Materiel Test Procedure 6-3-055(C)
U. S. Army Airborne, Communication
and Electronics Board

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U. S. ARMY TEST AND EVALUATION COMMAND
COMMODITY SERVICE TEST PROCEDURE

COMMUNICATION SECURITY EQUIPMENT

1. OBJECTIVE

This document is a guide to test methods and techniques for determining the suitability of communication security equipment for tactical use by the Army.

2. BACKGROUND

Communication security equipment as dealt with in this MTP is that equipment designed to deny to unauthorized persons information of value which might be derived from the possession and study of telecommunications. Various items of communication security equipment have been developed, tested, and produced for use. These include items for use with voice and teletypewriter communication means in a variety of applications such as fixed plant, certain links in common user type area systems, mobile systems in both the larger and smaller tactical combat vehicles, and man-pack operable radio sets. They also include Automatic Data Processing Installations, classified transmission links and remote terminals. Many of such applications have been made possible only through extensive use of solid state type electronic parts and the employment of digital signal techniques. Development is continuing and progress is being made in both size and weight reduction as well as improved security. As a result, increased use and more widespread application of communication security equipment can be expected in the future. Service testing will be required to determine the suitability of such equipment for Army use. Procedures for conduct of this testing are presented in the MTP.

3. REQUIRED EQUIPMENT

a. Communications security equipment under test (test item).
b. Electronic equipment or systems with which the test item is designed and/or required to operate together with test equipment and tools required for use of such equipment and systems.
c. Maintenance test package.
d. Suitable field test sites.
e. Equipment and facilities are specified in referenced MTP's.

4. REFERENCES

A. USATECOM Regulation 70-23, Research and Development: Equipment Performance Reports (EPRs).
B. USATECOM Regulation 70-24, Research and Development: Documenting Test Plans and Reports.
C. USATECOM Regulation 380-5, Safeguarding Defense Information.

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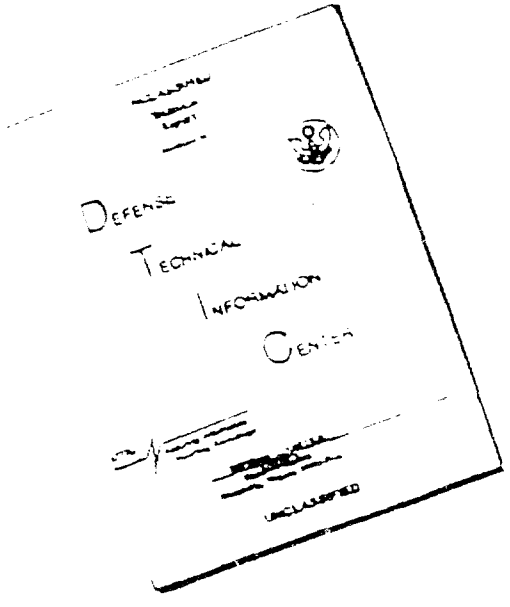

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D. USATECOM Regulation 380-40, Department of the Army Policy for Safeguarding COMSEC Information.
E. USATECOM Regulation 700-1, Quality Assurance: Value Engineering.
F. MTP 6-3-500, Physical Characteristics.
G. MTP 6-3-501, Pre-Test Inspections.
H. MTP 6-3-502, Personnel Training Requirements.
I. MTP 6-3-504, Installation and Operation.
J. MTP 6-3-506, Durability.
K. MTP 6-3-508, Submersion.
L. MTP 6-3-509, Effects of Weather.
M. MTP 6-3-510, Transportability of Communications, Surveillance, and Electronic Equipment.
N. MTP 6-3-512, Compatibility with Related Equipment.
O. MTP 6-3-513, Qualitative Electromagnetic Interference.
P. MTP 6-3-515, Reliable Communications Range.
Q. MTP 6-3-517, Electrical Power Requirements.
R. MTP 6-3-518, Operation During Travel.
S. MTP 6-3-521, Operational Intelligibility Testing of Voice Communication Equipment.
T. MTP 6-3-523, Safety.
U. MTP 6-3-524, Maintenance.
V. MTP 6-2-525, Human Factors.
W. QMR, SDR or other approved requirements.
X. Technical Manuals, Manufacturers Installation, Operation, and Maintenance Information and Appropriate Engineering Test Data.
Y. MIL-STD-188C, Military Communication System Technical Standards.
Z. FED-STD-222, Radiation Standards for Communications and Other Information Processing Equipment.

5. SCOPE

This materiel test procedure describes tests for determining the suitability of the test item for operation with designated items of communication equipment to provide secure communications. The test item will be installed and operated under field conditions by personnel representative of those who will operate the equipment when it is fielded. The test item and its performance, as part of a secure communications system, will be compared with the requirements of applicable QMR, SDR or other approved documents. When the test item is intended to replace one or more standard items, the standard items (referred to as control item(s)) shall be subjected to the applicable test procedures concurrently with the test item to develop the relative merits of each.

5.1 SUMMARY

5.1.1 Preparation for Test

This section provides guidance for test project planning requirements for facilities and equipment, and instructions for test personnel familiarization.

5.1.2 Test Conduct

The specific tests to be performed are as follows:

a. Physical Characteristics and Test Item Inspection - This section provides procedures for obtaining test item physical characteristics and determining condition of the test item as received for test, as well as condition of equipment with which it is to be used.

b. Personnel Training - Procedures are given for training test personnel in installation and operation of the test items as well as operator maintenance functions.

c. Installation and Operation - Installation and operation are accomplished by representative user personnel and repeated as necessary to determine time, personnel and tools required.

d. Electrical Power Requirements - The objective of this subtest is to determine power requirements for the test item.

e. Compatibility - Procedures are given for determining any lack of compatibility between the test item and equipment with which it is intended to operate.

f. Operational Intelligibility - The procedures given are for use in determining operational intelligibility effects where the test item is used with tactical voice communication equipment.

g. Qualitative Electromagnetic Interference - The objective of this subtest is to evaluate interference caused by the operation of collocated equipment to the test item and the interference caused by the test item to collocated equipment in the operating environment.

h. Reliable Communications Range - The objective of this subtest is to evaluate the suitability of the communications equipment or system to provide reliable communications over distances specified or deemed appropriate with the test item installed and operated on a system basis.

i. Transportability of Communications, Surveillance, and Electronic Equipment - The objective of this subtest is to evaluate provisions for transport of the test item and the suitability of the test item for air, surface, and man transport as required.

j. Submersion - The objective of this subtest is to determine if the test item is immersionproof.

k. Operation During Travel - The procedures given are for determining significant performance differences between stationary operation and operation while traveling.

l. Durability - This section contains procedures for determining capability of the test item to withstand the effects of handling and transporting under field conditions.

m. Weather - A determination of the effects of weather on the test item is made based on weather conditions encountered.

n. Maintenance - Throughout the conduct of the testing, maintenance actions are noted and reported. This includes all failures, manpower, tools and equipment required, suitability of maintenance instructions and the maintenance test package, mean time between failures and mean time to repair.

o. Human Factors - An evaluation of the man item relationship under the prescribed test conditions to determine the ease of handling, using, and maintaining the test item.

p. Value Analysis - An evaluation directed at analyzing components and features for the purpose of reducing cost without compromising its performance, safety, and suitability for Army use.

q. Safety - An evaluation to determine the safety characteristics and to provide safety confirmation.

5.1.3 Test Data

This section details the raw data to be collected and recorded while completing the test procedures in paragraph 6.2, Test Conduct.

5.1.4 Data Reduction and Presentation

This section provides instructions for analyzing and evaluating the raw data and presenting the results.

5.2 LIMITATIONS

The procedures in the MTP are limited to testing to determine the performance of communication equipment when security equipment is used; it excludes testing to determine the degree of security provided.

6. PROCEDURES

6.1 PREPARATION FOR TEST

6.1.1 Test Project Planning

The test project officer and other designated test personnel must:

a. Review the test directive to gain a clear understanding of test objectives and all accompanying instructions. Give particular attention to the security check list. The test item without the code key incorporated may be either unclassified or have a low security classification; however, with the code key incorporated, the test item may have a high security classification. Key lists, if any, almost invariably will have a high security classification. Additionally, where the test item is to be used with existing systems (such as mobile radio teletypewriter sets), the wiring/cabling in such systems must be such that signal security is not compromised; any doubt as to possibility of such compromise must be thoroughly investigated by the appropriate equipment developer prior to conduct of test.

b. Conduct a thorough study of stated requirements as contained in QMRs, SDRs, the Test Directive, or other appropriate documents to insure that complete and suitable test criteria are selected.

c. Study thoroughly the characteristics of the test item and associated electronic equipment with which it is intended to be used.

d. Determine test site and any radio frequency requirements.

e. Plan for and schedule all test personnel and any personnel training required.

f. Review the listing of required equipment (paragraph 3) and data determined in paragraph 6.1.1c. to determine support items required.

g. Consult, as required, with the appropriate U. S. Army Security Agency to preclude security compromise.

6.1.2 Required Equipment/Facilities Setup

Test projects conducted at established test facility will normally require minimum preparation with respect to equipment and facilities setup. Support items required are usually readily available but scheduling and planning for use are required. All COMSEC test facilities will be approved in accordance wtih AR 380-40.

6.1.3 Test Personnel Familiarization

Instruct supervisory test team members in the safety precautions to be followed when conducting tests. Issue copies of all appropriate technical manuals for equipment used during testing. Include the following:

a. Security classification of key lists, the test item under various specified conditions, and complete security measures to be used.

b. Information on proper use of electronic equipment operated with the test item.

c. Procedures to be followed and the data to be collected during test conduct.

d. Known hazards and safety precautions associated with test procedures and equipment.

6.2 TEST CONDUCT

Subtests shall be conducted concurrently with other subtests, whenever possible, so that time to collect required data will be minimized.

NOTE: All test item damage either noted upon receipt or sustained during testing shall be reported in accordance with USATECOM Regulation 70-23 (ref 4A).

6.2.1 Physical Characteristics and Test Item Inspection

Determine test item physical characteristics, the physical and operational condition of the test item as received for test and the condition of equipment with which the test item is to be used, using applicable portions of MTP 6-3-500 (ref 4.F) and MTP 6-3-501 (ref 4.G)

6.2.2 Personnel Training

Using applicable procedures in MTP 6-3-502 (ref.4.H),conduct operator training. Instruct test personnel in the tactical installation, operation and operator maintenance.

6.2.3 Installation and Operation

Perform applicable portions of MTP 6-3-504 (ref 4.I) to determine the ease of tactical installations and operation of the test item.

6.2.4 Electrical Power Requirements

Using applicable portions of MTP 6-3-517 (ref 4.O) to determine ability of the test item for use with power sources as may be designated in the QMR, SDR, and for use with representative tactical power sources.

6.2.5 Compatibility

Perform applicable portions of MTP 6-3-512 (ref 4.N) to determine any lack of electrical and mechanical compatibility that may exist between the test item and equipment with which it is required to operate. This includes,

but is not necessarily limited to, compatibility in terms of size, weight, electrical cables and connectors, code format, signal levels and signalling rate.

6.2.6 Operational Intelligibility

Using procedures in MTP 6-3-521 (ref 4.S)to determine that intelligibility of message traffic, transmitted and received using communication equipment and the test item operating as a system, is either suitable or unsuitable. Although MTP 6-3-521 is concerned with voice intelligibility, the principles used in judging acceptability of message traffic are equally applicable to teletype (or other digital data) and are to be used whether the test item is for voice or teletype.

6.2.7 Qualitative Electromagnetic Interference

Operate test item with collocated equipment as described in applicable sections of MTP 6-3-513 (ref 4.O) to determine the presence and effects of any objectionable electromagnetic interference.

6.2.8 Reliable Communications Range

Provided the results of testing conducted as specified in paragraph 6.2.6 are satisfactory, use procedures in MTP 6-3-515(ref 4.P) to determine the reliable communication distance for those communication items with which the test item is used. If the reliable communication distance of the communication items used without the test item is not already known, this must be determined in order to compare performance both with and without the test item. During the conduct of these procedures, give particular attention to the following as appropriate:

a. Synchronization methods required and effects of loss of synchronization.

b. Alarm features (e.g., for loss of security or inadvertent use of clear text).

c. Clear text override capability.

d. Built-in test equipment features.

e. The capability of removing the test item, primarily from shelter installations, for clear text operation without entailing significant delay.

f. Any loss of normal communication equipment functions as a result of test item employment. (These would include such functions, for example, as squelch and retransmission in case of radio communication.)

g. Provision for rapid and/or automatic key erasure (commonly referred to as zeroising) by authorized personnel or upon tampering by unauthorized personnel.

6.2.9 Transportability of Communications, Surveillance, and Electronic Equipment

Determine the transportability of the test item as described by the applicable sections of MTP 6-3-510 (ref.4.M)

6.2.10 Submersion

Determine the immersionproof characteristics of the test item, if applicable, according to the procedures of MTP 6-3-508 (ref.4.K)

6.2.11 Operation During Travel

If required, perform applicable portions of MTP 6-3-518 (ref 4.R) to determine performance to the test item during operation while moving. This performance will be compared with that obtained during operation while stationary. Each operational mode provided in the test item will be used during travel over unimproved roads, trails and cross-country terrain as specified.

6.2.12 Durability

Perform applicable portions of MTP 6-3-506 (ref 4.J) in order to determine if the test item has the requisite durability. Perform tactical installation (preparation for operation) and preparation for movement actions a sufficient number of times, and accumulate a sufficient number of hours (several hundred) of operations, to simulate extended life usage as specified.

6.2.13 Effects of Weather

Perform applicable portions of MTP 6-3-509 (ref 4.L) to determine the effects of weather encountered during the test period. Within limitations of stated requirements, take advantage of every opportunity to subject the test item to weather extremes occurring during the test period.

6.2.14 Maintenance

Conduct the maintenance evaluation using applicable guidance as outlined in MTP 6-3-524 (ref 4.U)

6.2.15 Human Factors

Conduct the human factors evaluation using applicable guidance as outlined in MTP 6-3-525 (ref 4.V) Give particular attention to:

a. The ease and rapidity with which personnel can accomplish

change of code or key settings. This must be accomplished repeatedly by different individuals in order to assure the minimum possibility of errors being made.

b. Total size and weight involved and any operator personnel difficulties where man=pack operation is required.

6.2.16 Value Analysis

a. During the conduct of all tests, test personnel shall evaluate the test item(s) from a value versus cost standpoint. Record all pertinent comments concerning features or components which can be eliminated or modified to accomplish cost reduction without impairment of performance, reliability, quality, maintainability, or safety. The applicable portions of USATECOM Regulation 700-1(ref 4.E) shall be used for this evaluation.

b. Consideration shall be given to the following:

1) Mission Capacity.

The test item(s) should be capable of accomplishing the specified task with only a reasonable margin of excess capability. Excess capacity and unused capability normally result in unnecessary bulk, excessive weight and unwarranted costs.

2) Simplicity

Unnecessarily complex components and systems, redundancy, and the use of unneeded parts will increase costs and maintenance efforts.

3) State of the Art

In many instances the use of recently developed, currently available, components and automated features will result in an overall product improvement and cost savings.

4) Standardization

The use of identical parts and parts currently in the military system will reduce the overall logistics burden.

5) Materials and Methods of Construction

Polished surfaces, overdone finishes, and the use of expensive materials will result in unnecessary costs if used inappropriately.

6) Tolerances

Excessively close tolerances are costly and result in difficulties and delays in accomplishing assembly, routine maintenance, servicing and repair.

6.2.17 Safety

Conduct the safety evaluation using applicable guidance as outlined in MTP 6-3-523 (ref 4.T)

6.3 TEST DATA

NOTE: In compiling the Test Data section, test personnel should expound upon that data which is other than quantitative in nature by recording narrative descriptions of events occurring during conduct of the test.

Record the following:

6.3.1 Physical Characteristics and Test Item Inspection

Date required by MTP 6-3-500 (ref 4.F) and MTP 6-3-501 (ref 4.G)

6.3.2 Personnel Training

Data required by MTP 6-3-502 (ref 4.H)

6.3.3 Installation and Operation

Data required by MTP 6-3-504 (ref 4.I)

6.3.4 Electrical Power Requirements

Data required by MTP 6-3-517 (ref 4.Q)

6.3.5 Compatibility

Data required by MTP 6-3-512 (ref 4.N)

6.3.6 Operational Intelligibility

Data required by MTP 6-3-521 (ref 4.S) with comments on any degradation caused by the test item.

6.3.7 Qualitative Electromagnetic Interference

Data required by MTP 6-3-513 (ref 4.O)

6.3.8 Reliable Communications Range

Applicable data required by MTP 6-3-515 (ref 4.P) with comments on any degradation caused by test item. In addition, and as appropriate, record the following.

a. Any difficulties encountered with synchronization, time required for initial synchronization, and time required for resynchronization during the course of operation.

b. All inadequate aspects of alarm features.

c. All instances of failure of clear-text override capability, if provided.

d. Inadequacies of built-in test equipment features.

e. Time and actions required to effect clear-text operation once the test item is removed.

f. Each normal communication equipment function lost as a result of test item employment and operational procedures with and without the test item being used.

g. Time and operator action required for key erasure (zeroise) and any inadequacy of automatic key erasure.

6.3.9 Transportability of Communications, Surveillance, and Electronic Equipment

Data required by MTP 6-3-510 (ref 4.M)

6.3.10 Submersion

Data required by MTP 6-3-508 (ref 4.K)

6.3.11 Operation During Travel

Data required by MTP 6-3-518 (ref 4.R)

6.3.12 Durability

Data required by MTP 6-3-506 (ref 4.J)

6.3.13 Effects of Weather

Data required by MTP 6-3-509 (ref 4.L)

6.3.14 Maintenance

Data required by MTP 6-3-524 (ref 4.U)

6.3.15 Human Factors

Data required by MTP 6-3-525 (ref 4.V) In addition, record the number of times key changes were made and all resulting errors, if any.

6.3.16 Value Analysis

a. Appropriate comments for each of the topics listed below:

1) Mission capacity.
2) Simplicity.
3) State of the Art.
4) Standardization.
5) Materials and methods of construction.
6) Tolerances.

b. Proposals for changes in the test item with reasons therefore.

6.3.17 Safety

Data required by MTP 6-3-523 (ref 4.T)

6.4 DATA REDUCTION AND PRESENTATION

6.4.1 Data Reduction

Organize, analyze and summarize all raw data as specified in each of the MTP's referred to in paragraph 6.2. Use tabulations and charts as appropriate. Make a succinct, unbiased, and independent analysis of test data to show:

a. The degree to which the test item meets stated requirements (test criteria) in QMR, SDR, or other approved documents.

b. Deficiencies, shortcomings and suggested improvements.

6.4.2 Data Presentation

Evaluate and present a complete data summary indicating the results and address the following:

a. Item characteristics such as preformance, reliability, durability and human factors engineering.

b. Comparison of test item characteristics with those of a similar item or standard (control item). Show whether the test item offers a significant improvement (or not) over the control item or only a minimal and perhaps costly improvement.

c. Maintenance and maintainability characteristics.

d. Safety characteristics and safety confirmation. All aspects of safety must be evaluated to determine if safety confirmation can be given or must be withheld pending correction of any hazards found.

e. A brief study and discussion on any problems that may arise, once the test item is fielded, on storage distribution, and use of crypto material down to and including the lowest tactical unit level where the test item is intended for use.

f. Conclusions and recommendations on overall test objectives and the suitability or unsuitability of the test item for Army use.

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13. ABSTRACT

Procedures are described for testing communications equipment designed to provide secure communications under simulated tactical conditions. Operational intelligibility, system compatibility, reliable communications range, and electromagnetic effects are

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