipment. The more effective and approved back-pressure arm lift, or Holger-Neilson method, supplants previous methods for artificial respiration. Two publications are available for instruction purposes. One pamphlet, the NAV-MED P-5003, Artificial Respiration (Back-Pressure, Arm Lift Method) and one poster suitable for bulkhead display, the NAV-MED P-5002-A, Artificial Respiration, are available in the Navy supply system. Additional copies of each publication may be procured by submitting DD Form 1149 to the Appropriate Forms and Publications Supply Distribution Point. At suitable intervals, the electronics or other cognizant officer should require all personnel normally engaged in operation and maintenance of electronic equipment to demonstrate their practical knowledge of the application of artificial respiration and shall arrange for such additional training as may be necessary for all personnel to attain proficiency.

67-287. WORK TO BE DONE BY AUTHORIZED PERSONS ONLY

Because of the danger of fire, damage to material, and injury to personnel, all repair and maintenance work on electronic equipment shall be done only by duly authorized and competent persons. Where the work involves the use of voltages dangerous to life personnel should not work alone.

67-288. INTENTIONAL SHOCKS FORBIDDEN

Intentionally taking a shock from any voltage is always dangerous and is strictly forbidden. Whenever it becomes necessary to check a circuit to see that it is alive, a test lamp, voltmeter, and other indicating device shall be used. The indicating device employed shall be suitable for obtaining the desired check without jeopardizing personnel. In the case of live circuits, never implicitly trust insulating material when considering personal safety. Treat all wiring as though it were bare of insulation. Insulating material has failed before and may fail again-be on the alert.

67-289. TAGGING OPEN SWITCHES

1. When any electronic equipment is to be overhauled or worked on, the main supply switches or cutout switches in each circuit from which power could possibly be fed shall be secured in the open (or safety) position and tagged. The

tag shall read "This circuit was ordered open for repairs and shall not be closed except by direct order of _____" (the person making, or directly in charge of the repairs). After the work has been completed, the tag or tags shall be removed by the same person.

2. When more than one repair party is engaged in the work, a tag for each party shall be placed on the supply switch. Each party shall remove only its own tag upon completion of the work.

3. Where switch-locking facilities are available, the switch should be locked in the open (SAFETY) position and the key retained by the person doing the work so that only he, or a person designated by him, can remove the lock and restore the circuit.

67-290. TAGGING OF TEMPORARY PROTECTIVE GROUNDS

All circuits over 750 volts shall be grounded for protection of personnel engaged in repair work, such grounds should be located in the vicinity of the working party and shall be properly secured to prevent accidental removal. If the location of the grounding point is not in the immediate vicinity of the working party, the tagging procedure indicated in article 67-289 shall be followed with the wording of the tags suitably revised to cover the applicable conditions.

67-291. OPERATING SWITCHES

1. *Power and lighting circuits.* As a general rule, use only one hand for switching. Keep the other hand clear. One switch only should be touched at one time by one person. Before closing a switch, make sure that:

- a. The provisions of articles 67-289 and 67-290 have been met.
- b. The circuit is ready and all parts are free.
- c. Men near moving parts are notified that the circuit is to be energized. This is particularly important in cases where rotating antennas are energized.
- d. Proper fuses are installed for protection of the circuit.
- e. Circuit breaker is closed.

Ease the switch to a position of safe and quick action and then make the final motion positive and rapid. When opening switches carrying current, the break should be positive and rapid.

2. *Radio frequency circuits.* Avoid breaking energized high voltage output circuits insofar as may be feasible. When other transmitting equipment is in use at the same installation or close by, be on the alert to prevent shock, burn, or other injury to personnel due to energy picked up from adjacent antennas or equipment.

67-292. FUSES

Fuses should be removed and replaced only after the circuit has been completely de-energized. When a fuse blows, it shall be replaced with a fuse of the proper capacity of the nonreplaceable link type and suitable for use at the circuit current and potentials involved. When practicable, a circuit should be checked before replacing a burned-out fuse as such trouble is usually indicative of a circuit fault. Nonconducting fuse pullers shall be used

when removing knife or cartridge type fuses from fuse holders.

67-293. CIRCUIT BREAKERS

Except for operating handles, all parts of circuit breakers are normally conductors. In opening and closing circuit breakers:

- a. Use only one hand.
- b. Keep the hands clear of parts other than operating handles.
- c. Touch only one breaker handle at a time.
- d. Where positive and negative breakers have two handles they shall not be closed at one time.
- e. Close the breaker first and then close the switches.
- f. Trip circuit breakers before opening switches.
- g. Never disable a circuit breaker.
- h. Keep the face turned away while closing circuit breakers. *
- i. Never stand over a circuit breaker while power is on.

*Wearing of safety goggles is recommended while opening or closing nonenclosed types of breakers or switches.

67-294. POWER LINE GROUNDS

Except in an installation where local power conditions require a grounded line as a normal operating condition, power shall be removed from equipment immediately when the power line shows a ground and shall not be replaced until the ground is cleared. Keep all electrical circuits which are not intentionally grounded free from grounds.

67-295. AVOID WORKING ON ENERGIZED CIRCUITS

1. Insofar as practicable, repair work on energized circuits shall not be undertaken. When repair work of an emergency nature or repair work considered essential by the commanding officer is undertaken on an energized circuit, it shall be accomplished under the supervision of an experienced electronic technician or other experienced electronics material or communication officer. In all such work every care shall be taken to insulate from ground the person performing the work and to use all applicable safety precautions. The following precautions shall be taken:

- a. Provide ample light for illumination.
- b. Remove loose clothing and metallic personal accessories such as bracelets, rings, etc.
- c. Insulate worker from ground with dry wood, several layers of dry canvas, sheets of phenolic insulating material, or a suitable rubber mat depending upon conditions involved.
- d. Cover working metal tools with insulating rubber tape or cambric sleeving (not friction tape).
- e. Use only one hand, if practicable, in accomplishing the work.
- f. A rubber glove should be used on the hand not used for handling tools and if the nature of the work permits, rubber gloves should be worn on both hands.
- g. Have men stationed by circuit breakers or switches so that the circuit or switchboard can be de-energized immediately in case of emergency.

h. A man qualified in first aid for electric shock shall stand by during the entire period of repairs.

i. If equipment must be energized after removal from its normal rack or mounting make certain that all parts normally at ground potential such as chassis-frame ground terminals are securely grounded.

2. Circuits employing 300 volts or more. Voltages in excess of 300 volts shall not be measured by probing or holding the test probe in the hands. Whenever measurements are necessary on equipment employing potentials in excess of 300 volts or where rubber gloves cannot be worn, the following precautions and procedures shall be observed:

a. The equipment shall first be de-energized.

b. High voltage capacitors shall be discharged with a suitably insulated shorting or grounding bar. (See art. 67-301.)*

c. Technician shall ascertain that test equipment controls are set correctly for testing high voltage.

d. Test leads capable of carrying high voltage shall be secured on the desired test points by the technician.

e. Technician shall withdraw from the equipment under test making sure he is also free from leads and in good position for making correct meter readings.

f. Equipment shall be energized by assistant standing by switch.

g. After necessary reading is made, equipment shall be de-energized and high voltage capacitors shall be discharged before removing test leads. (See 2.b above.)

h. For each measurement, the above steps shall be repeated as applicable.

* Since capacitor may not be completely discharged when first shorted, this operation should be repeated several times.

67-296. ADJUSTMENT OF ELECTRONIC TRANSMITTING EQUIPMENT

No person should reach within or enter energized electronics equipment enclosures for the purpose of servicing or adjusting except when such servicing or adjustments are prescribed by official applicable technical manuals (instruction books) and then not without the immediate presence and assistance of another person capable of rendering adequate aid in the event of an emergency. Extreme caution shall be exercised when reaching into the enclosures of equipment having internal exposed high voltage points. (See arts. 67-295, 67-300, 67-301 and 67-304)

67-297. INTERLOCKS AND SAFETY DEVICES

Safety devices, such as interlocks, overload relays, and fuses shall not be altered or disconnected except for replacement, nor shall safeguard circuits be modified without specific authority of the Bureau of Ships in each case. Periodic tests and inspections shall be made to insure that they are functioning properly.

67-298. ALL PROTECTIVE ENCLOSURES TO BE KEPT CLOSED AND PERMANENT PROTECTIVE GROUNDS MAINTAINED

All fuse boxes, junction boxes, lever type boxes, and wiring accessories shall be habitually kept closed except when necessary to open. Care shall be exercised to ground

effectively and to maintain such protective grounds on all metal enclosures for electrical and electronic equipment. Care should be taken when painting to avoid painting ground straps. (See ch. 60, arts. 60-24 through 60-28)

67-299. AVOID TROUBLE DUE TO CARELESS HANDLING OF LOOSE METAL PARTS OR LIQUIDS

No person shall take loose metal parts or liquids near or above a starter box or above open electronic equipment. No person shall go above open electronics apparatus with loose metal objects attached to clothing. Stowage or insertion of foreign articles in or near switchgear, control appliances, panels, etc., is forbidden.

67-300. DISCHARGE AND GROUND CIRCUITS

The electrical charge retained by electrical machinery when secured is in certain cases sufficient to cause a severe shock. This shall be considered when making connections to an apparently dead machine. Be safe-discharge and ground all machinery and power tools using an adequately insulated lead for this purpose. Repeat discharge operation several times.

67-301. DISCHARGE CAPACITORS

Prior to touching a capacitor which is connected to a de-energized circuit, or which is disconnected entirely, short circuit the terminals using a suitably insulated lead shorting or grounding bar for this purpose. Repeat this operation several times to make sure capacitor is discharged.

67-302. USE OF PORTABLE CABLE OR LEADS

Portable cables shall be carefully selected for use with safety under the conditions involved. They shall be adequately insulated and of proper length and cross-sectional area. Spliced portable cables are extremely dangerous and shall not be used. (See also ch. 60, arts. 60-25 and 60-30)

67-303. METAL FITTINGS OF WOOD MASTS AND SPARS TO BE GROUNDED

All metal fittings installed on wooden masts and wooden spars of ships shall be effectively grounded by suitable metallic strips, preferably copper not less than 1-1/4 inches wide by 1/16 inch in thickness, in accordance with instructions issued by the Bureau of Ships. They should not be painted.

67-304. WORK ON TRANSMITTING ANTENNAS

1. Personnel shall not be permitted to go aloft near antenna installation while they are energized by electronic transmitting equipment except by means of ladders and landings rendered safe by grounded hand rails or similar structures unless it is definitely determined in advance that no danger exists. This will prevent casualty due to involuntary relaxation of the hands which might occur if a small spark is drawn from a charged piece of metal or section of rigging. The spark itself may be quite harmless, but the "surprise" may set up dangerous reflex action. The voltages or resonant circuits, set up in a ship's structure or section of rigging, will cause shock to personnel or produce open sparks when contact is broken or when momentarily in contact with a metallic object. Personnel of the deck force

or others working on rigging shall be warned regarding the hazards which may exist and the precautions to be observed. Safety belts shall be employed when working aloft to guard against falls. (See art. 67-308)

2. The above precautions should be observed also when other antennas in the immediate vicinity are energized by electronic transmitters unless it is definitely known that no danger exists. Other antennas may be interpreted to mean any antennas on board another ship moored alongside or across a pier or at a nearby shore station.

3. There is serious danger to men aloft from falls caused by radar or other antennas which rotate or swing through horizontal or vertical arcs. Motor switches controlling the motion of radar antennas should be tagged and locked open before men are allowed aloft within dangerous proximity to such antennas.

67-305. PRECAUTIONS WHILE SHIP IS IN DRYDOCK

The electronic equipment of the ship may be energized only with the express permission of the docking officer. The hull must be adequately grounded. Excitation is not to be applied to sonar transducers unless properly immersed. Hoist mechanisms are to be operated only after it has been definitely ascertained that adequate clearance exists for the moving elements within their full limit of travel and that no mechanical damage will be incurred by such operation. This determination is to be made as soon as practicable after the dock is unwatered and if insufficient clearance does exist, positive steps are to be taken to prevent lowering of the transducer by gravity, manual, or power operation.

67-306. CLEANING OF ELECTRONIC EQUIPMENT

1. All electronic equipment shall be cleaned to assure good performance and not for appearance only.

2. Steel wool or emery in any form shall not be used on or near electronic equipment.

3. Sandpaper and files shall be used only with competent advice or not at all.

4. The use of a vacuum cleaner with nonmetallic hose and adequate dust receiver is to be resorted to wherever practicable.

5. The use of solvents is to be resorted to only where absolutely necessary. Some solvents are flammable, others are toxic, and still others are both flammable and toxic.

a. Flammable solvents (alcohol, stoddard, etc.) shall not be used on energized equipment or near any energized equipment from which a spark may be received. Smoking, "hot-work," etc., is prohibited within the immediate area. (See chapter 15 article 15-8 and chapter 60 articles 60-38 through 60-41)

b. When using toxic solvents, personnel shall, if at all possible, work in open, well ventilated areas. When it is necessary to work in closed spaces, personnel shall be given respiratory protection. For types of respiratory protection, see U.S. Navy Manual of Safety Equipment, NAVEXOS P-422 (1954) Section II.

c. In using any solvent for cleaning purposes, care shall be taken to see that only the smallest reasonable quantity of the solvent is brought to the job site. Generally speaking, this would be considered to be one quart, in closed spaces.

d. Suitable warning signs shall be posted in locations where dangerous vapors may accumulate. (See article 67-284)

e. Serious accidents have resulted from the improper use, storage, and handling of carbon tetrachloride resulting in headaches, dizziness, nausea, loss of consciousness and even death. Actually it is four times as toxic as carbon monoxide. A new solvent, methyl chloroform has been approved for cleaning of electrical and electronic equipment and is now available from General Stores under stock numbers FSN 6M-6610-664-0387 (1 gallon) and FSN 6M-6810-664-0388 (5 gallons), (See BUSHIPS Journal September 1957). This new solvent shall be used for cleaning applications in which carbon tetrachloride was previously used. Even though it is less toxic than carbon tetrachloride, the new solvent does present some hazards to personnel and the following precautions must be observed:

(1) Use with adequate ventilation.

(2) Avoid prolonged or repeated breathing of the vapor.

(3) Avoid prolonged or repeated contact with the skin.

(4) Do not take internally.

f. Every effort should be made to prevent the direct contact of the chlorinated hydrocarbons and other solvents with the skin.

67-307. USE OF VOLATILE LIQUIDS

When working with volatile liquids such as insulating varnish, paint, lacquer, turpentine, kerosene, etc., the same precautions discussed in article 67-306 above, for solvents should be taken in dealing with the flammable and toxic hazards of these liquids. (See Chapter 15, article 15-8 and Chapter 60, articles 60-38 through 60-41.)

67-308. HIGH FREQUENCY OPERATING HAZARDS

1. When proper precautionary measures are taken, (see below), the operation of electronic transmitting equipment, in the frequency range of 30 megacycles and below, and having a rated output of 500 watts and lower has been proven safe while handling ammunition, volatile liquids, or gases; during fueling operations involving delivery of gasoline from hoses, spouts, cans, or any place where gasoline vapors are present. PERSONNEL SHOULD BE CONSTANTLY ALERT TO THE FACT THAT EVEN UNDER THE ABOVE OPERATIONAL LIMITS, ELECTRONIC TRANSMITTING EQUIPMENT CAN CAUSE HAZARDOUS VOLTAGES TO BE INDUCED IN THE STANDING RIGGING AND OTHER PORTIONS OF A SHIP'S STRUCTURE, PARTICULARLY THOSE STRUCTURES AND OBJECTS (i.e. PLANES AND HELICOPTERS) WHICH PROTRUDE FROM THE SHIP IN THE SAME PLANE AS THE RADIATING SOURCE. The voltages, or resonant circuits, set up in a ship structure, rigging or other objects will cause shock to personnel (See 67-281.3) or produce open sparks when contact is made or broken, the circuit opened, or when momentary contact is made with personnel or other conductive objects. Operation on higher frequencies (above 30 megacycles) is not considered hazardous in this respect due to the remote location of antennas from the normal working areas in a ship.

The danger of firing electrically detonated guns, *ammunitions, VT fuses, destructors, and other electrically controlled circuits is not great under normal conditions, since construction of these units effectively shields their firing circuits.* During the handling of ammunition, volatile liquids or gases where booms, cranes, or burtoning wires are used, the following precautions must be observed:

- a. Call attention of the deck force or other to hazards involved.
- b. Use an insulated steering hook for guiding boom or crane cables.
- c. Insulate loading hook from burtoning wire, crane, or boom cables by use of manila rope or strain insulators.
- d. Observe all safety precautions with respect to ventilation dangers from sparking, insulation of rigging, etc., as listed in chapters 15 and 18.

2. The hazards referenced above exist mainly due to the operation of the ship's own electronic transmitting equipment. Caution must be exercised also when the antennas of a nearby ship or shore station are energized.

3. Although the many variables encountered on service installations preclude approximation of the possible voltage encountered, the following examples are cited:

- a. Excessive radio frequency pickup from ship antennas has been noted on smokestack guys, davit head spans, and the like.
- b. A similar high radio-frequency pickup has been observed on board ship, particularly carriers, when reeving in or paying out wire cable and wire hawsers when the length involved becomes resonant to the emitted frequency.
4. All precautionary measures required in chapter 15, must be taken to nullify the hazards mentioned above when operating transmitters rated higher than 500 watts.

67-309. RADAR RADIATION HAZARDS

1. The following is intended to warn personnel, particularly those engaged in test and installation work, to exercise extreme care during radar operation to avoid hazards to personnel.

a. Based on an average radiation intensity of 0.01 watts/cm², the following minimum distances from the rotational center of radar antennas are tentatively established as limits beyond which constant exposure (one hour or more) is safe and within which there is a definite hazard from radiation:

RADAR	MINIMUM DISTANCE (FEET)	
	IN AXIS OF PRIMARY BEAM OF NON-ROTATING ANTENNA	IN HORIZONTAL PLANE OF PRIMARY BEAM OF ROTAT- ING ANTENNA
AN/BPQ-2	45	5
AN/BPS-1	10	20 inches*
AN/BPS-2	40	8*
AN/BPS-3	46	5*
AN/BPS-4	20	3-1/2
AN/SPN-6	186	21
AN/SPS-2	340	35
AN/SPS-6	40	9*
AN/SPS-8	175	25
AN/SPS-8A	245	34

RADAR	MINIMUM DISTANCE (FEET)	
	IN AXIS OF PRIMARY BEAM OF NON-ROTATING ANTENNA	IN HORIZONTAL PLANE OF PRIMARY BEAM OF ROTAT- ING ANTENNA
AN/SPS-12	40	9*
AN/SPS-17	35	11
AN/SPS-26	320	37
AN/SPS-28	10	9*
CXRX	152	21
SA, SC series	7	8*
SF _a , SK series	7	9*
SR-3, SR-6	40	9*
SS-1	10	16 inches*
SS-2	11	16 inches*
SV-3	22	4-1/2*

* These limits are the swing-circle safety radius.

The intensity level of 0.01 watts/cm² has been tentatively accepted as a working tolerance subject to further review by the Bureau of Medicine and Surgery. On board ship, normal radar use practices (scanning and tracking) are such that the likelihood of long exposure in the main beam is remote. However, during target examination or testing, it could be anticipated that an antenna would remain on one bearing for an extended period.

b. Do not make a direct visual examination of any microwave radiator, reflector, waveguide opening, or waveguide horn during periods of transmission.

c. Photographic personnel should be cautioned regarding the dangers of exposing photoflash bulbs to radar beams even at considerable distances.

d. Personnel engaged in servicing the equipment, or who must remain in the beam, for any length of time, should be provided with—and required to wear—personal equipment, such as eye protection, equipped with wire mesh screen.

2. Magnetrons, Klystrons, Thyatrons and rectifiers produce ionizing radiation in applications using 15,000 volts or higher. Attention is invited to the fact that they may therefore produce a personnel hazard. Safety precautions should therefore include avoidance to the extent practical, any approach to close proximity of the tubes when in operation and keeping the shielding in between the personnel and the tubes.

67-310. PRECAUTIONS REGARDING ELECTRICAL DETONATORS OR IGNITORS

Electric ignitors, primers or detonators, electrically fired rocket and guided missile motors, electronic or electric ordnance fuses, shall not be stowed in the same compartment with, or be exposed within five feet of, any exposed electronic transmitting apparatus or exposed antenna or antenna lead, except where such electronic apparatus or antenna is a part of authorized test equipment of a weapon or is integral with a weapon containing such components, in which event special instructions pertinent thereto shall apply. See Safety Precautions OPNAV 34P1 Article 08210-8

for further information on electronic transmitter hazards regarding premature firing of electrical blasting circuits by radio frequency energy.

67-311. OPERATING HAZARDS AT SHORE INSTALLATIONS

1. At shore installations, although the hazard conditions improve due to the fact that the space available permits greater separation of antennas and leads from other circuits and structures, the increased power of transmitting equipment increases certain hazards.

a. The grounding of isolated metal parts wherever feasible and the bonding of parts together where grounding is not feasible is helpful in reducing fire hazards and interference. Metal used in building structures and particularly in wood structures, shall be grounded.

b. The fueling of motor vehicles in proximity to antennas and antenna down leads should be avoided or conducted with special precautions. An ungrounded automobile, and ungrounded filling nozzle, the attendant's body capacity when in close proximity to transmitting antennas and down leads will produce sparks sufficient to ignite gasoline vapor when the nozzle contacts the tank opening. Pump nozzles must be grounded at all times, and motor vehicles must also be grounded when fueling and before opening the tank. (See ch. 15) The application of highly volatile and flammable coatings (saran, vinyls, etc.) should not be done in the affected area.

67-312. PRECAUTIONS FOR HANDLING CATHODE RAY TUBES

Wear safety goggles to protect eyes from flying glass particles in event of envelope fracture which might cause implosion due to high vacuum within tube. Goggles which provide side and front protection and have clear lenses which will withstand a fairly rigid impact test are prescribed. Remove tube from packing box with caution, taking care not to strike or scratch the envelope. Insert into equipment socket cautiously, using only moderate pressure. Do not jiggle the tube. These precautions also apply when removing tube from equipment socket. Do not stand directly in front of the tube face. If the tube should implode, the tube base is often propelled directly forward with a velocity sufficient to cause severe injury.

67-313. PRECAUTIONS IN THE HANDLING AND STORAGE OF RADIOACTIVE MATERIALS USED IN CALIBRATING OR CHECKING THE OPERATION OF RADIAC EQUIPMENTS

There is a large variety of types and sizes of radioactive material used in calibrating or checking radiac equipments. The use of the larger sources is restricted to authorized radiac repair facilities. Prior to using a new source assigned to such a facility, the person in charge of the facility shall review its installation and operational procedures with cognizant health and/or safety personnel and receive from these or other appropriate local personnel authority to install and use the new source. Areas where

these sources are used shall be restricted to authorized personnel only and shall be adequately marked. Smaller sources, although also of possible danger, are supplied with equipments for the purpose of field checking the equipments. Proper use or handling of these sources is covered in the technical manuals for the equipments with which they are supplied. If these instructions do not cover the proposed use of the source under consideration, its proposed use should be referred to local health and/or safety personnel. Even in storage, radioactive materials may be harmful to personnel and may expose unprocessed photographic and radiographic films and papers. Precautions must therefore be observed constantly to protect personnel and vulnerable materials from these radiations. More detailed information on the handling and storage of radioactive material and the safety precautions to be observed is contained in NAVMED P-1325, Radiological Safety Regulations, and various Bureau of Standards Handbooks, particularly numbers 23, 42, 48, and 52.

67-314. HANDLING OF TUBES CONTAINING RADIOACTIVE MATERIAL

1. Detailed information regarding the handling, marking, storage and disposition of radioactive material is contained in BUSHIPS letter S67/9-11(871C) Serial 871-268 of 11 Sept 1956.

2. Useless unbroken tubes containing radioactive material, such as radiac spark gap, TR, glow lamp, or cold cathode tubes, should be treated as any other radioactive waste material. They should be sunk intact at sea. In shore installations it is best to collect the tubes in special containers which should be weighted, sealed, and shipped out to be sunk at a convenient time. A plot of land may be set aside in an isolated location to be used as a burial ground. However, the former method of sinking is recommended. If a burial plot is used, it should be adequately posted and supervised.

3. Spark gap, glow lamp, and cold cathode tubes which contain radon gas can be broken up under a ventilated hood, since radon gas is heavier than air. However, burial of such tubes intact or sinking them at sea is the optimum disposal method. If possible, radioactive material that is to be junked should be encased in concrete to insure that no parts will float to the surface when the material is sunk at sea.

4. Any equipment or tools used in crushing tubes or handling radioactive waste should be thoroughly cleaned before using for other purposes, or, if practicable, such equipment and tools should also be buried or sunk at sea. It should be borne in mind that any buried material may at some later date be exposed by land excavation and cause radiation exposures.

5. In the event of breakage, the broken tubes and waste matter should be removed and disposed of in accordance with the following:

BUSHIPS Instructions 5100.5 of 28 Nov 1955, Radiological Safety Regulations, NAVMED P-1325 and BUSHIPS EMB NAVSHIPS 900,000 change 9 Sec 7 Chapter 1. See also EIB No 271 NAVSHIPS 900,023

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