NOTE: The document identifier and heading has been changed on this page to reflect that this is a performance specification. There are no other changes to this document. The document identifier on subsequent pages has not been changed, but will be changed the next time this document is revised.

NON MEASUREMENT SENSITIVE

MIL-PRF-38793A
4 March 1993
SUPERSEDING
MIL-M-38793
1 MAY 1969

PERFORMANCE SPECIFICATION
MANUALS, TECHNICAL: CALIBRATION PROCEDURES
PREPARATION OF

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE.

1.1 Scope. This specification covers the requirements for preparing technical manuals containing manual or automated calibration procedures. It does not apply to calibration procedures written for the exclusive use of the services' primary standards laboratories.

1.2 Applicability. This specification contains paragraphs and requirements which are not applicable to all Services. Such paragraphs or requirements are prefixed to indicate the Services to which they pertain: (A) for Army; (N) for Navy; and (F) for Air Force.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: HQ AFMC/ENCS, Wright-Patterson AFB, OH 45433-5000 by using the attached Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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SPECIFICATIONS

Military

MIL-M-38784	Manuals, Technical: General Requirements for Preparation of
MIL-P-38790	Printing Production of Technical Manuals: General Requirements for

(Unless otherwise indicated, copies of federal and military specifications, standards and handbooks are available from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

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

PUBLICATIONS

Technical Manuals

Army:	SC 6695-92-A05	Calibration Set, Secondary Transfer Standards (Basic)
	SC 6695-92-A06	Calibration Set, Secondary Transfer Standards (Augmented)
	SC 4931-92-CL-A04	Sets, Kits, and Outfit Component Lists, Calibration Sets: Secondary Reference Set
	TB 43-180	Calibration and Repair Requirements for Maintenance of Army Materiel
Navy:	NAVAIR 17-35CR	Calibration Requirements Document Series
	NAVAIR 17-35MTL-1	Metrology Requirements List
	NAVAIR 17-35NCE-1	Navy Calibration Equipment List
Air Force:	TO 33K-1-100-1	TMDE Calibration Notes, Maintenance Data Collection

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	Codes, Calibration Measurement Summaries, Transportable Field Calibration Unit Configurations, and Automatic Calibration System Supportable Equipment.
TO 33K-1-100-2	TMDE Calibration Interval, Technical Order, and Work Unit Code Reference Guide.
TO 33K-1-101	Calibration Standards and Associated Equipment.

(Copies of documents required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for related associated detail specifications, specification sheets, or MS standards), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 General requirements. The general manner of preparation shall be in accordance with MIL-M-38784 and MIL-P-38790. Calibration procedures shall be provided in a separate manual for each test instrument (refer to 6.4.7); however, similar test instruments, or variations of the same type or model of test instrument may be covered in the same manual when so specified by the procuring activity (see 6.2). (Similar test instruments are considered those having similar parameters, controls, displays, and performance limits to the degree which allows combination of calibration instructions without undue complications.)

3.1.1 Numbering of pages, paragraphs, and procedural steps. Pages within calibration technical manuals shall be numbered consecutively. The front matter (see 3.2) shall be numbered with lower case Roman numerals (i.e., i, ii, iii, iv, etc.). The remainder of the manual shall be numbered using Arabic numerals. All paragraphs and procedural steps shall be numbered using the decimal numbering requirements in MIL-M-38784. Procedural steps shall not be numbered with lower case letters.

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3.1.2 Text content. A calibration procedure shall contain the essential information required by personnel for performing calibration of one or more test instruments. Each procedure shall contain instructions and/or reference data sufficient in detail to enable calibration personnel to determine whether the test instrument(s) is operating within the prescribed performance limits without requiring reference to other publications.

> NOTE: This may result in some of the data being duplicated, or partially duplicated, in other procedures; however, this is required in order that each specialist will have, in one procedure, all instructions required to calibrate the test instruments.

If specified by the procuring activity, it is permissible to reference another publication in a calibration procedure when either (1) calibration of the test instrument requires classified data which is available in the referenced publication, thereby eliminating the need to classify the calibration procedure, or (2) the test instrument (refer to 6.4) is actually composed of commercial off-the-shelf (COTS) or general purpose equipment which is already supported by existing DOD approved calibration procedures.

3.1.2.1 Development of text. In accordance with the requirements of MIL-M-38784, procedures shall be written in simple practical language. All terminology, symbols, and abbreviations shall be readily understandable by calibration technicians. New or unusual terms, symbols, or abbreviations shall either be avoided altogether or explained at the first usage in each procedure. Action verbs, as defined in 6.5, shall be used. Division into discrete steps comprising one or more closely related operations contributes to ease of understanding. Short sentences and steps enable the operator to remember the entire operation. Instructions shall use the imperative mode, direct sentences, e.g., "Set the FUNCTION switch to SQUARE WAVE.

3.1.2.2 Types of instructions to be excluded. Calibration procedures shall not cover maintenance instructions; for example: complete disassembly and assembly instructions of any instrument, subassembly, accessory, or plug-in unit; or reconditioning, realignment, repair, or replacement instructions for work that is accomplished by maintenance activities.

3.1.2.3 Security classification. Inclusion of classified matter in the calibration procedures shall be held to a minimum. When classified information is included, it shall be identified in accordance with MIL-M-38784. Special precaution shall be taken to assure that selection of calibration equipment or settings of

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calibration equipment and test instruments, do not inadvertently reveal or provide supplemental information which would allow determination of frequencies or other test instrument parameters, resulting in a compromise of classified information.

3.2 Detailed requirements. A manual shall be arranged as follows:

Front Matter
Section I Identification and Description
Section II Equipment Requirements
Section III Preliminary Operations
Section IV Calibration Process
Calibration Performance Tables
Appendices (if required)

3.2.1 Front matter. The front matter shall be done in accordance with MIL-M-38784.

3.2.2 Section I - Identification and Description. The identification and description section shall contain the following information.

3.2.2.1 Test instrument identification. Commercial test instruments shall be identified by manufacturer, model number, and nomenclature. Military test instruments shall be identified by model number, nomenclature, and principle function if not evident from the nomenclature. Component identification shall include the following information as applicable:

a. Set and component [(7603) and (7B53A)].

b. Military item and commercial counterpart [(ANUSM205) and (Hewlett-Packard 650A)].

c. Model variations (ANPSM45, A).

d. Any other identification specified by the acquiring activity, such as manufacturer's part number (see 6.2).

e. The various configurations, such as cabinet and rack-mount models (i.e., Tektronix 545 and RM545) or those using Zener reference or standard cells, such as Fluke 801 H and 801 HG.

3.2.2.2 Calibration Description. The test instrument parameters, performance specifications, and test methods pertinent to the calibration, shall be presented in tabular form (see FIGURE 1). The test method description shall clearly indicate how each test instrument performance specification is verified and shall

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refer to alternate methods if utilized in the procedure. Variations in test instrument parameters or performance between models shall be identified.

3.2.2.2.1 Parameters. Test instrument parameters shall include those parameters identified in the Calibration Requirements Test List of the applicable Calibration Requirements Document (CRD). CRDs are tri-service approved technical manuals which describe the test parameters that are necessary and proper for the calibration of a generic class of instruments.

3.2.2.2.2 Performance specifications. Performance specifications shall be consistent with the item manufacturer's specifications whenever possible. If they are not, the calibration procedure shall identify any deviations from manufacturer's specifications.

3.2.2.3 Accessories. All peculiar accessories that require calibration with the test instrument shall be identified and described (refer to 6.4.4).

3.2.3 Section II- Equipment Requirements. This section shall contain a list of the calibration equipment and peculiar accessories required in the calibration process (see FIGURE 2). The information given shall include the generic name, minimum use specifications (parameters, range, and accuracy required by the procedure), and one or more recommended equipment items selected from the equipment lists specified below:

Army:	SC6695-92-A05 SC6695-92-A06 SC4931 -92-CL-A04
Navy:	NAVAIR 17-35NCE-1
Air Force:	TO 33K-1-101

3.2.3.1 Calibration equipment table.

3.2.3.1.1 Reference item number. The first column shall contain a reference item number assigned during the preparation of the procedure and the generic or common name for the equipment.

3.2.3.1.2 Minimum use specifications. The second column shall present the minimum use specifications, which are defined as the parameters, accuracy, range, input impedance, and any other pertinent factors which are required during the performance of the tests and measurements described in the procedure. This information is intended to assist in selecting suitable substi-

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tute equipment in the event equipment listed in column 3 is not available.

3.2.3.1.3 Equipment selection. The third column shall contain one or more examples of equipment which meet or exceed the second column minimum use specifications and which are adequate for the performance of the procedure. Selection of the items in this column will be made as described in paragraph 3.2.3.

3.2.3.1.4 Subsequent identification of equipment. Subsequent identification of the calibration equipment shall be general so as to facilitate equipment substitution. The calibration equipment shall be identified by generic terms, e.g., signal generator, direct voltage source, power meter, etc., as long as no confusion exists. Item numbers, where needed for understanding, shall be used throughout the text.

3.2.3.1.5 Note and footnote. The note and footnote shown in FIGURE 2 shall be used in all procedures if specified by the procuring activity (see 6.2).

3.2.3.2 Measurement system. A measurement system shall consist of all recommended calibration equipment or combinations thereof and have an uncertainty equal to or better than one-fourth of the uncertainty of the test instrument for each parameter tested, i.e., a test accuracy ratio (TAR)(see 6.4.5) equal to or better than four to one. Measurement systems of better TAR may be used for reasons of equipment availability, reduced complexity, or reduced calibration time. If a TAR equal to or better than four-to-one is not feasible because of state-of-the-art or other technical considerations, the best TAR available shall be used. In such cases, the actual TAR shall be stated in the procedure. Where several items of equipment are applicable, preference shall be given to the equipment affording the simplest, quickest, and most efficient test method.

3.2.3.3 Equipment list deviation. Contractors shall not deviate from the specified equipment list and from the TAR stated in 3.2.3.2 without prior approval of the procuring activity. If the TAR is worse than four to one, the actual TAR shall be stated in the procedure.

3.2.4 Section III - Preliminary Operations. This section shall include test instrument, accessory, and calibration equipment connections, warmup instructions, setup instructions, or other operations that are preliminary to the complete calibration process.

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3.2.4.1 Familiarization. Instructions for the technician to familiarize himself with the procedure before beginning calibration shall be included.

3.2.4.2 Special environmental conditions. Environmental conditions beyond those normally specified in facility requirements documents, and which affect the accuracy or validity of measurements, shall be described and shall include an explanation of the reasons for the requirement.

3.2.4.3 Test jigs and fixtures. When special test jigs and other test fixtures are required in the calibration process, the necessary instructions, drawings, and schematics for the fabrication shall be included in the preliminary operations, or in an appendix. If the logical location is in an appendix, the requirement shall be noted in the preliminary operations, along with the location of the necessary information.

3.2.5 Section IV- Calibration Process. This section shall describe the details (text, figures, illustrations, and tables) essential to the calibration of the test instrument and peculiar accessories.

3.2.5.1 Division of calibration process. The calibration process shall be divided into well identified divisions that cover each general calibration area. Each division shall be arranged in a logical sequence that will keep changes in connections, equipment setups, and control positions to a minimum. The necessary equipment connections, control settings, and operations which comprise the calibration process shall be described.

3.2.5.2 Procedure methods. The procedure shall utilize overall performance testing. Calibration methods by measurement of the test instrument output or end product shall be employed. For example, power supplies of items such as signal generators, oscilloscopes, and electronic voltmeters are tested indirectly by monitoring the output frequency or amplitude, or both.

3.2.5.2.1 Connection to internal components. The calibration shall be conducted without connection of equipment to internal components of the test instrument unless such connection is absolutely unavoidable.

3.2.5.2.2 Criteria for including parameters. In development of calibration procedures, the following shall apply:

a. Parameters (capabilities) that have performance limits which can be reasonably expected to change with time, use, or handling shall be included.

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b. Parameters (capabilities) whose performance limits are described as "approximate" shall not be verified.

c. Parameters whose values are fixed and not subject to change with time, use, or handling shall not be included. The parameter value shall be consistent with the performance specifications and test methods listed in the calibration description (see 3.2.2.2 and FIGURE 1).

d. Functional tests shall be omitted when a related discrepancy or malfunction would be revealed during normal operation of the test instrument.

3.2.5.3 Interconnection instructions. The procedure shall specify the type length, and dress of leads, grounding, and relative equipment placement, whenever such factors must be controlled to assure the success of the calibration. Interconnection information shall be described in words or shown in a simple line drawing, block diagram, or combination thereof, as required for clarity (see FIGURE 3).

3.2.5.4 Control settings. Control settings shall be given as necessary to assure complete understanding of the instructions. This information shall be specific with respect to control and panel markings on the test instrument and in general terms with respect to the calibration equipment and accessories. Series of control settings shall be presented in tabular form when required for clarity. Identification of test instrument controls and control settings shall be identically as shown on the equipment and shall be in uppercase characters.

3.2.5.5 Adjustment instructions.

3.2.5.5.1 Criteria for including adjustments. Adjustment instructions shall be included to the extent they satisfy the following criteria:

a. The adjustment instructions apply to all test instruments/serial numbers covered by the calibration procedure.

b. Reasonable assurance exists that an out-of-tolerance condition can be corrected by the adjustment without need for other maintenance/repair action.

c. The adjustment instruction can be included without unduly increasing the length and complexity of the procedure.

d. Interaction with other tests or adjustments are adequately covered.

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e. The adjustment instruction is compatible with the calibration equipment setup being used and test sequence being followed.

f. The adjustment is readily accessible.

3.2.5.5.2 Additional adjustment instructions. When adjustment instructions are included in a procedure, the intent of the following additional instructions will also be included in Section III:

a. Do not make adjustments prior to making measurements.

b. Do not adjust a parameter when the measurement of that parameter is within tolerance.

c. If a parameter is adjusted, repeat the calibration process for that parameter.

3.2.5.6 Verification and corrective action. The following note shall be placed at the beginning of Section IV:

"NOTE

Unless otherwise specified, verify the results of each test and take corrective action whenever the test requirement is not met, before proceeding."

In those cases where interaction of individual measurements will be affected by corrective action, the following instruction shall be added: "Do not take corrective action until step ___ has been performed."

3.2.5.7 Calibration curves and charts. Instructions for preparation of calibration curves, charts, and tables shall be included, when required, for the use of the test instrument.

3.2.5.8 Performance limits. Performance limits shall be included in the text wherever instructions for tests or measurements appear. When a series of related measurements are indicated, the performance limits shall be shown in tabular form. Limits shall conform to the following:

a. Performance limits shall be expressed in the same units as nominal values whenever feasible.

b. Tolerances shall be expressed as upper and lower limits, for example, 49 to 51 volts, rather than plus or minus a quantity

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or percentage. Where the nominal value is not predictable, or is derived during calibration, preference shall be given to expressing the tolerance as plus or minus a quantity rather than plus or minus a percentage of the nominal value.

c. Performance limits shall be expressed as single minimum or maximum values, for example, 2 centimeters minimum (2 cm min.) when required by the test instrument specification.

d. Nominal values and performance limits shall be expressed in the same units as the expected test data, whenever possible. Nominal values shall be omitted for quantities such as distortion, noise, ripple, etc., and quantities which are ideally zero. The processing of data or other computations, when required, shall be simplified as much as possible.

3.2.6 Calibration performance tables. Each calibration procedure shall include a Calibration Performance Table (CPT) when the technical specifications are not otherwise summarized in the procedure.

3.2.6.1 Contents of the CPT. The CPT shall be located after the Calibration Process (Section IV). It shall consist of all calibratable parameters listed in TABLE 1, showing procedure step number, range, values applied to the test instrument for each measurement parameter, and the performance limits for each measurement, as specified in 3.2.5.8. The performance limits shall be expressed in units of the same parameter as the test instrument capability listed in the calibration description (see 3.2.2.2 and FIGURE 1).

3.2.6.2 Number of CPTs. CPTs shall be provided for all instruments covered by the calibration procedure. A separate CPT shall usually be provided for each test instrument; however, if two or more test instruments have identical characteristics, or have minor differences which can be readily and unambiguously handled on one CPT, one CPT may be used. All applicable instruments shall be identified in the heading (see FIGURE 4). General procedures which include many test instruments do not require a separate CPT for each one.

3.2.7 Appendices. Appendices shall be used if necessary to present supplementary or reference material, extracts from National Institute of Standards and Technology bulletins, dimensional tolerances for coaxial fittings, alternate test or calibration methods or other essential information which has no logical location in the preceding instructions.

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4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in this specification where such inspections are deemed necessary to ensure supplies and services conform to the prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of Sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.2 Quality conformance inspection. Material furnished in accordance with this specification shall be inspected by the contractor for conformance to the applicable requirements of this document in accordance with MIL-M-38784 and MIL-P-38790, and when specified in the contract (F), (N), MIL-M-85337.

4.3 Government inspection. Material furnished in accordance with this specification shall be subject to inspection, verification and approval or disapproval by the Government as specified by the terms of the contract. Inspection/verification will be performed by the Government prior to acceptance.

5. PACKAGING.

5.1 Packaging requirements. Packaging shall be in accordance with MIL-P-38790.

6. NOTES.

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

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6.1 Intended use. Calibration procedures prepared to this specification are intended to provide the necessary instructions for periodic calibration of test and measurement equipment. These procedures are complete step by step instructions that enable the calibration personnel to verify the original accuracy of the test instrument.

6.2 Acquisition requirements. Acquisition documents must specify the following:

a. Title, number, and date of this specification.

b. Issue of the DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (2.1.1, 2.1.2, 2.2).

c. When similar test instruments will be covered in the same manual (3.1).

d. Other identification required (3.2.2.1 d).

e. Whether the note and footnote will be used (3.2.3.1.5 and FIGURE 2).

f. If performance of inspections will be other than as specified in this document (4.1).

6.3 Technical manuals.

6.3.1 Technical manual acquisition. (N), (A) This specification must be listed on the Contract Data Requirements List (DD Form 1423) in order to acquire the technical manuals described by this specification, except where DOD FAR Supplement 27.475-1 exempts the requirement for a DD Form 1423.

6.3.2 Technical manual acquisition. (F) To acquire the technical manuals described herein, this specification must be listed in AF TMCR TM-86-01, which in turn is listed in the Contract Data Requirements List (DD Form 1423), except where DOD FAR Supplement 27.475-1 exempts the requirement for a DD Form 1423.

6.4 Definitions. To clarify the terms used throughout this specification, the following definitions are given:

6.4.1 Calibration equipment. Equipment other than the test instrument required to perform the calibration.

6.4.2 Functional check (test). A check intended to verify correct functioning of a test instrument or some feature of a test instrument, which is independent of the accuracy of the test

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instrument. The requirement is usually a condition to be met rather than comparison with numerical tolerance limit values. Examples of functional checks are: oscilloscope position control range and centering, multimeter battery check, and oscilloscope sweep time vernier range check.

6.4.3 Minimum use specification. Minimum use specifications are the principal parameters required for performance of the calibration, and are included to assist in the selection of alternate equipment, which may be used at the discretion of the using laboratory. Satisfactory performance of alternate items will be verified prior to use. All applicable equipment must bear evidence of current calibration.

6.4.4 Peculiar accessories. Items furnished with a test instrument and used only with that test instrument, but not physically part of it; for example, a high voltage plug-in probe that is used specifically to extend the range of a particular voltmeter.

6.4.5 Test accuracy ratio (TAR). The maximum permitted error of the unit to be measured or calibrated divided by the maximum known error of the measuring or generating device used to perform the measurement. For example, if it is required that a system or equipment output parameter be accurate to 8% (maximum permitted error) and the known accuracy (maximum known error) of the measuring device used to measure the output parameter is 2%, then the TAR is 4.

6.4.6 Test and measurement equipment. Those devices which are used to measure or evaluate the characteristics of materiel or natural phenomena.

6.4.7 Test instrument. The equipment to be calibrated is identified as the test instrument.

6.5 Action verbs:

a. The verb "adjust" refers to the action of a continuously variable control, dial, etc.

b. The verb "set" refers to the action of a detent device having two or more detent positions.

c. The verbs "press" and "release" refer to the action of a spring-loaded plunger or lever device.

d. The verbs "push in" and "pull out" can be used for any type control that would require that particular action to enable its function. This would differ from pressing a pushbutton in

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that it could relate to a dual function control or dial that provided one function while pushed in, and another while pulled out; e.g., push in and set the VARIABLE/FREQUENCY DIAL for a frequency reading on the digital display (control is detent in the pushed in mode, and functions as a digital readout dial); pull out VARIABLE/FREQUENCY control and adjust control to 1.0 (control is no longer detent, but can be adjusted to various settings on the dial to affect another function). It would not be just a press and release action, as it would require a definite effort to push in or pull out.

e. The verb touch is used for equipment having electronic response "keys" that are "touch-activated" and respond to light finger pressure not considered to be a pressing action.

f. The phrase "adjust---to---" is used when the instruction means to align a mark on the control within an index on the panel, or the index on the control with a mark on the panel (i.e., Adjust the ATTEN control to -10dB.).

g. The use of "set---to---" follows the same rule, applicable to switches or controls with detent positions (i.e., "Set the RANGE switch to X10.).

Note: "To obtain" can be used in place of "for" and usually is preferable.

h. The phrase "adjust---for---" is used when the instruction means to adjust a control, to achieve a given condition or result indicated on another instrument, or on the same instrument in such a way as not to be directly associated with the dial or switch (i.e., "Adjust the FREQUENCY dial to obtain (for) a minimum DMM indication.").

i. The phrase "set---for---" follows the same rule, applicable to switches or controls with detent positions (i.e., "Set the DMM range switch to obtain (for) an upscale indication.").

6.6 Key word list.

Equipment certification
Test Accuracy Ratio (TAR)
TMDE (Test, Measurement and Diagnostic Equipment)

6.7 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

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TABLE 1 CALIBRATION DESCRIPTION:

Test Instrument (TI) Parameters	Performance Specifications	Test Method
Frequency Output	Range: 245 to 1050 MHz; 50 kHz or 6 MHz reference Accuracy: ±2%	Measured with an Electronic Counter
Amplitude Output	Range: 0.5 to 4 V p-p Accuracy: ±3% at reference output	Measured with a Digital Voltmeter
Amplitude Flatness	Range: 50 kHz to 1050 MHz Accuracy: Within ±4% of the 50 kHz or 6 MHz reference frequency amplitude (equivalent to an 8% power change).	Monitored with p-p detector and with a power meter.

FIGURE 1 Typical Calibration Description

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NOTE

Minimum use specifications are the principal parameters required for performance of the calibration, and are included to assist in the selection of alternate equipment, which may be used at the discretion of the calibrating activity. Satisfactory performance of alternate items shall be verified prior to use. All applicable equipment must bear evidence of current calibration.

TABLE 2 EQUIPMENT REQUIREMENTS:

Noun	Minimum Use Specifications	Calibration Equipment[1]
2.1 Electronic Counter W/Heterodyne Converter	Range: 0.05 to 1050 MHz Accuracy: ±0.01%	Hewlett-Packard 5345A w/5254C
2.2 Digital Voltmeter	Range: 0 to 2.0 VAC; 0 to 1 VDC Accuracy: ±0.5%	Fluke 8840A
2.3 P-P Detector	Range: 0.05 to 245 MHz Accuracy: AGMC calibrated for flatness	Tektronix 067-0625-00
2.4 Resistor	Range: 2MΩ Accuracy: ±5%	As available
2.5 Power Meter W/Power Sensor	Range: 0 to 10 mW; 245 to 1050 MHz Accuracy: Amplitude flatness within 4%	Hewlett-Packard 432A w/8478B
2.6 Power Module	Range; Suitable for use with TI	Tektronix TM 500 Series
2.7 Termination	Range: 50Ω Accuracy: ±0.1%	Tektronix 011-0129-00

[1]The calibration equipment utilized in this procedure was selected from those known to be available at Department of Defense facilities, and the listing by make or model number carries no implication of preference, recommendation, or approval by the Department of Defense for use by other agencies. It is recognized that equivalent equipment produced by other manufacturers may be capable of equally satisfactory performance in the procedure.

FIGURE 2 Typical Equipment Requirements

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NAVAIR 17-20ICP-000

TRIPLE SPACE

4.10.2 This step is typed here in order to illustrate the correct spacing between this step, the procedure number (above), and the figure (below). Leave a triple space between the procedure number and the running text; quadruple space if a section heading starts the page.

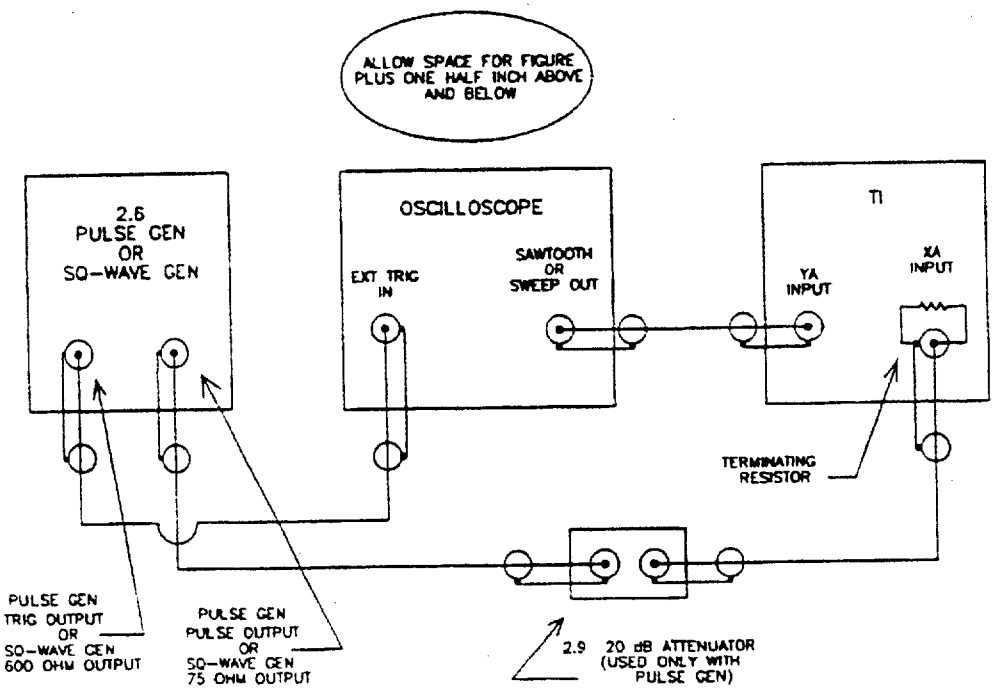

Figure 1. X Attenuator Compensation Test Configuration

TRIPLE SPACE

NOTES

1. If the pulse generator is being used, connect the 20 dB attenuator between the pulse output and the TI. Adjust the pulse generator controls for a repetition rate of approximately 4000 pps, the pulse width control for a width of 5 ms, and adjust the delay and amplitude controls for a stable TI CRT display 10 cm in amplitude.

2. If the square-wave generator is being used, adjust the frequency control for approximately 20 kHz, and adjust the 75 ohm amplitude control for a TI CRT display 10 cm in amplitude.

TRIPLE SPACE

4.10.3 Set the TI X VOLTS/CM switch to 5 (green marking).

FIGURE 3 Typical Interconnection Diagram

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CALIBRATION PERFORMANCE TABLE

Test Inst(s): SG-504

Procedure Para. No.	Parameter	Range	Applied	Limits
4.1 MHz	Frequency	LOW	245 MHz	240.1 to 249.9
			250	245.0 to 255.0
			300	294.0 to 306.0
			.	
			.	
			.	
			550	539.0 to 561.0
	HIGH		500	490.0 to 510.0
			600	588.0 to 612.0
			700	686.0 to 714.0
			800	784.0 to 816.0
			900	882.0 to 918.0
			1000	980.0 to 1020.0
			1050	1029.0 to 1071.0
		0.05 MHz	0.05	0.049 to 0.051
		6 MHz	6	5.88 to 6.12
4.2 Output Amplitude		0.5 to 4 V p-p	4.0 V p-p	1.371 to 1.456 Vrms
			3.0	1.028 to 1.092
			2.0	0.685 to 0.728
			1.0	0.342 to 0.364
			0.5	0.171 to 0.182
4.3 Leveled Amplitude		50 kHz to 1050 MHz	50 kHz	Reference
			245 to 1050 MHz	Within +4% of ref amplitude

FIGURE 4 Typical Calibration Performance Table

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Navy - OS
Air Force -16

Review Activities:
Army- USATA
Navy - NWAC
Air Force - AGMC/MLEP

User Activities:
Army
Navy
Air Force

Preparing Activity:
Air Force - 16

TMSS Project O297 Air Force

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