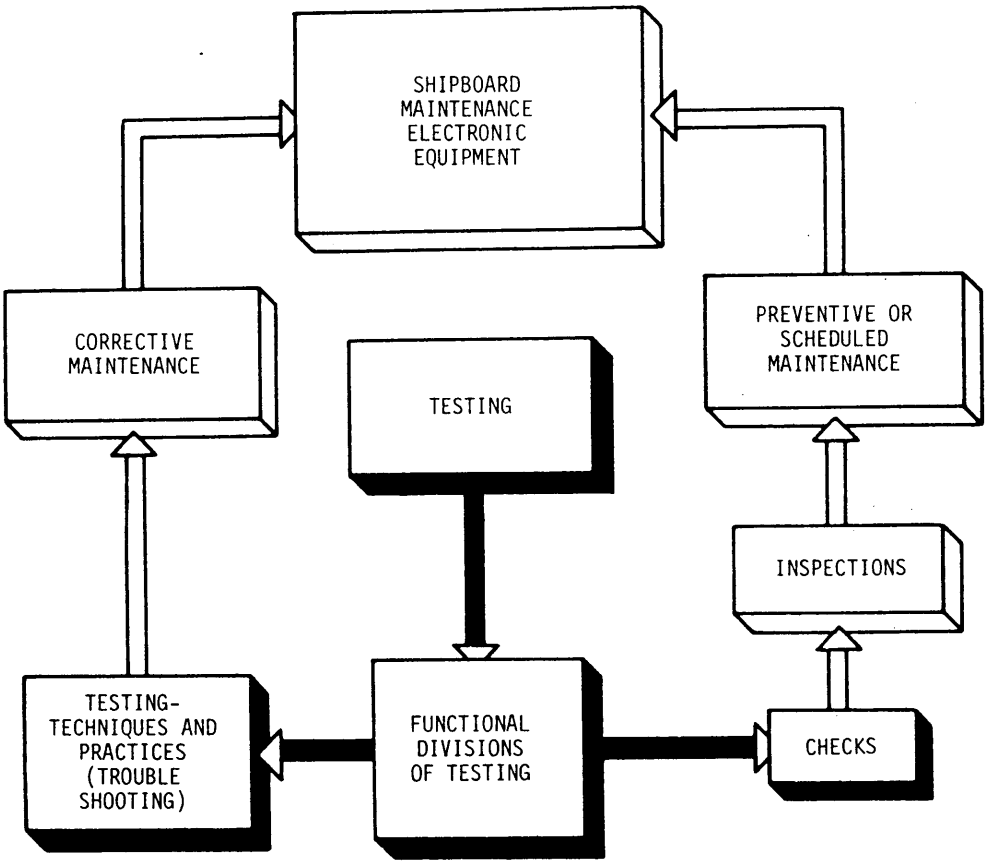
CHAPTER 11

TEST EQUIPMENT

Maintenance of Navy electronics equipment is divided into two main categories, preventive and corrective. As illustrated in figure 11-1, testing is the major function performed by the ET in accomplishing maintenance. You, as a SEMO, will be responsible for the maintenance of most of the electronics equipment in your department as well as some equipment in other departments.

Testing or test procedures may sometimes be referred to as tests, measurements, or checks. These terms are sometimes used interchangeably



162.112

Figure 11-1.—Electronic Maintenance functional diagram.

and overlap in meaning depending upon their use and the results obtained. For example, a power output measurement and a frequency check may constitute a test for the proper operation of a transmitter.

Basic testing procedures and some of the general purpose test equipment used by the ET are discussed in Volumes 1 and 2 of *Basic Electronics,* NAVPERS 10087 (Series) and the *Navy Electricity and Electronics Training Series* (NEETS). Safety precautions to be followed may be found in the *Electronics Technician 3 & 2* Vol. 1, NAVEDTRA 10196. Further information for the processes involved in testing may be found in the *EIMB Handbook on Test Methods and Practices* (NAVSEA 0967-LP-000-0130), and *EIMB Handbook on Test Equipment,* NAVSEA 0967-LP-000-0040. The following paragraphs will introduce you to a primary information source book for test equipment, commonly known as the Test Equipment Index.

ELECTRICAL/ELECTRONIC TEST EQUIPMENT INDEX FOR SUPPORT REQUIREMENTS OF SHIPBOARD ELECTRONIC, ELECTRICAL, IC, WEAPONS, AND REACTOR SYSTEMS, NAVSEA ST 000-AA-IDX-010/PEETE (TEST EQUIPMENT INDEX)

The Test Equipment Index is a guide to assist fleet personnel in identifying portable electrical/electronic test equipment (PEETE) required for support of prime electronic, electrical, IC, weapons, and reactor instrumentation systems. It may also be used as an aid to establish priorities for the calibration of PEETE. In general, the Index should be used in conjunction with the (SPETERL) Ships Portable Electrical/Electronic Test Equipment Requirements List (outlined later in this chapter). Data in the Index is subject to revision periodically as new equipment/systems become available, and new requirements are generated. Hence, incongruities may exist between data in the Index and the SPETERL, depending upon issue date of the SPETERL. Under present procedures, these incongruities will be eliminated automatically in subsequent issues of the SPETERL. The Index does NOT, in any way, supersede or modify the SPETERL, nor does it authorize procurement of, or requisition of, items not listed on the SPETERL. The Index is published on an annual basis in the spring of each year and you, as EMO, should keep a copy in the work center.

TEST EQUIPMENT INDEX SECTIONS

The Index, divided into six sections and five appendices, is outlined in the following paragraphs.

Section I—SCAT Code by Prime Electronic Equipment Requirements

This section is organized by "prime" (AN-SPS-65, AN-SPS-48, and so forth) electronic equipment. It is arranged in alphabetic sequence by the nomenclature of the prime electronic equipment, and indicates the SCAT codes. A SCAT code is a four-digit numeric code used to identify a range of measurement requirements by functional category. Test equipment is assigned SCAT codes in the 4000 to 4999 series. Section I also lists the quantities of test equipment required for support of the prime electronic equipment.

Section II—SCAT Codes by Fleet Supplemental Test Equipment Requirements

Section II is organized by Fleet Supplemental Test Equipment Requirements (FSTER) code, which is a three-digit alpha-numeric code that is used to indicate and identify test equipment requirements for electrical, IC, weapons, reactor instrumentation, workshops, and other "special" electronic and nonelectronic applications, on either a hull or class basis. It is arranged in alpha-numeric sequence by FSTER code, and indicates the SCAT codes and quantities required for support of the requirement indicated by the FSTER code description.

Section III—Support Requirement by SCAT Codes

Section III is organized on a "test" equipment SCAT code basis. It is arranged in

numerical sequence by SCAT code, and indicates the applications or requirements for a SCAT code in support of shipboard equipment/systems.

Section IV—FSTER Codes by Ship Type/Activity

Section IV is organized by ship type and hull. It is arranged in order by the ship type and hull number, and indicates those FSTER codes which are applicable to a particular fleet activity.

Section V—Test Equipment Models by SCAT Codes

Section V is organized on a SCAT code basis. It is arranged in numeric sequence by SCAT code, and indicates the acceptability of alternates or substitutes for test equipment models assigned to each SCAT code.

Section VI—SCAT Codes by Test Equipment Models

Section VI is organized on a test equipment model number basis. It is arranged in alphanumeric sequence by model, and indicates the SCAT code grouping to which a test equipment model has been assigned.

APPENDICES

The appendices in the Index provide other useful information for the EMO.

Appendix A—FSCM and MDS by Manufacturer Name

Appendix A is arranged in alphabetic sequence by the name of commercial manufacturers of test equipment, and provides a cross-reference to the Manufacturer Designating Symbols (MDS), and Federal Supply Code for Manufacturers (FSCM).

Appendix B—Manufacturer and MDS by FSCM

Appendix B is arranged in numeric sequence by FSCM, and provides a cross-reference to manufacturer name and MDS.

Appendix C—Manufacturer Names and FSCM by MDS

Appendix C is arranged in alphabetic sequence by MDS, and provides a cross-reference to manufacturer name and FSCM.

Appendix D—National Stock Numbers by SCAT Code

Appendix D is arranged in SCAT code sequence, and provides the National Stock Number and cognizance symbol for test equipment models (usually the most preferred or recently procured item) in the SCAT code. This data is provided to assist fleet personnel in identifying test equipment stock number for GPETE End Item Replacement (GEIR) or other supply actions.

Appendix E—SCAT Codes by Functional Description

Appendix E is arranged in functional description sequence, and provides a cross-reference to the SCAT code having that functional capability.

ELECTRICAL METERS

The three types of meters frequently encountered are the ammeter, ohmmeter, and voltmeter.

AMMETER

The ammeter is used to measure current. The ammeter consists of a basic meter movement and a combination of resistors. A multiposition switch or a series of pin jacks is sometimes used to connect various sizes of resistors to permit the same meter to be used for different current ranges. An ammeter must always be placed in series with the circuit to be measured. Always have the meter on the highest range before connecting it to a circuit.

OHMMETER

The ohmmeter is widely used by electronic technicians in making resistance measurements and continuity checks. Technicians will find wide use for this instrument in checking cables and locating malfunctioning components in electrical circuits. The ohmmeter consists of a basic meter movement connected as an ammeter, a voltage source, and one or more resistors used to adjust the current through the meter movement. The meter must be adjusted for "zero resistance" prior to making resistance measurements. Care must also be exercised not to use an ohmmeter on an energized circuit.

VOLTMETER

The voltmeter utilizes the basic meter movement. Because the current is directly proportional to the voltage applied, the scale can be calibrated directly in volts.

The sensitivity of voltmeters is given in ohms per volt. This sensitivity is an indication of how accurately voltages in a circuit will be measured. In many cases, a sensitivity of 1,000 ohms per volt is satisfactory. However, if the circuit in which the voltage is being measured has a high resistance, a greater sensitivity is required for accurate readings; thus, the higher the sensitivity, the more accurate the reading. Good technicians are careful NOT to use a meter with low sensitivity to measure circuit parameters due to the "loading effect." This loading will cause incorrect readings and can also cause improper circuit operation.

MULTIMETERS

During troubleshooting, a technician is often required to measure voltage, current, and resistance. To eliminate the necessity of obtaining three or more meters, the multimeter is used. The multimeter contains a voltmeter, ammeter, and ohmmeter in one unit. Multimeters are of two types, electronic and nonelectronic. The nonelectronic multimeter has the advantage of being highly portable and available for quick measurements without a warmup period. The electronic multimeter requires an a.c. outlet and a warmup period; however, it is capable of more accurate readings and measurement of smaller voltages. A nonelectronic multimeter, the AN/PSM-4( ), is shown in figure 11-2.

Multimeters capable of measuring a.c. voltages utilize conventional d.c. meter movements and metallic oxide rectifiers to change the a.c. to d.c. Most multimeters have an accuracy of two to five percent at low frequencies. However, the metallic oxide rectifiers affect the accuracy of the multimeter as the frequency of the voltage being measured increases. When the frequency is above the audio range, the voltage reading is no longer accurate. Where accuracy at the higher frequencies is desired, an electronic multimeter or an a.c. vacuum tube voltmeter should be used.

Multimeter, (SCAT 4245)

The multimeter AN/PSM-4C (fig. 11-2) is designed to permit the technician to make measurements of voltage, resistance, and current with a completely self-contained portable instrument. It can measure either a.c. or d.c. voltage, resistance, or direct current in a wide range of values. This capability covers the basic requirements for a portable tester of this type. All leads and accessories are stored in a compartment built into the cover, which should remain with the instrument at all times. The cover forms a watertight seal when clamped over the face of the meter. While the instrument is in use, the cover clamps over the back of the meter, keeping the accessory compartment convenient to the operator. Batteries are used with the meter to provide the voltage source for resistance readings.

In the accessory compartment, there is a pair of standard test leads (one red and one black) which are used for most applications of the instrument, and a high voltage probe. The SIMPSON Model 260 (CSV-260) is another common multimeter, with similar characteristics, which is widely used.

Multimeter, Digital (SCAT 4237)

Digital multimeter 8000A/BU + HVP is a portable, combination electronic instrument

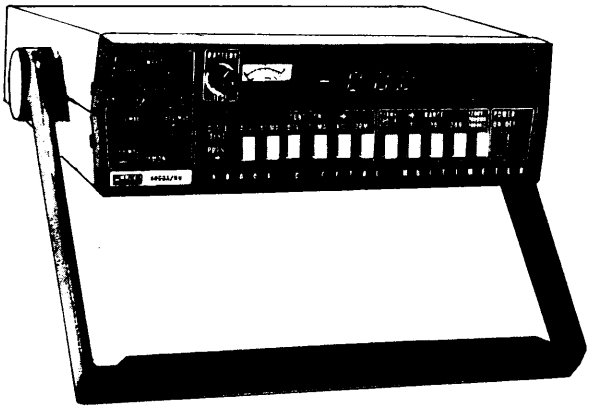
243.371

Figure 11-2.—Multimeter AN/PSM-4C (SCAT 4245).

used for general servicing of electronic equipment. It is designed for use where precise voltage, current, and resistance measurements are required. It provides a direct reading of values on an analog panel meter mounted on the control panel (fig. 11-3). Special design characteristics enable this meter to make voltage measurements with a small percentage of error. A high voltage probe is included.

DIFFERENTIAL VOLTMETER (SCAT 4208)

The differential voltmeter is a reliable precision item of test equipment. Its general function



245.94

Figure 11-3.—Digital Multimeter CCUH-8000 A/BU (SCAT 4237).

is to compare an unknown voltage with an internal reference voltage, and to indicate the difference in their values. The differential voltmeter in most common use in Navy applications is the 803D/AG (fig. 11-4), manufactured by the John Fluke Company. It can be used to measure voltage excursions about a reference value. The meter is accurate enough for the precision work of a calibration laboratory, yet rugged enough for general shop work.

CAPACITANCE-INDUCTANCE-RESISTANCE BRIDGE, (SCAT 4457)

Capacitance, inductance, and resistance are measured for precise accuracy by alternating current bridges which are composed of capacitors, inductors, and resistors in a wide variety of combinations. These bridges operate on the principle of the Wheatstone bridge, in which an unknown resistance is balanced against known resistances. The unknown resistance is calculated in terms of the known resistance after the bridge has been balanced. One type of capacitance bridge circuit is the ZM-11A/U shown in figure 11-5. This instrument is self-contained except for a source of line power, and

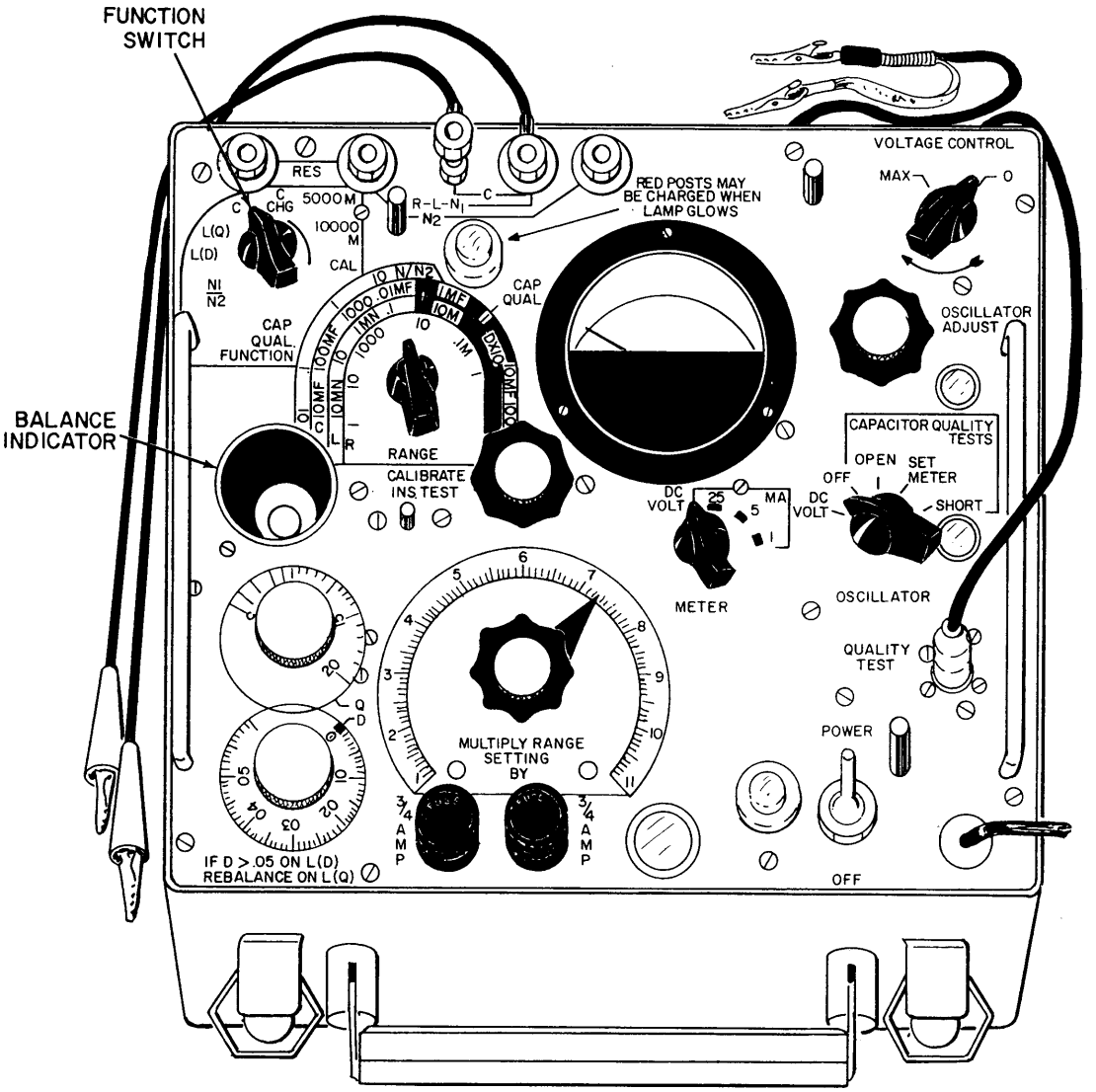
124.375

Figure 11-4.—Differential Voltmeter, Model CCUH-803D/AG (SCAT 4208).

has its own source of 1000-Hz bridge current with a sensitive bridge balance indicator, and an adjustable source of direct current for electrolytic capacitor and resistance testing. The bridge also contains a meter with suitable ranges for leakage current tests on electrolytic capacitors.

(MEGGER) INSULATION TEST SET, (SCAT 4452)

The AN/PSM-2 megger (fig. 11-6) is an instrument that applies a high voltage to the component under test and measures the current leakage of the insulation. Thus, a capacitor or insulated cable can be checked for leakage under much higher voltages than an ohmmeter is capable of supplying. It consists of a hand-driven d.c. generator and an indicating meter. The name Megger is derived from the fact that it measures resistance of many megohms.

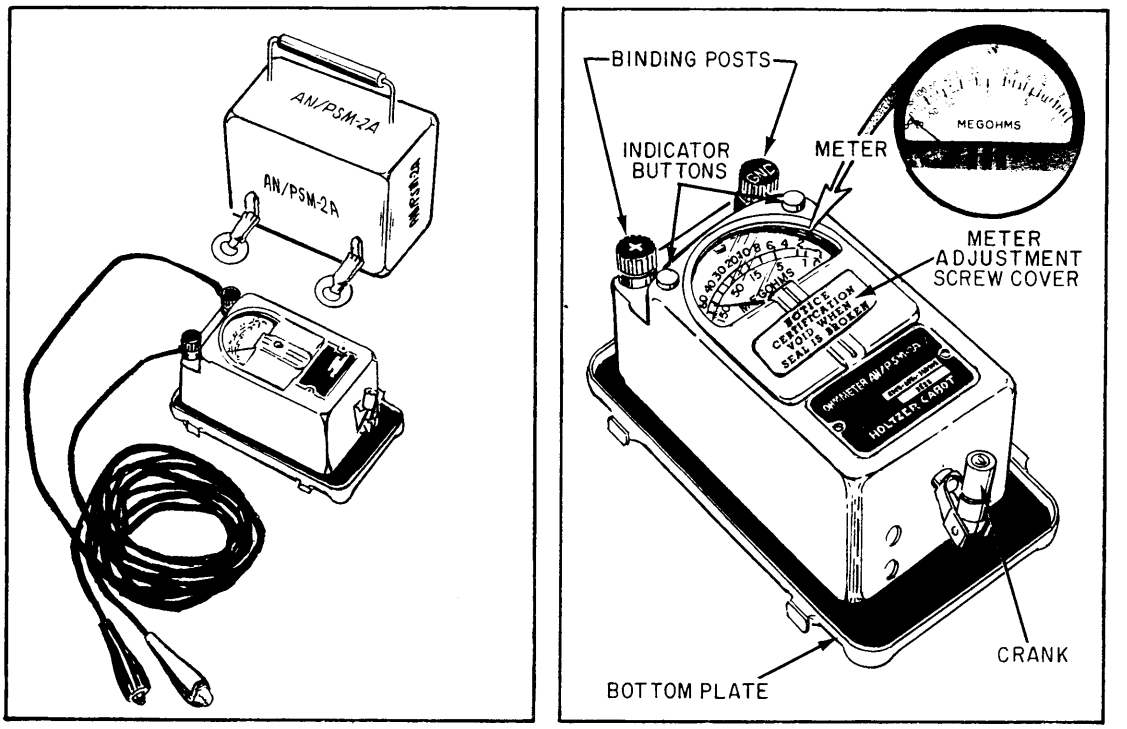


1.68

Figure 11-5.—Capacitance-Inductance-Resistance Bridge (ZM-11A/U) (SCAT 4457).

RF IN-LINE WATTMETER (SCAT 4958)

Wattmeter AN/URM-120 (fig. 11-7) is designed to measure incident and reflected rf power from 10 to 1000 watts with a frequency range of 2 to 1000 MHz. Three coupler-detectors, each rated to cover a portion of the frequency and power ranges, are provided with the wattmeter. Each coupler-detector has a knurled knob which projects through a hole in the top of the wattmeter case. A nameplate on the knurled knob indicates the power range. Centered on the nameplate is the power range knob, which can be rotated 360° to any desired power range. The coupler-detector rotates only 180° along the coaxial primary line inside the metal cases for forward or reverse power measurement.



1.55

Figure 11-6.—Insulation Test Set AN/PSM-2A (SCAT 4452).

SIGNAL GENERATORS

In the maintenance of electronic equipment, it is often necessary to employ standard sources of a.c. energy, both audio frequency and radio frequency. These sources are called signal generators. They are used in testing and aligning radio transmitters, receivers, and amplifiers; they may also be utilized when troubleshooting various electronic devices, and occasionally for measuring frequency.

The principal function of a signal generator is to produce an alternating voltage of the desired frequency, amplitude, and modulation required to meet measurement criteria. It is very important that the amplitude of the generated signal be correct. In many generators, output meters are included in the equipment to permit the output to be adjusted and maintained at a standard level over a wide range of frequencies.

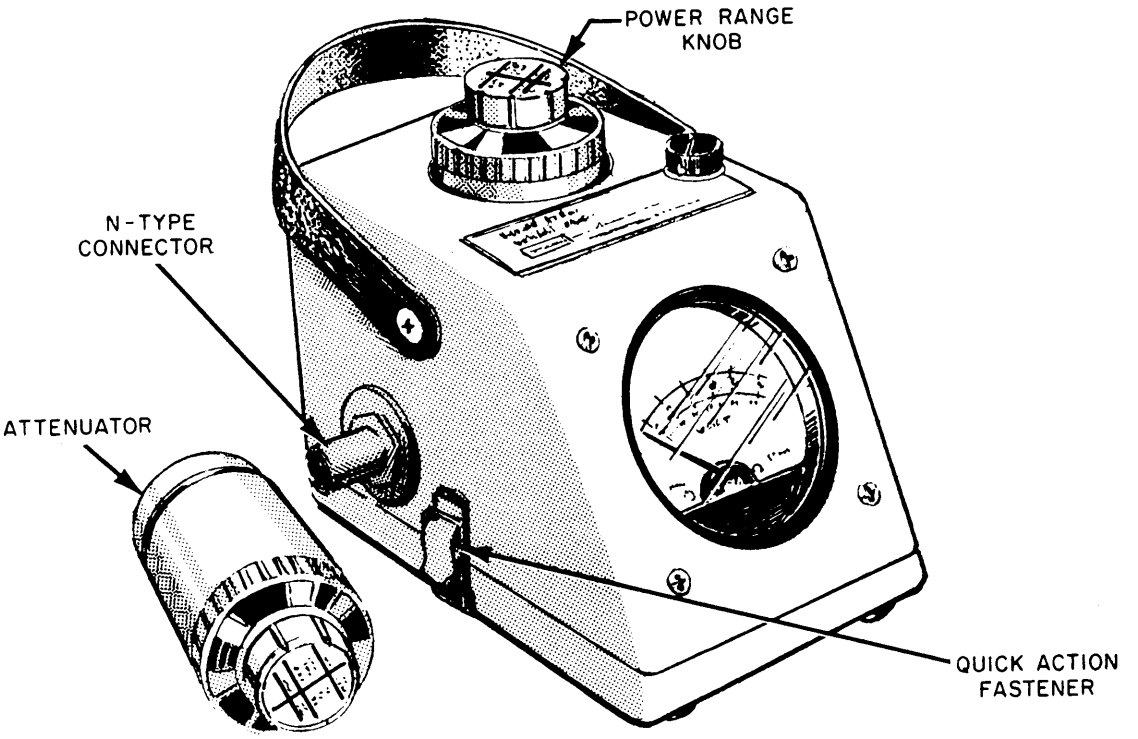
The many types of signal generators may be classified roughly by frequency into audio generators, video-signal generators, radio-frequency generators, frequency-modulated rf generators, and special types which combine some of these frequency ranges.

AUDIO AND VIDEO SIGNAL GENERATORS

Audio signal generators produce stable audio-frequency signals used for testing audio equipment. Video-signal generators produce signals which include the audio range and extend considerably further into the rf range. These generators are used in testing video amplifiers and other wideband circuits.

RADIO-FREQUENCY SIGNAL GENERATORS

A typical radio-frequency signal generator contains, in addition to the necessary power supply, three main sections: an rf oscillator circuit,



162.113

Figure 11-7.—RF in-line wattmeter, AN/URM-120 (SCAT 4958).

a modulator, and an output control circuit. The internal modulator modulates the radio-frequency signal of the oscillator. In addition, most rf generators are provided with connections through which an external source of modulation of any desired waveform may be applied to the generated signal. To ensure that the generator output circuitry is the only source of signal to the circuit under test, metallic shields are utilized to prevent injection of unwanted signals from the oscillator.

FREQUENCY MEASUREMENTS

Frequency measurements are an essential part of preventive and corrective maintenance for electronics equipment. Frequency measurements for radio equipment are made during tuning, preventive maintenance, and corrective maintenance procedures. The type of test equipment selected depends on the frequency to be measured and the required accuracy. Signal frequencies of radio transmitters which operate in the low-frequency to the very-high-frequency range are normally measured by wavemeters, frequency meters, and calibrated radio receivers.

Frequency-measuring equipment and devices, particularly those used to determine radio frequencies, constitute a distinct class of test equipment because of the important and critical nature of such measurements. The requirement of precise calibration is extremely important in all frequency-measuring work. In order to provide accurate measurements, every type of frequency meter must be calibrated against some frequency standard.

FREQUENCY STANDARDS

A frequency standard, although not a piece of test equipment, is presented here because of its frequency-measuring application. The

frequency standard will most often be used with communications equipment. (See Chapter Five.)

Frequency standards are divided into two general categories: primary and secondary standards. The primary frequency standard is determined and maintained by the U.S. Bureau of Standards. It has long-term stability and accuracy that are determined by comparison with a standard interval of time. A secondary frequency standard is a highly stable and accurate standard that has been calibrated against the primary standard.

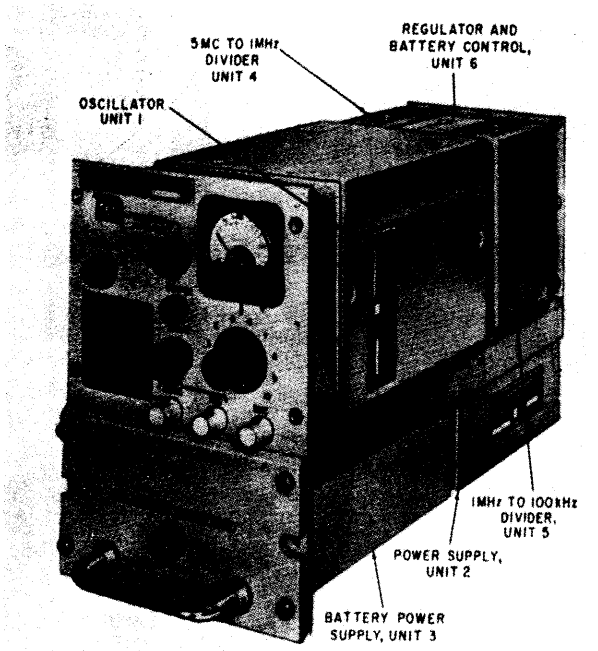
The accuracy of a secondary frequency standard is maintained only when periodic calibration checks are made against a primary standard, or against standard frequency transmissions of radio stations WWVB (60 kHz) or WWVL (20 kHz) in the United States. Special narrow-band receivers, such as the R-1401A/G, are used to accomplish calibration checks. These transmissions are broadcast continuously, and are monitored for agreement with the National Primary Frequency Standard, which is maintained by the Bureau of Standards, Time and Frequency Division, Boulder, Colorado.

The AN/URQ-10 (Not Test Equipment)

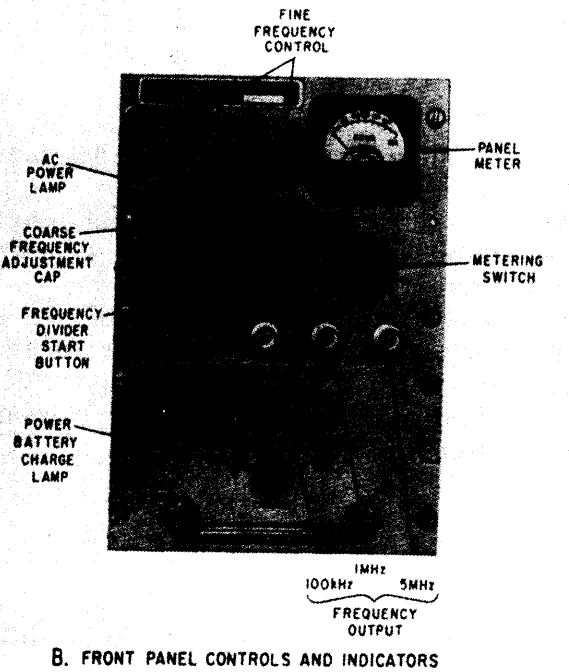
Frequency Standard AN/URQ-10 (fig. 11-8) is a compact, multipurpose, secondary frequency standard designed for continuous duty operation aboard ship or at shore facilities. The standard operates from a 115-volt, 50- to 400-Hz single-phase a.c. source or internal batteries (for short periods of time), and provides three highly stable output frequencies (100 kHz, 1 MHz, and 5 MHz).

FREQUENCY COUNTER (SCAT 4296)

The AN/USM-207 (fig. 11-9) is a portable, solid-state electronic counter for precisely measuring and displaying on an eight-digit numerical readout the frequency and period of a cyclic electrical signal, the frequency ratio of two signals, the time interval between two points on the same or different signals, or the total number of electrical impulses (totalizing).



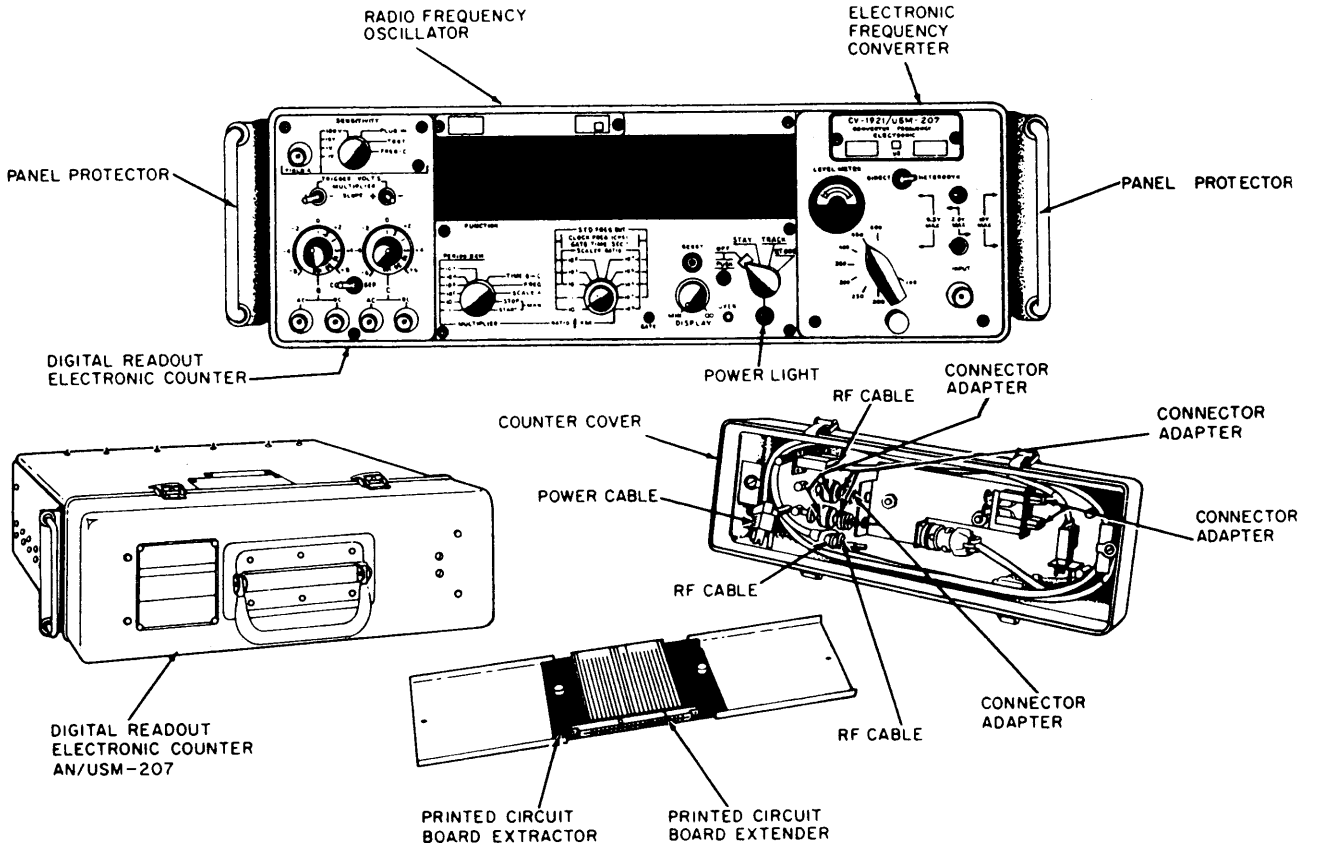
A. COVER REMOVED



B. FRONT PANEL CONTROLS AND INDICATORS

162.114

Figure 11-8.—Frequency Standard AN/URQ-10 (Not test equipment).



162.7

Figure 11-9.—Digital Readout Electronic Counter AN/USM-207 (SCAT 4296).

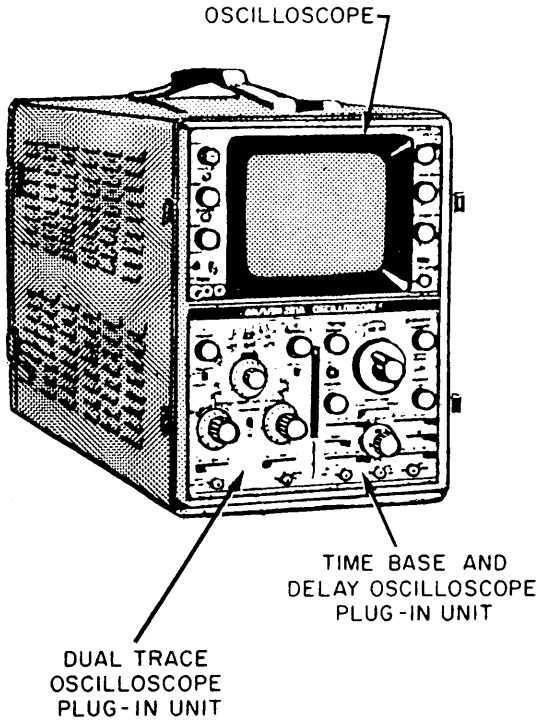
OSCILLOSCOPES (SCAT 4308)

The basic principles and a general description of the operation of an oscilloscope are covered in *Basic Electronics,* Volume 1, NAVPERS 10087 (Series) and the *Navy Electricity and Electronics Training Series* (NEETS).

The AN/USM-281 oscilloscope (fig. 11-10) operates on the same principle as the ones described in *Basic Electronics* and NEETS. The basic difference is that the AN/USM-281A, a later model, has complete solid-state design except for the crt. This oscilloscope is a dual-trace oscilloscope that will display waveforms from d.c. to 50 MHz and has the capability of measuring up to 600 volts. With a weight of approximately 30 pounds, it is portable and can be used just about anywhere.

TUBE TESTER, (SCAT 4548)

A representative field-type electron tube tester (AN/USM-118B) designed to test all common low-power tubes is shown in figure 11-11. The tube test conditions (which are as close as possible to the actual tube operating conditions) are programmed on a prepunched card. The card switch automatically programs the tube test conditions when it is actuated by a card. A compartment on the front panel of the tester provides storage for the most frequently used cards. The cover of the tester (not shown) contains operating instructions, brackets for storing the technical manual, the power cord, a calibration cell for checking the meter and short tests, calibration cards, blank cards, and a steel hand punch.



1.86

Figure 11-10.—Oscilloscope AN/USM-281A (SCAT 4308).

TRANSISTOR TESTER, (SCAT 4557)

Laboratory transistor test sets are used in experimental work to test all characteristics of transistors. For maintenance and repair, however, it is not necessary to check all of the transistor parameters. A check of two or three performance characteristics is usually sufficient to determine whether a transistor needs to be replaced. Two of the most important parameters used for transistor testing are the transistor current gain (Beta) and the collector leakage or reverse current (I_{CO}). These are discussed in *Basic Electronics,* Volume 1, NAVPERS 10087 (Series) and the *Navy Electricity and Electronics Training Series* (NEETS).

Semiconductor test set AN/USM-206-A (fig. 11-12) is a rugged field-type tester designed to test transistors and semiconductor diodes. The set will measure the beta of a transistor, the resistance appearing at the electrodes and the reverse current of a transistor or semiconductor diode, a shorted or open condition of a diode, the forward transconductance of a field-effect transistor, and the condition of its own batteries.

OCTOPUS

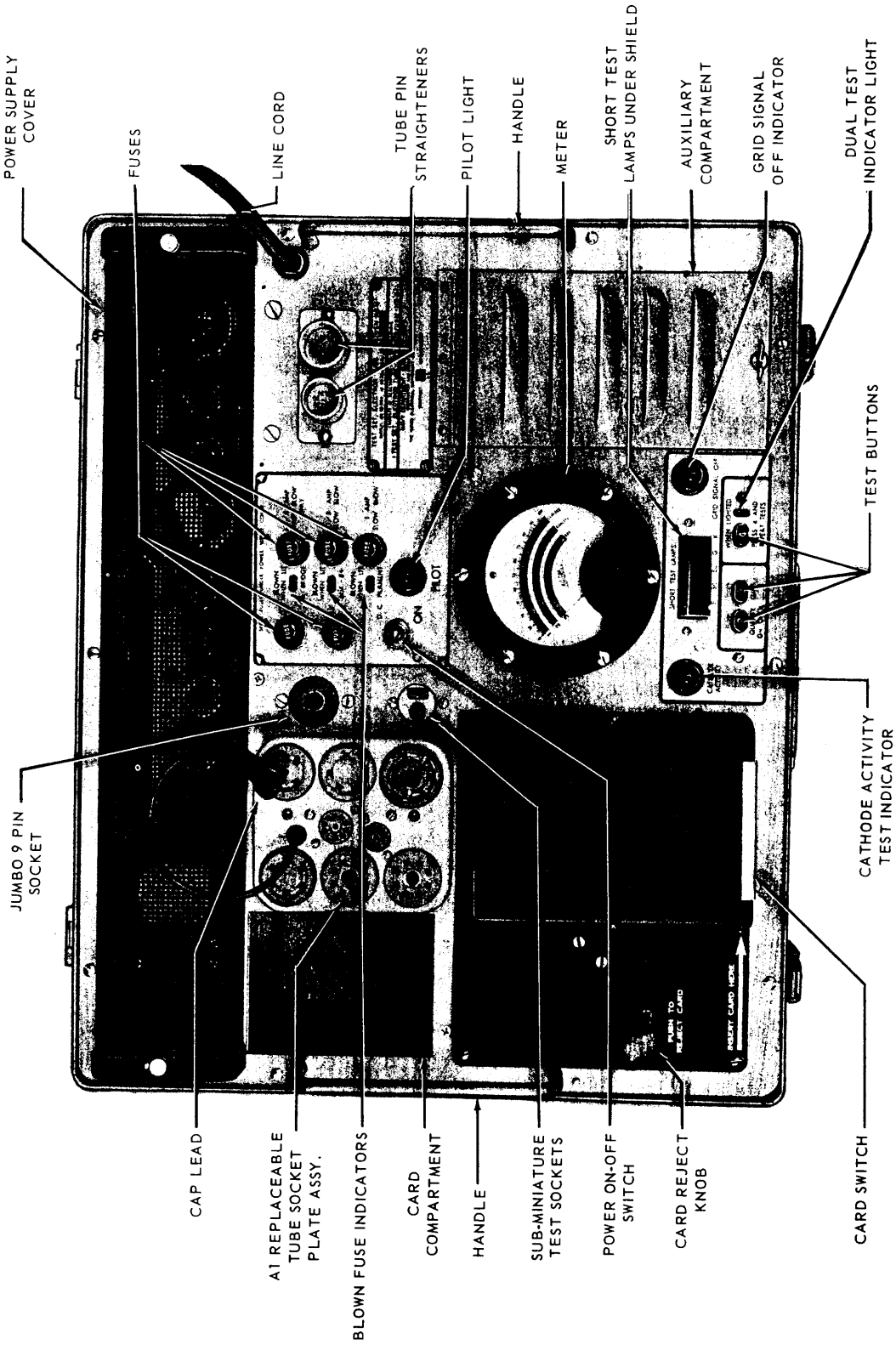
Ohmmeter troubleshooting of deenergized printed circuit boards (pcb's) requires removal from the circuit of all but one lead of every component under test. Not only is this time consuming, but it also involves considerable desoldering and resoldering thus compounding the problems associated with heat application, soldering and leadbending. Obviously, because physical size determines the amount of heat a component can safely dissipate, electronic part miniaturization and microminiaturization have made troubleshooting by desoldering techniques obsolete. Not only are the components very small, they are also quite close together so that desoldering, an old troubleshooting method and a byproduct of the use of the ohmmeter in testing, destroys the reliability of the pcb's.

An ohmmeter, moreover, cannot detect a shorted inductor or open capacitor even after the reactive component is lifted from the circuit, and some ohmmeters generate enough current at low range to damage solid-state components. Normally, as these parts decrease in size their current-handling capacity correspondingly decreases, and the use of ohmmeters becomes even more undesirable.

In other words, today's methods of troubleshooting deenergized miniature component boards have proved generally inefficient because of damaged boards and costly hours expended in the removal and replacement of components that tested good.

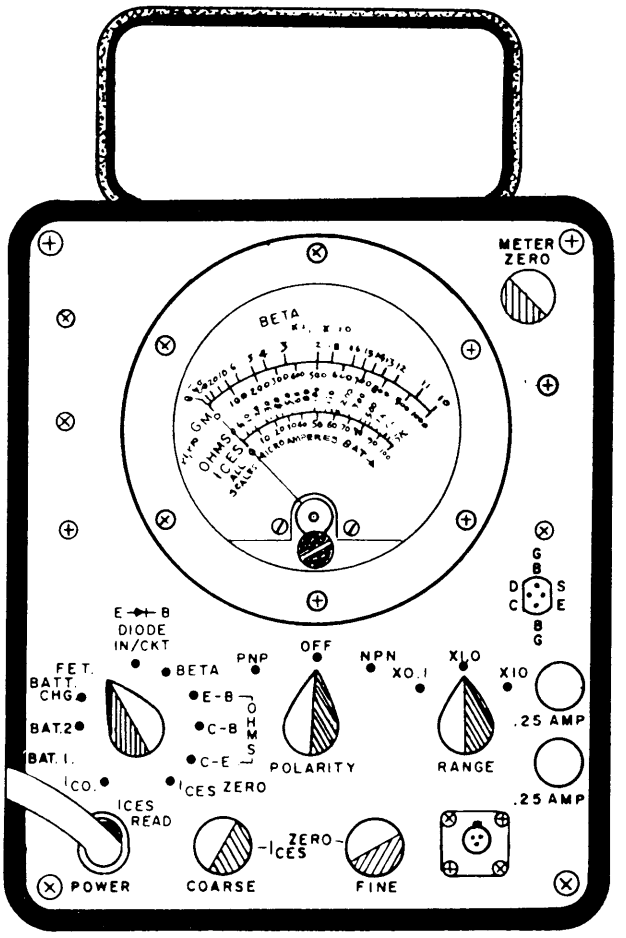
However, there is an improved method using an in-circuit tester which can be constructed through do-it-yourself construction using components carried by the supply system. The total cost per unit is less than $5 through commercial distributors when buying the individual components commercially.

"In-circuit" troubleshooting means exactly what the term implies: components need not be removed from the equipment. This results in a saving in maintenance hours and eliminates the possibility of damage caused by soldering-iron



20.346(162A)

Figure 11-11.—Tube Tester AN/USM-118B (SCAT 4548).



162.121

Figure 11-12.—Semiconductor Test Set AN/USM-206A (SCAT 4557).

heat. Used in conjunction with any standard oscilloscope, the in-circuit tester affords a visual display of component condition.

With the power cord, oscilloscope leads, and probe cables all protruding from various sides, the tester resembles an octopus, and it is commonly called just that.

The Octopus is designed to quickly test delicate components and it does not deliver more than 1.0 milliampere of a.c. current. Also, it energizes components during test, without removal of circuit interconnections, much the same as they are energized in the circuit during normal service.

The circuit construction details and other uses may be found in the *EIMB Handbook on Test Equipment,* NAVSEA 0967-LP-000-0040. Point it out to your technicians in case they aren't already aware of it.

AUTOMATIC TEST EQUIPMENT

A recently developed program to evaluate Automatic Test Equipment (ATE) and select hardware and software for fleet use, is the Support and Test Equipment Engineering Program (STEEP). The automatic test equipment and the STEEP program are described elsewhere in this book.

TEST EQUIPMENT MANAGEMENT

A major task facing the EMO is that of management of the Test and Monitoring System (TAMS).

TAMS includes automatic test systems and equipment, general and special purpose test equipment, built-in-test, self-test and related equipment/software and their application at all levels of maintenance and monitoring. TAMS is used for monitoring and testing all types of weapon systems, equipment, and devices, and the environmental conditions under which these weapon systems and fleet personnel operate. It includes all devices used to measure, calibrate, gage, test, inspect, diagnose or otherwise examine materials, supplies, and equipment to determine compliance with specifications, engineering drawings, technical orders, technical manuals, maintenance instructions, and/or serviceability standards. (Note: TAMS is also referred to as Precision Measurement Equipment (PME), Test and Measuring Equipment (T&ME), or Test, Measuring, and Diagnostic Equipment (TMDE)).

General Purpose Electronic Test Equipment (GPETE), and Special Purpose Electronic Test Equipment (SPETE) require alert management by the EMO to ensure timely calibration and repair. As the EMO, you will liaison with elements of the Naval Electronic Systems Command (NAVELEX) Fleet Liaison Program and type commander representatives. Therefore, it is important that you be cognizant of the many

programs and people, outside of the immediate command, involved in TAMS management. Many of the TAMS programs interface with fleet programs. The following are some of the more common programs and a brief description of how NAVELEX and other commands interface.

PROGRAMS

Combat System Readiness Review and Electronics Examining Board

The Combat System Readiness Review (CSRR), Combat System Readiness Test (CSRT), the Electronics Examining Board (EEB), and Electronics Systems Review, are SURFLANT, SURFPAC, AIRLANT and SUBLANT programs, respectively, that look at all of the electronics installations aboard their respective ships. GPETE falls into both of these programs. GPETE will be inventoried and inspected to determine operability and calibration status. Representatives from NAVSEACENLANT usually conduct this part of the review and report their findings to cognizant commands. The information gained is used to update SECAS, determine excess and obsolete equipment to be off-loaded, and to identify the deficiencies in accordance with Special Purpose Electronics Test Equipment Requirement List (SPETERL) requirements. Comments on GPETE management often highlight calibration and repair problems aboard the ship.

GPETE Assets Screening Program (GASP)

GASP deals with test equipment excesses and deficiencies of the fleet. When a ship has excess GPETE, it should be turned in to one of the Redistribution Centers. GASP Redistribution Centers are located at NAVELEXSYSENGCEN, Portsmouth and San Diego, and NAVSEEACTPAC, Pearl Harbor. In turn, ships that have a deficiency of GPETE should first check with applicable NAVELEXSYSENGCEN/NAVSEEACTPAC via TYCOM, to fill that deficiency. The Redistribution Center has the equipment calibrated, repaired and made ready for issue. Any equipment not economically repairable is turned in to supply for disposition. (A word to the wise however, don't go shopping for GPETE at salvage since you will just start the cycle over again.) For further information regarding GASP, including what is available, contact applicable NAVELEXSYSENGCEN/NAVSEEACTPAC.

GPETE Loan Pools

The purpose of GPETE loan pools is to provide a broad range of ready-for-issue GPETE for short term use. Equipment depth in the various pools is adjusted, based upon demand, to provide continuous availability for fleet units. GPETE from the pools is checked out for specific purposes (i.e., PMS for the AN/SPS-40B radar or corrective maintenance for the AN/URT-23) when the GPETE is, for some reason, unavailable aboard ship. The GPETE pools are not intended to supplement a ship's allowance and equipment must be returned to the pool as soon as possible to assure its availability to other users. In no instance will pool equipment be kept over 10 days without specific TYCOM approval.

Fleet Improvement Logistic Support Program (FILS)

The FILS program is presently concerned with TAMS. The goal of the program is to ensure that each ship has 100% of its required TMDE on board at the end of its overhaul availability. FILS is administered by PERA CRUDES and is only applicable to CRUDES ships. (See Chapter 13.)

The primary function of the FILS TAMS review is to bring the ships electrical/electronic test equipment inventory into consonance with the Ships Portable Electronic/Electrical Test Equipment Requirements List (SPETERL). This is accomplished by an intensive inventory of on board test equipment by ship's force. As a result of this inventory, the specific test equipment excesses and deficiencies are identified. The ship's deficiencies are categorized as GPETE Initial Outfitting (GINO) or GPETE End Item Replacement (GEIR). FILS will provide the ship with the latest status of GINO already on the

NAVELEX buy list. The ship must requisition GEIR deficiencies in accordance with current procedures. All of the deficiencies and excesses are identified in a follow-up message to all concerned. The GASP manager will be an action addressee and will fill the remaining deficiencies if available and, of course, will want the excess test equipment. Further information on GINO and GEIR may be found in Chapter Two of NAVMAT 9491, *Electronic Test Equipment Calibration Program Indoctrination Handbook.*

MEASURE

The Metrology Automated System for Uniform Recall and Reporting (MEASURE) is a data processing system designed to provide participating activities with a standardized system for the recall and scheduling of Test, Measurement, and Diagnostic Equipment (TMDE) into calibration facilities and for the documentation of data pertaining to calibration actions performed by these facilities, as well as for reporting all actions performed on those equipments. MEASURE also provides for the collection, correction, analysis and collation of data as well as distribution of data and products/formats to requiring activities. In short, MEASURE's objective is to provide a single, uniform management information system throughout the chain of command. At the ship level, you will find that MEASURE provides an excellent method of managing test equipment. Since it is an information system, the "garbage in-garbage out" rule applies. It is imperative that you, as EMO, closely monitor all of the MEASURE documentation for correctness.

You should be on the lookout for available training on MEASURE documentation so you can ensure that supervisory personnel using TMDE can receive periodic training. Assistance in processing MEASURE documents and general TMDE management is available at the local Readiness Support Group (RSG), Atlantic/Maintenance Coordinating Center (MCC), Pacific and you shouldn't hesitate to use this assistance. MEASURE itself will not keep all of the TMDE calibrated and repaired, but it certainly aids in the TMDE area. A closely supervised program should be a high priority of every EMO.

The primary source for system operation is OPNAV 43P6A, *Metrology Automated System for Uniform Recall and Reporting (MEASURE) Users Manual.* MEASURE is sponsored by the Chief of Naval Material (CNM) who establishes policy, guidelines and operational requirements to provide system applicability. The Naval Air Systems Command provides overall coordination, implementing CNM directives with regard to MEASURE. The Naval Sea and Electronics Systems Commands have implemented MEASURE within their respective areas of cognizance. The Naval Aviation Logistics Center (NALC) interfaces with the Field Activities of the other SYSCOMs, coordinating procedural aspects of system operation. SYSCOM Field Activities (also referred to as SYSCOM METCALREPs or simply METCALREPs) are responsible for providing METCAL support services pursuant to their respective charters. There are two advisory groups which bring together a cross-section of MEASURE participants. CNM's TMDE Action Group serves as a forum for the discussion of management policies, whereas the MEASURE Working Group is directly concerned with day-to-day system operation.

Each customer activity (the ship, which is usually an EMO responsibility) must ensure that the test equipment for which that activity has been assigned primary responsibility, is submitted on a timely basis to a calibration activity for required calibration. Accordingly, the EMO within each customer activity should monitor the scheduled submissions of the equipment to ensure submission to the appropriate calibration activity.

The MEASURE Program is designed, among other things, to assist customer activities in the fulfillment of this responsibility. It does this by providing for the automatic scheduling and recall of all such test equipment for calibration. Each customer activity must submit its initial Inventory Report Form (fig. 11-13) promptly to the cognizant METCALREP for approval and forwarding to the MEASURE Operational Control Center (MOCC). The MOCC, based upon the information contained on these Inventory Report Forms, can provide the necessary preprinted METER Cards (fig. 11-14), computer printouts of the customer's

CUSTOMER MAILING ADDRESS

TO | CODE

BUILDING NUMBER

ACTIVITY | LAB CODE

CITY

STATE

ZIP | ATTENTION

CUSTOMER ACTIVITY CODE

MEASURE TMDE INVENTORY

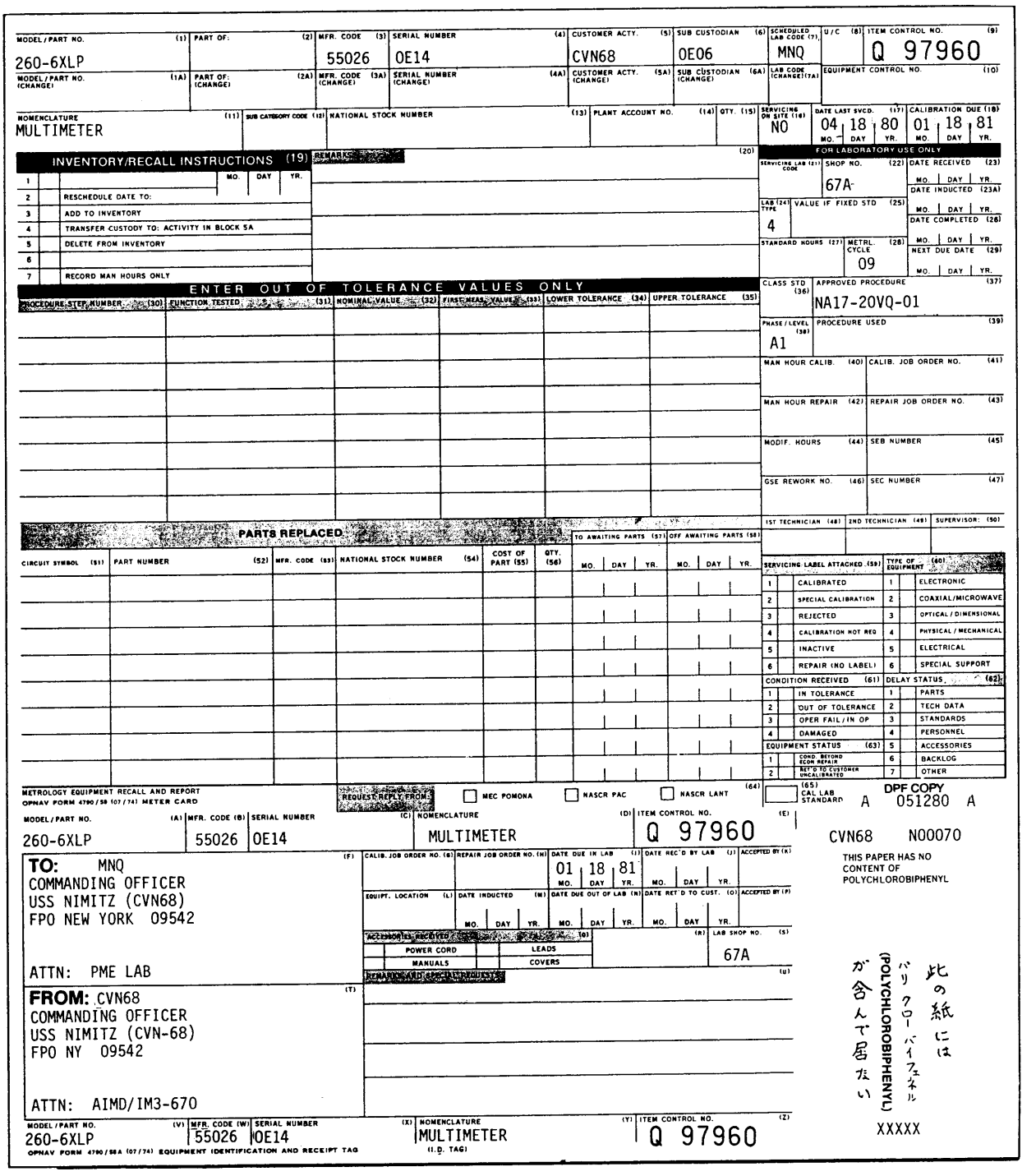
PLEASE CHECK (✓) APPROPRIATE BLOCK

- ☐ THIS FORM REFLECTS ONLY ITEMS RECALLED ON A REGULAR BASIS
- ☐ THIS FORM REFLECTS ONLY ON-SITE ITEMS
- ☐ THIS FORM REFLECTS ONLY ITEMS IN NCR STATUS
- ☐ THIS FORM REFLECTS ONLY INACTIVE ITEMS

CAL LAB	SUB CUSTODIAN	MFR	MODEL PART NUMBER	SERIAL NUMBER	NOMENCLATURE	DATE LAST SERV	NEXT DUE DATE	SERV CYC	MAJOR SYSTEM WHICH EQUIPMENT IS PART OF			

245.95

Figure 11-13.—MEASURE TMDE Inventory Report Form.



METROLOGY EQUIPMENT RECALL AND REPORT
OPNAV FORM 4790/58 (07/74) METER CARD

MODEL/PART NO. (A)	MFR. CODE (B)	SERIAL NUMBER (C)	NOMENCLATURE (D)	ITEM CONTROL NO. (E)
260-6XLP	55026	0E14	MULTIMETER	Q 97960

CVN68 N00070

THIS PAPER HAS NO CONTENT OF POLYCHLOROBIPHENYL

此の紙にはポリクロロバイフェニル(POLYCHLOROBIPHENYL)が含んで居ない

XXXXX

TO: MNQ
COMMANDING OFFICER
USS NIMITZ (CVN68)
FPO NEW YORK 09542

ATTN: PME LAB

FROM: CVN68
COMMANDING OFFICER
USS NIMITZ (CVN-68)
FPO NY 09542

ATTN: AIMD/IM3-670

MODEL/PART NO. (V)	MFR. CODE (W)	SERIAL NUMBER (X)	NOMENCLATURE (Y)	ITEM CONTROL NO. (Z)
260-6XLP	55026	0E14	MULTIMETER (I.D. TAG)	Q 97960

OPNAV FORM 4790/58A (07/74) EQUIPMENT IDENTIFICATION AND RECEIPT TAG

245.96

Figure 11-14.—MEASURE METER Card.

inventory (format 310), and equipment Recall Schedules (format 800). Format 350, sequenced by 3-M work centers, is useful for shipboard management of equipment. It can be passed to each work center supervisor to give accurate monthly inventory with calibration status. Formats 310, 350, and 800 are updated and sent to the ship monthly.

It is absolutely essential that each customer activity, through the submission of METER Cards, promptly update its recorded inventory; i.e., the inventory data maintained in the computer data base by the MOCC. In this way it will be possible to project calibration requirements in sufficient time to permit their incorporation into the next Recall Schedule. If the inventory is not updated promptly, new activity items will have to be rescheduled, or be submitted to a calibration activity for unscheduled calibration upon prior approval of the cognizant METCALREP.

METER Card

The Metrology Equipment Recall and Report (METER) Card (fig. 11-14) is the primary operative input to MEASURE, and it is submitted to the MEASURE Operational Control Center on an "as required" basis. In part, the METER Card is preprinted by the MEASURE Operational Control Center with information taken from the initial inventory data submitted on the Inventory Report Forms, together with such updated data as may appear on any prior METER Card. The balance of the information required will be entered on the card by the customer activity, or by the calibration activity, as appropriate. The METER Card is used by the customer activity to report changes in the scheduled laboratory; i.e., the calibration activity to which the equipment is submitted for calibration (changes in the scheduled laboratory which involve Type III Laboratories, and above, must be approved by the cognizant METCALREP). The METER Card also is used by the customer activity to report additions and deletions to its inventory; to report changes in subcustodianship and equipment status; and to correct errors in the inventory data file. For procedures, see Appendix B and I of the *MEASURE USER'S MANUAL,* OPNAV 43P6. METER Card Submission procedures are outlined in the reference. Blank METER Cards are available through the cognizant METCALREP.

Recall Schedules

The purpose of the MEASURE Recall Schedules is to list those items of equipment which are due at a laboratory for calibration. It serves as a reminder and a planning document for the customer activity, the subcustodian, and the laboratory performing the calibration. MEASURE Recall Schedules for equipments, other than those which are inactive or are classified as No Calibration Required (NCR), are generated by the MEASURE Operation Control Center and are forwarded to the appropriate customers, with copies to the cognizant calibration activities. Separate schedules are printed, indicating the equipment which is due for calibration during the scheduled period by Intermediate Level/Field Calibration Activities, calibration laboratories, and calibration teams "on-site." Each Recall Schedule comprises a set of four identical copies. One such set is provided to the supporting calibration activity as an aid to work load planning, and a second set is sent to the customer activity.

Product Format Distribution

MEASURE products/formats have been designed to meet the data information requirements of several levels of management. Many MEASURE formats are forwarded automatically by the MOCC to the customer activities on a regular basis, such distribution being based upon the type/level of those activities and upon established requirements. Others however, are available only upon the receipt of an approved request from the cognizant METCALREP. Accordingly, customer activities having a requirement for a particular format which is not being received automatically, should forward the requirement to the cognizant METCALREP for approval. Such requests should include a justification of the need for the format, together with a statement indicating the frequency at which the format is required.

MEASURE CUSTOMER AUTOMATIC DISTRIBUTION LIST.—The following MEASURE Products are distributed automatically to customer activities by the MOCC at the intervals shown:

1. Format 215,	Unmatched Listing	As Required
2. Format 310,	Test Equipment Inventory	Monthly
3. Format 350,	Test Equipment Inventory in Sub-custodian order	Monthly
4. Format 804,	Recall Schedule, "On-Site" Equipment	Monthly/ Quarterly
5. Format 804,	Recall Schedule, Equipment Due in Laboratory	Monthly/ Quarterly
6. Replenishment Cards	Preprinted METER	As Required
7. Blank METER Cards		Initial Issue

The Format 310 is, by far, the best management tool of the MEASURE Program for the EMO/Test Equipment Coordinator to manage the command's test equipment inventory. Actions to fully utilize this tool are as follows:

1. EMO/Test Equipment Coordinator should thoroughly review the Format 310 monthly

2. Annotate the Format 310 as status changes occur for equipments which have been calibrated, deleted, in repair, added to inventory, delayed, surveyed, inactivated, and so on, during the month

3. Carry these annotations forward to the next monthly Format 310 when received, until the change is reflected on a new Format 310

4. If changes in equipment status are not reflected on the new monthly Format 310 within 60 days of the transaction date, resubmit necessary MEASURE METER Cards (hand scribed) to correct the discrepancy or contact RSG/MCC MEASURE Coordinator for assistance

GENERAL TEST EQUIPMENT RESOURCES/INFORMATION

EMOs should be thoroughly familiar with the following publications to assist in optimum test equipment readiness:

1. *Measure Users Manual,* OPNAV 43P6

2. *Electronic Test Equipment Calibration Program Indoctrination Handbook,* NAVMAT P9491

3. *Electrical/Electronic Test Equipment Index For Support Requirements Of Shipboard Electronic, Electrical, IC, Weapons And Reactor Systems,* NAVSEA ST000-AA-IDX-010/PEETE

4. *Standard General Purpose Electronic Test Equipment* MIL-STD-1364 Series (Navy)

5. Metrology Requirements List 0969-LP-133-2010

6. Metrology Requirements List for Field Calibration Activities (FCA) 0969-LP-133-2020

Activities that offer special assistance to the EMO are described in the following paragraphs.

FIELD CALIBRATION TECHNICAL REPRESENTATIVES (FCTR)

The FCTR has the basic responsibility for exercising the NAVELEX Calibration Program, including management and implementation policies. They interpret directives and provide guidance within assigned areas of responsibility. You will find liaison with the FCTR beneficial in clarifying many of the calibration questions which may arise. The FCTR has responsibilities up and down the chain of command, but some of them deal directly with the fleet. Those ships that have a Field Calibration Activity (FCA) aboard should stay in touch with the FCTR for guidance in the FCA's operation, and consultation on any local calibration procedure. The addresses of NAVELEX FCTRs are:

1. NAVELEXSYSENGCEN Charleston—Commanding Officer, Naval Electronics System Engineering Center, Charleston, SC; ATTENTION: Field Calibration Technical

Representative, 4600 Goer Road, North Charleston, SC 29406

2. NAVELEXSYSENGCEN Portsmouth—Commanding Officer, Naval Electronic Systems Engineering Center, Portsmouth; ATTENTION: Field Calibration Technical Representative, P.O. Box 55, Portsmouth, VA 23705

3. NAVELEXSYSENGCEN San Diego—Commanding Officer, Naval Electronic Systems Engineering Center, San Diego; ATTENTION: Field Calibration Technical Representative, P.O. Box 80337, San Diego, CA 92138

4. NAVELEXSYSENGCEN Vallejo—Commanding Officer, Naval Electronics Systems Engineering Center, Vallejo, Mare Island Naval Shipyard, Vallejo, CA 94592

5. NAVSEEACT Pacific—Commanding Officer, Naval Shore Electronics Engineering Activity, Pacific; ATTENTION: Field Calibration Technical Representative, Box 130, FPO San Francisco, CA 96610

ADDITIONAL TEST EQUIPMENT MANAGEMENT CONTACTS

While managing your test equipment assets, you will discover a need to work with other representatives of the Naval Electronics System Command (NAVELEX). NAVELEX is involved with Navy electronics of many descriptions. Besides "prime" equipment, NAVELEX also stands ready to assist with the fleet's test equipment. To work effectively with these representatives, you will have to understand their relationships with your ship and with each other.

NAVAL ELECTRONIC SYSTEMS COMMAND FLEET LIAISON PROGRAM

Forces afloat are the highest priority customers of NAVELEXSYSCOM. The general reduction in operating naval forces requires concentrated efforts by NAVELEX and its field activities to provide the maximum achievable availability of our ships' mission-essential electronic systems to allow realization of Navy operational mission commitments. An in-house technical logistic support capability is maintained to ensure quick response to fleet requests for assistance beyond the capability of ships force. The implementation of the Fleet Liaison Program established direct lines of communication and provided "one-stop shopping" sources for support necessary to meet fleet operational requirements.

A primary goal of the Fleet Liaison Program is to provide a single point-of-contact for the fleet in electronic matters by receiving, investigating, and evaluating problem areas to include requests for technical assistance. The fleet liaison follow-on procedure after investigating a problem area, is to recommend, initiate, and coordinate corrective actions.

Technical assistance requests for NAVELEX cognizant equipment should be made in accordance with fleet instructions.

There are five NAVELEX Field Activities having Fleet Liaison Offices. They are: NESEC Charleston, NESEC Portsmouth, NESEC San Diego, NESEC Vallejo, and NESEA St. Inigoes, MD. Additionally, NAVELEXENGOFF Mayport has a Fleet Liaison Officer assigned.

FIELD MAINTENANCE AGENTS (FMAs)

Although all of the NAVELEX field offices offer various services to the fleet for cognizant NAVELEX systems/equipments, certain field offices are assigned as FMA for selected major electronic systems/equipments. A FMA is an activity which has been assigned responsibility for the continuing management of certain maintenance and logistic functions for selected systems/equipments. FMAs include various aspects of:

1. Maintenance engineering management and analysis
2. Design defect/problem analysis and field change development
3. Installation review and validation
4. Support documentation review and improvement

5. Review of all factors relating to maintenance and submission of recommendations for improvements to cognizant activities
6. Technical support to depot level repair facilities
7. Configuration management
8. Technical assistance

With respect to item (8) above, it should be noted that the FMA provides a high level of technical expertise for assigned equipment. Accordingly, FMAs will provide field assistance only when lower echelon service activities lack the required capabilities. Therefore, organization requests for assistance may not be made directly to the FMA, but must be made in accordance with established fleet and NAVELEX procedures. Any requests, other than unofficial technical advice via telephone, for outside services must be made to the RSG/MCC in your geographical area.

SHIPBOARD TAMS MANAGEMENT

As EMO, you will be responsible for the calibration and repair of all GPETE and SPETE, including built-in test equipment (BITE) aboard ship. You must ensure that all GPETE allowed in the SPETERL is aboard. NAVMAT P-9491 (*Electronic Test Equipment Calibration Program Indoctrination Handbook*) is a good basic text for information regarding management of test equipment. As EMO, you should also be alert for changes in policy reflected in updated references. TAMS management, from the system level down, is often revised.

TAMS ACTION NEWS

NAVELEX TAMS ACTION NEWS is a good, unofficial, source of current information concerning changing policies and procedures. Additionally, keep in touch with the Readiness Support Group (RSG)/Maintenance Coordination Center (MCC) and talk to the FCTR.

YOUR RESPONSIBILITY

In general, RSG/MCC wants the ship's calibration package once a month. Use your MEASURE recall schedule, submitted with a 4790/2L. But remember, any test equipment in this package must be in working order. If the equipment is inoperable, use a 4790/2K. Be reasonable, though, as many minor repairs (broken knobs, broken meter faces, dead batteries) should be repaired aboard the ship.

MANAGING TEST EQUIPMENT

Managing the test equipment aboard ship is a challenge. It is recommended that a ship's instruction be drafted (if one doesn't exist already) making the EMO the test equipment manager for the ship. Many work centers use test equipment, and someone should coordinate the efforts to keep it all aboard, calibrated, and ready to use. Management schemes seem to vary from ship to ship. Those without any kind of plan seem to have more test equipment problems. Don't be afraid to ask around the waterfront, because another EMO might have a good idea which you can use.

RESPONSIBILITY DEFINITION

Half the battle in preparing a shipboard instruction will be to clearly define and assign the responsibilities involved. You will find that, just as at the SYSCOM level, the shipboard management of TMDE must cross the lines of command. As previously mentioned, shipboard management remains at the discretion of the commanding officer, but the following guidelines are provided for consideration.

The ship will receive two sets of MEASURE documents. One set will be for the EMO (E) and one set for the Chief Engineer (S). The E and S stand for NAVELEX and NAVSEA respectively and are assigned for billing purposes at the SYSCOM level. The plan is that all NAVELEX cognizant equipment will be on the E documents and all the NAVSEA cognizant equipment will be on the S documents thereby providing a system for everyone to pay their share of the calibration costs. The EMO maintains both NAVELEX and NAVSEA prime equipment and TAMS, as does the Chief Engineer. As you can see, assigning responsibility for TAMS aboard ship leaves room for controversy. We recommend that GPETE (p/o TAMS) be assigned to

the EMO for management. GPETE assigned to the EMO should then appear on the E documents regardless of NAVELEX/NAVSEA cognizance.

GENERAL PURPOSE ELECTRONIC TEST EQUIPMENT (GPETE)

GPETE is test equipment that has the capability, without modification, to generate, modify, or measure a range of parameters of electronic functions required to test two or more equipment or systems of basically different design. GPETE includes that electronic test equipment listed, or determined by Naval Material Command Electronic Test Equipment (ETE) Classification Board to be listed, in MIL-STD-1364, *Standard General Purpose Electronic Test Equipment.*

All GPETE should appear on the MEASURE inventory, even if it is NCR (no calibration required). It should also appear in the Ship Configuration Accounting System Reports (SECAS 502.1 B&C) to ensure that it will appear in the ship's COSAL for parts support (both APLs and AELs). Most EMOs assign the maintenance responsibility for GPETE to the work center that has subcustody. This allows them to use their JSN (Job Sequence Number) should the equipment require off-ship repair. The EMO must remain aware of the repair status. For this reason, OPNAV 4790/2Ks will normally go via the EMO's office to the RSG/MCC.

Calibration can be managed more easily if the EMO's test equipment petty officer prepares all documentation for submission to RSG/MCC and notifies subcustodians to deliver GPETE to the cal lab assigned (or to the ship's test equipment work center for delivery to the cal lab). While procedures will vary from ship to ship, the EMO's representative must maintain very close liaison with the cal lab.

One major problem is that of accountability for GPETE. EMOs should make certain they get a responsible person's signature (preferably a Division Officer) when GPETE is subcustodied. A periodic inventory is suggested, with the results forwarded to the commanding officer. When GPETE turns up missing, the division officer having subcustody should initiate the survey request, although the EMO should order the replacement GPETE. If the EMO is the only one aboard ship allowed to order GPETE, it is simpler to keep track of the status of the ship's allowance. In short, the EMO should "take charge" of GPETE rather than being faulted for not having a vital piece of GPETE available where it is needed for a ship's mission.

SPECIAL PURPOSE ELECTRONIC TEST EQUIPMENT (SPETE)

SPETE is test equipment that is specifically designed to generate, modify, or measure a range of parameters of electronic functions of a specific or peculiar nature required to test a single system or equipment. SPETE includes that electronic test equipment that is not listed (or is determined by the Naval Material Command ETE Classification Board to be excluded from listing) in MIL-STD-1364. SPETE is procured by the SYSCOM which has the acquisition responsibility for the system/equipment which requires the SPETE for maintenance.

SPETE includes items such as the TS-2232A/UCC-1C(V) test set, or BITE (Built-In Test Equipment) that require calibration. This type of equipment aboard ship must be included in the ship's TAMS program. The equipment should be reported on SECAS as a component of a prime equipment. On MEASURE, however, it will appear with GPETE to ensure that it is in the calibration program. Obviously, the maintenance responsibility belongs to the work center that maintains the prime equipment. The EMO should, however, take the responsibility to include SPETE on the monthly calibration delivery when it is due. A word of caution: SPETE, such as gas turbine BITE, may not fall under the EMO's responsibility. Where to draw the line for responsibility can become unclear. Regardless of who gets the job done, SPETE that requires calibration must appear on MEASURE.

REQUIREMENTS FOR ELECTRICAL/ELECTRONIC TEST EQUIPMENT

The electrical/electronic test equipment requirements for support of prime shipboard

SHIPS PORTABLE ELECTRICAL/ELECTRONIC TEST EQUIPMENT REQUIREMENTS LIST

SPETERL

USS DIXON AS 0037 TEST EQUIPMENT QUANTITIES BASED ON SECAS REPORT OF 08/30/81 PAGE 063 16 DEC 81

SCAT CODE FUNCTIONAL DESCRIPTION OF SCAT CODE REQUIREMENT

Mfg Sym	FSCM	Test Equipment Model Number	Priority	Allowance Equipage List No.	Acc Qty	Ltd Qty	Obs Qty	Exc Qty	Def Qty	Total Rqd	P M S	Equipment/ System Application	PE Qty	Prime Equip Location SHIPALT	Foot Note
4958		Power Meter Thruline 2-30MHZ 15-1000W													
		AN/URM-120	6									AN/SRA-17B	1	02-115-0-C	50
		AN/URM-96A	22	7-670050816EQ								AN/SRA-17B	5	04-40-0-C	50
		AN/URM-96	23								P	AN/SRA-33	1	04-50-4-C	
CBUW	94668	164B-PMN	37		5							AN/SRA-43	6	04-40-0-C	
CBUW	94668	164-PMN	37								P	AN/SRA-56	1	04-50-4-C	
CBXA	95712	263	39			1					P	AN/SRC-20	2	04-50-4-C	
											P	AN/SRC-21	3	04-50-4-C	
											P	AN/URA-38	3	04-50-4-C	
											P	AN/URA-38A	2	04-50-4-C	
												AN/URT-75	1	04-50-4-C	
											P	AN/VRC-46	1	04-50-4-C	
										2		AN/WSC-3 Electronics Subtotal	1	AS-111K	
										1		Electronics Calibration Lab			
					5	1		1		2 5		Electronics Shop-As (Non-FBM) SCAT 4958 Totals			

245.97

Figure 11-15.—Ships Portable Electrical/Electronic Test Equipment Requirements List.

systems/equipments shall be delineated in the SPETERL (fig. 11-15) prepared for the designated ship.

Electrical/electronic test equipment requirements are determined by performing a maintenance engineering analysis of specific measurement parameters required to perform planned and corrective maintenance on shipboard planned prime system/equipment installations. These measurement parameters are described by functional categories (i.e., oscilloscopes, signal generators, powermeters, multimeters and so forth) which define the minimum test requirements in terms of four digit SCAT (sub-category) codes. NAVSEA ST 000-AA-IDX-010/PEETE, *Electrical/Electronic*

The following is an explanation of columnar headings on the SPETERL:

a. **SCAT CODE**: A four digit numeric code used to identify a range of measurement requirements by functional category.

b. **SCAT DESCRIPTION**: A description of the minimum technical requirements of the SCAT Code.

c. **MFG SYM**: Manufacturer Symbol—A two, three, or four character alphabetic code assigned to identify the manufacturer of commercial test equipment.

d. **FSCM**: Federal Supply Code for Manufacturers—A five digit code assigned to a manufacturer listed in DSA Cataloguing Handbook H4-2.

e. **TEST EQUIPMENT MODEL NUMBER**: An alphanumeric identifier of an item of test equipment. This identifier may be a military nomenclature or a commercial model/type/part number. In the SPETERL, equipment identified by a military nomenclature are not assigned a manufacturer's symbol or FSCM.

f. **PRIORITY**: A two digit numeric code which is used to identify the priority (order of preference) of test equipment within a SCAT code. Definitions of priority codes are as follows:

(1) Standard (STD) (06-21): Denotes the most advanced and satisfactory equipment approved for service use. These are the most preferred for procurement.

(2) Substitute Standard (SUB STD) (22-37): Denotes those equipments approved for service use which do not have as satisfactory military characteristics as standard equipment.

(3) Limited Standard (LTD STD) (37-71): Denotes equipment approved for service use which does not have as satisfactory military characteristics as standard or substitute standard equipment, but are useable substitutes.

(4) Obsolescent (O) (72-94): Denotes equipment which no longer has satisfactory military characteristics but which must be continued in service pending availability of replacement(s).

(5) Obsolete (OBS) (95-99): Denotes equipment which has been declared unsuitable for its original military purpose. Disposal of obsolete equipment will be expedited.

g. **ALLOWANCE EQUIPAGE LIST NO**: The Allowance Equipage List (AEL) number for quantities of one through eight of that particular test equipment model.

h. **ACC QTY**: (Acceptable Quantity) Quantity of test equipment on board with priority in the standard or substitute standard categories.

i. **LID QTY**: (Limited Quantity) Quantity of test equipment on board with priority in the limited standard category.

j. **OBS QTY**: (Obsolescent/Obsolete Quantity) Quantity of test equipment on board with priority in the obsolescent or obsolete category.

k. **EXC QTY**: (Excess Quantity) Quantity of test equipment on board which is excess to the total required.

l. **DEF QTY**: (Deficient Quantity) Quantity of test equipment needed to fill a deficiency.

m. **TOTAL RQD**: (Total Required) Quantity of test equipment required for the application shown. Totals of each of the above quantities are summarized on the "SCAT TOTALS" line.

n. **PMS**: The letter "P" in this column indicates that this SCAT Code/test equipment is required for POMSEE or planned maintenance systems tests.

o. **EQUIPMENT/SYSTEM APPLICATION**: The prime equipment, weapons system, shop, or other general application for which the test equipment is required. Requirements for prime electronic equipment are shown as "ELECTRONIC SUBTOTAL" and if there are more than 25 electronic equipments requiring that SCAT Code, the application is shown as "GENERAL PURPOSE ELECTRONICS."

p. **PE QTY**: The quantity of prime electronic equipment to be supported or installed.

q. **PRIME EQUIP LOCATION/SHIPALT**: The location by deck, frame, and compartment of the prime equipment supported as reported by SECAS. For equipment to be installed, the applicable SHIPALT is shown.

r. **FOOTNOTE**: A numeric code used to provide comments applicable to a SCAT Code or Prime Equipment/System application.

245.97

Nomenclature for figure 11-15.

Test Equipment Index for Support Requirements of Shipboard Electronic, Electrical, IC, Weapons, and Reactor Systems provides a ready reference on the use of SCAT codes by cross-referencing current test equipments, by SCAT code, Federal nomenclature designation and priority of preference, to the prime electronic equipments with which they can be used.

For new construction ships, the SPETERL identifies the electrical/electronic test equipment requirements by SCAT codes in lieu of specific nomenclatures/manufacturer models. However, all standard models and one substitute-standard model that will meet each SCAT requirement are listed under the appropriate SCAT code with the designated order of preference. The SPETERL serves as the baseline document for negotiating procurement contracts, establishing planned requirements at the cognizant activity and subsequent input to the ship's COSAL of the specific models procured for and provided to the ship/activity. It is NAVSEA policy to outfit new construction ships with only standard or substitute standard test equipments listed in MIL-STD-1364 unless a nonstandard model is approved for use. Accordingly, NAVSEA coordinates all test equipment requirements for

support of the ship's planned prime equipment installations. The quantities are factored based on the total population and location of prime system/equipment installations onboard the ship. These requirements are coordinated with all program and acquisition managers (NAVAIR, NAVELEX, NAVSEA, SSPO, SPCC, and the like) before publication in the ship-tailored SPETERL.

For active fleet ships scheduled for overhaul, the SPETERL is computed by SCAT codes in the same format as for new construction ships, except it is based on the post-overhaul configuration of the prime equipment installations. In this respect only the specific test equipment models validated as being onboard by the SECAS (Ship Equipment Configuration Accounting System) reporting system are listed under the appropriate SCAT code for support of the prime equipments not scheduled for change during overhaul. All standard/preferred models are still listed under the new SCAT code requirements for support of the planned prime equipment changes.

ALLOWANCE LISTS FOR ELECTRICAL/ELECTRONIC TEST EQUIPMENTS

NAVMAT delegates the responsibility to NAVSUP for publishing allowance lists to support SYSCOM requirements for designated ships. Accordingly, for visibility and control purposes, the onboard test equipment models and quantities are included as tailored allowances in every COSAL published by NAVSUP Inventory Control Points (ICPs).

For new construction/major conversion ships, the test equipment models reported by the Naval Supervising Activities (NSAs) as being provided to the ship to meet the SCAT code requirements designated by the SPETERL are listed in the Index (Part I) of the electronics segment of the ship's COSAL. The COSAL Part II contains single equipment Allowance Equipage Lists (AELs) for every model shown in the Index. Part II also will contain Allowance Parts Lists (APLs) for those test equipments requiring onboard repair parts (OBRPs) and quantities of the onboard test equipment models are listed in the consolidated Stock Number Sequence List (SNSL) (Part III) of the ship's COSAL.

For active fleet ships scheduled for overhaul, the onboard test equipment models will be displayed in the ships' COSAL in the same format described above for new construction/major conversion ships. However, the models and quantities of each represent the onboard test equipment inventories reported through the SECAS reporting system. This is updated with planned overhaul changes to reflect the post overhaul configuration requirements designated by the SPETERL developed for the ship.