

MIL-S-14823A
24 March 1988
 SUPERSEDING
 MIL-S-14823
 11 July 1968

MILITARY SPECIFICATION

STOP WATCH, MILITARY

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

1. SCOPE

1.1 Scope. This specification covers a general purpose stop watch having a minimum of seven jewels, adjusted for one position, with a 60-minute register and a non-continuous running movement controlled by the crown and a side push-button.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

- * 2.1.1 Specifications and standards. The following specifications and standards form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation.

SPECIFICATIONS

FEDERAL

PPP-T-360 - Timer Measuring Instruments, Packaging of

STANDARDS

MILITARY

MIL-STD-105 - Sampling Procedures and tables for Inspection by Attributes

MIL-STD-109 - Quality Assurance Terms and Definitions

MIL-STD-202 - Test Methods for Electronic and Electric Component Parts

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document, should be addressed to: Commander, U.S. Army ARDEC, ATTN: SMCAR-ESC-S, Picatinny Arsenal, New Jersey 07806-5000 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 6645

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(Copies of specifications, standards, handbooks, drawings, publications, and other Government documents required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting offices.)

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

3. REQUIREMENTS

3.1 Qualification. Stop watches furnished under this specification shall be products which are qualified for listing on the applicable qualified products list at the time set for opening of bids (see 4.3 and 6.4).

3.2 Materials. All materials shall be of uniform quality and free of defects which might impair the functioning or accuracy of the stop watches. Material which is not specified by a definite material specification shall be of a composition and quality that will enable the stop watches to meet all applicable requirements of this specification.

3.2.1 Protective treatment. All parts of the stop watch which are susceptible to corrosion shall be protected by a suitable finish except parts where proper functioning would be detrimentally affected.

3.3 Design and construction. The stop watch shall have a metal or plastic case. A stem wound, jeweled non-continuous running movement (see 6.3) with a jeweled lever escapement shall drive concentrically mounted second and minute hands around a dial having 1/5 second marking a 60 minute register. The stop watch shall have a side push-button.

3.3.1 Controls.

3.3.1.1 Crown. Successively depressing and releasing the crown, in one operation, shall start or stop the movement and both hands. The hands shall not return to zero as a result of any operation.

3.3.1.2 Side push-button. Depressing the side push-button shall result in both hands returning to zero. The releasing of the push-button, when the depression was made with the movement running, shall result in both hands starting to record the next interval of time.

3.3.2 Functions.

3.3.2.1 Single interval of time. A single interval of time shall be measured by two successive operations of the crown.

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3.3.2.2 Cumulative intervals of time. Cumulative intervals of time shall be measured by repeating the functions for a single interval of time (see 3.3.2.1). The hands shall re-start at the point where stopped.

3.3.2.3 Successive intervals of time separately. Depressing the side push-button, while recording an interval of time, shall result in the hands returning to zero. Releasing the side push-button shall result in both hands starting to record the next interval of time.

3.4 Movement. The movement shall have a minimum of seven jewels with a non-continuous running movement. The movement shall be stem wound with the crown located at the 60 second position on the dial.

3.4.1 Mainspring. When fully wound, the mainspring shall be capable of driving the movement for 8 hours without rewinding. The material for the mainspring shall be a corrosion-resistant, high strength, "non-breakable" alloy.

3.5 Dial. The dial shall conform to Figure 1. All markings and the dial shall have a durable protective coating. The graduations between seconds on the second register shall be 1/5 second.

3.6 Hands. There shall be two hands; one each to indicate the second and minute. The tips of the hands shall be curved downward to reduce parallax. The indicator ends of the second and minute hands at all positions of recording time shall terminate on the graduations of their respective dials.

3.6.1 Color. The second hand shall be black; the minute hand shall be white.

3.7 Case. The case dimensions shall be as shown on Figure 2.

* 3.7.1 Finish. Visible parts of the case, including the crown and push-button, shall have a dull, non-reflecting finish.

3.7.2 Crystal. The crystal shall be clear, uncolored, and free of bubbles, scratches, or other imperfections which may interfere with the reading of the watch.

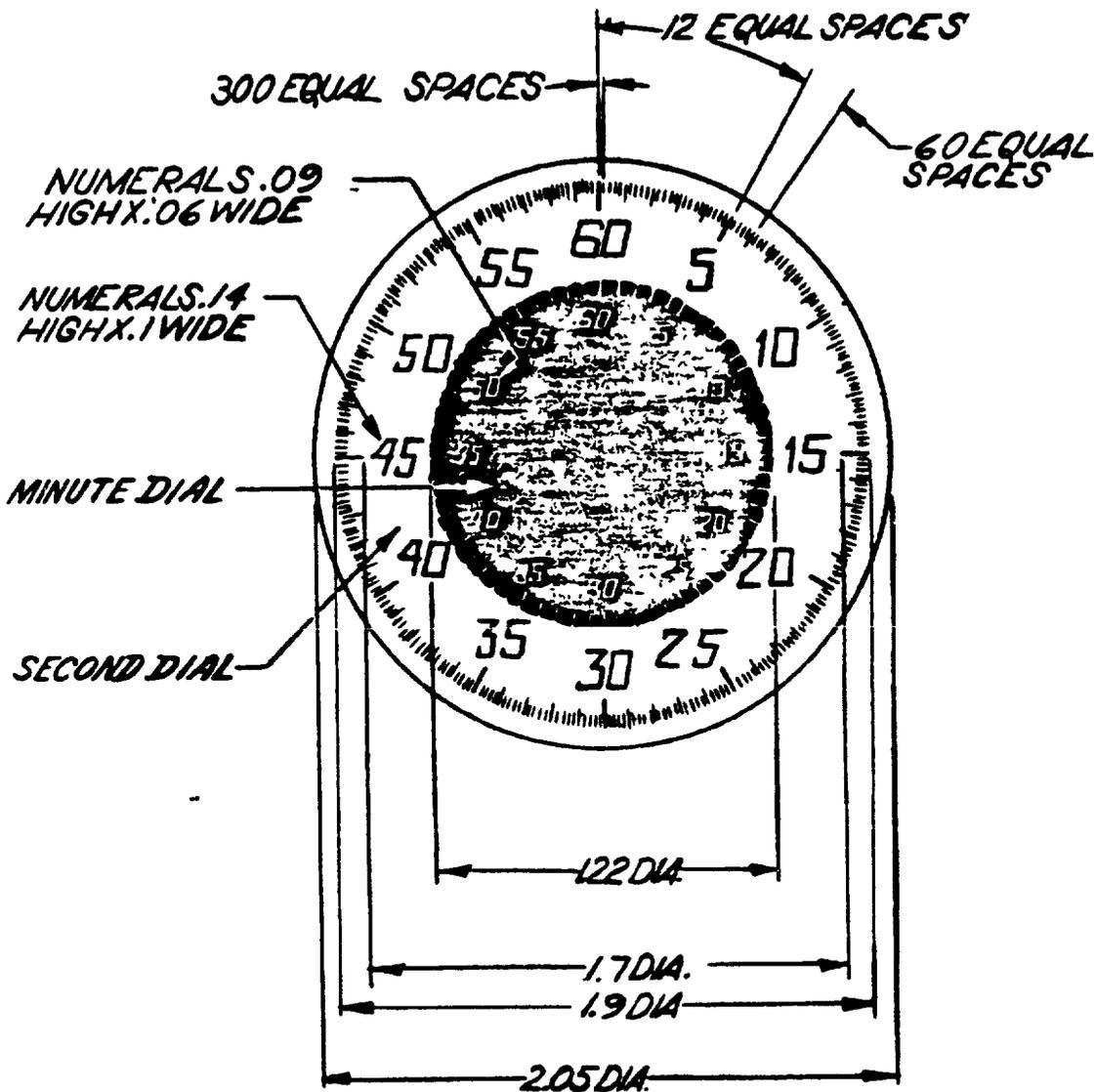
* 3.7.3 Crown. The crown shall be located at the 60 second position of the dial.

* 3.7.4 Push button. The push button shall be located between the 5 and 10 seconds or the 50 and 55 seconds position of the dial. The position as illustrated in Figure 2 is for reference only.

3.8 Performance.

3.8.1 Operating force. The force required to operate the crown shall be 3 pounds \pm 1/2 pound. The force required to operate the push-button shall be 5 pounds \pm 1/2 pound.

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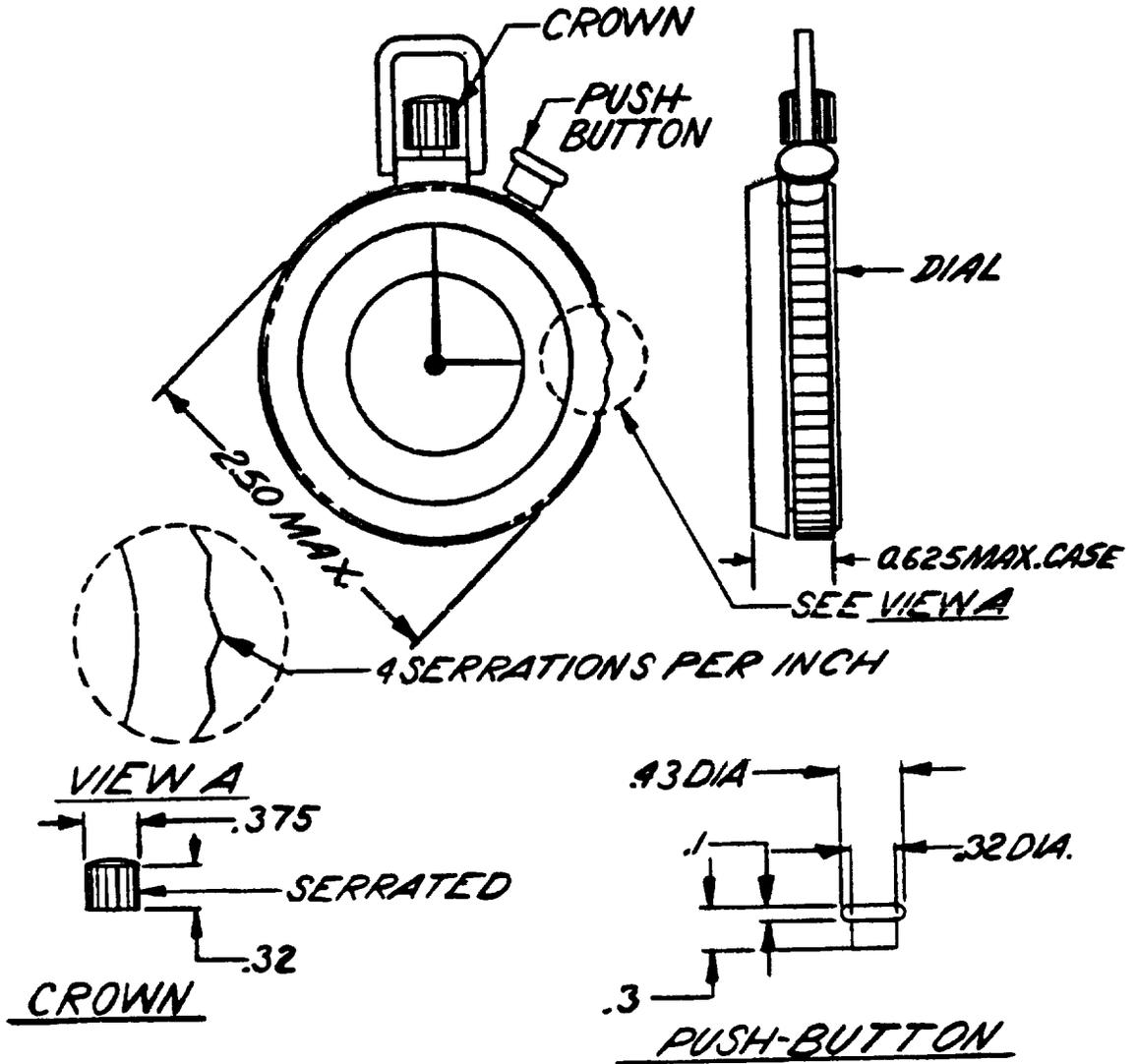


- NOTES: 1. MINUTE DIAL BACKGROUND TO BE BLACK, GRADUATIONS AND NUMERALS TO BE WHITE.
2. SECOND DIAL BACKGROUND TO BE WHITE, GRADUATIONS AND NUMERALS TO BE BLACK.

DIMENSIONS IN INCHES
TOLERANCES $+.010, -.000$

FIGURE 1. Dial.

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DIMENSIONS IN INCHES
TOLERANCES $\pm .010$

FIGURE 2. Case dimensions.

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3.8.2 Torque. When fully wound, the stop watch shall not be damaged when a torque of 32 inch-ounces is applied to the crown.

3.8.3 Vibration. Stop watches shall retain accuracy and show no evidence of damage after being subjected, while running, to 4 cycles of vibration, each of one minute. A cycle of vibration shall consist of a simple harmonic motion having an amplitude of 0.03 inches (0.06 inches total excursion) and a frequency varied uniformly between the limits of 10 and 55 cycles per second (cps). The entire frequency range from 10 to 55 cps, and return to 10 cps, shall be traversed in approximately one minute.

3.8.4 Shock. Stop watches shall retain accuracy and show no evidence of damage affecting serviceability after an uncontrolled drop, while running, from a height of 3 feet onto a block of hard wood.

3.8.5 Waterproofness. Stop watches shall be capable of rejecting the entry of water at a depth of 6 1/4 feet for 15 seconds at +24 C + 2 C.

* 3.8.6 Magnetism. The 3-minute rate (3.8.8.1b) shall not change by more than +0.2 second when the watch is subjected to a magnetic field of 60 Gauss (+5 Gauss, -0 Gauss) for a minimum of 5 seconds in each of the following positions:

- a. Vertical (with crown in any position).
- b. Horizontal (with dial up or down).

* 3.8.7 Storage. The stop watch shall show no evidence of damage affecting serviceability after being subjected to storage temperatures of -54 C and +65 C for 24 hours at each temperature.

3.8.8 Accuracy.

3.8.8.1 Room temperature. Stop watches at +22 C + 2 C in the position of crown up with the back of case 45 degrees from horizontal shall not exceed the following accuracy tolerances:

Time	Tolerance
a. 60 seconds	+0.2 second, -0.0 second
b. 180 seconds	+0.2 second, -0.0 second
c. 60 minutes	+0.6 second, -0.0 second

3.8.8.2 High and low temperatures. Stop watches at +5 C + 2 C and + 41 C + 2 C at the position specified in 3.8.8.1 shall not exceed the following accuracy tolerances:

Time	Tolerance
60 minutes	+ 1.0 second

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3.8.9 Start-stop mechanism.

3.8.9.1 Crown. The start-stop mechanism controlled by the crown shall be capable of 2500 cycles of starting and stopping.

3.8.9.2 Side push-button. The start-stop mechanism controlled by the side push-button shall be capable of 2500 operations.

3.9 Identification marking. The back of each case shall be permanently marked as specified in Figure 3. The serial numbers will be assigned by the contracting officer. Serial numbers of rejected stop watches will not be reused.

3.9.1 Application. The marking shall be applied directly to the back of the case by any method which is as permanent as the life expectancy of the stop watch and capable of withstanding the specified environmental requirements.

3.10 Workmanship. Workmanship shall be of a quality consistent with the highest existing production standards and practices. All finished surfaces shall be protected against corrosion or damage during manufacture prior to delivery. All surfaces shall be free from burrs and sharp edges. All material shall be free from seams, cracks, and other defects which may adversely affect the strength, endurance, or wear resistance of the part. Any material which has been treated in any manner to conceal defects therein shall not be offered for Government acceptance.

4. QUALITY ASSURANCE PROVISIONS

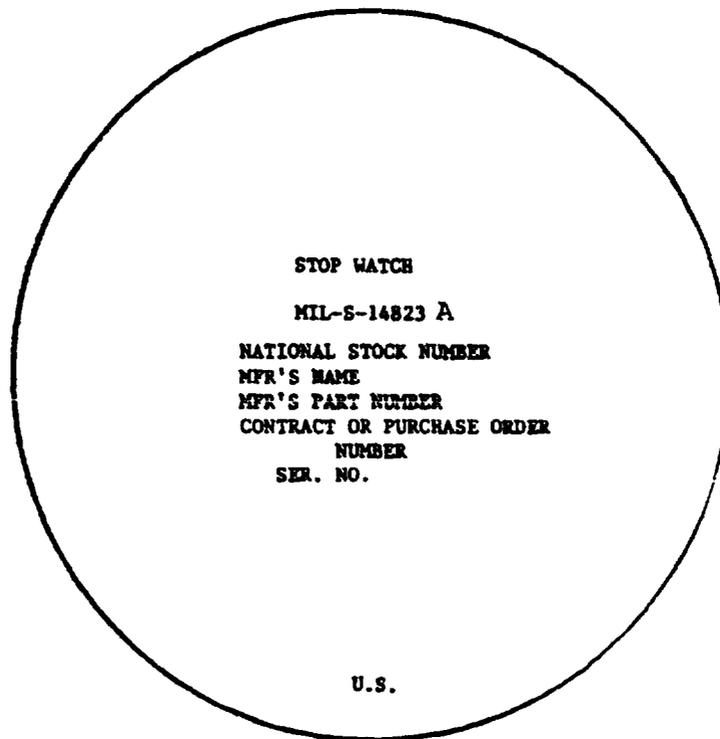
4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any 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 the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

* 4.1.1 Responsibility for compliance. All items must 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 assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.1.2 Quality assurance terms and definitions. Quality assurance terms and definitions shall be in accordance with MIL-STD-109.

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**LETTERS AND NUMERALS TO BE .1
HIGH X .020 DEEP CENTRALLY LOCATED**



NOTE: THE NATIONAL STOCK NUMBER, MANUFACTURER'S NAME, MANUFACTURER'S PART NUMBER AND CONTRACT OR PURCHASE ORDER NUMBER MAY BE APPLIED WITHOUT THEIR DESCRIPTIVE TITLES.

DIMENSIONS IN INCHES
TOLERANCES $\pm .010$

FIGURE 3. Identification marking.

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4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. Qualification inspection (see 4.3).
- b. Quality conformance inspection (see 4.4).

4.3 Qualification inspection. The examination and tests comprising qualification inspection are classified as specified in Table I.

4.3.1 Samples. Four stop watches shall be subjected to qualification inspection. The samples shall be representative of the stop watches produced under contract or order.

TABLE I - QUALIFICATION INSPECTION

<u>Examination or Test</u>	<u>Requirement Paragraph</u>	<u>Method Paragraph</u>
Certification	3.2, 3.2.1	4.4.6
Mechanical	3.3.1.1 thru 3.3.2.3, 3.7	4.4.5
Visual	3.3, 3.5 thru 3.7.2	4.4.4
Operating force	3.8.1	4.4.8.1
Torque	3.8.2	4.4.8.2
Vibration	3.8.3	4.4.8.3
Shock	3.8.4	4.4.8.4
Waterproofness	3.8.5	4.4.8.5
Magnetism	3.8.6	4.4.8.6
Storage	3.8.7	4.4.8.7
Accuracy	3.8.8.1 and 3.8.8.2	4.4.8.8.1, 4.4.8.8.2
Start-stop mechanism	3.8.9.1 and 3.8.9.2	4.4.8.10 thru 4.4.8.10.2
Mainspring	3.4.1	4.4.8.9
Identification marking	3.9, 3.9.1	4.4.8.11
Workmanship	3.10	4.4.8.12

4.3.2 Failure. Failure of any sample stop watch to pass all the examinations or tests listed in Table I is cause for rejection of all samples submitted for qualification at one time.

4.4 Quality conformance inspection. The examination and tests comprising quality conformance inspection are classified as specified in Tables II and III.

4.4.1 Inspection lot. Unless otherwise specified by the contracting officer, inspection lot size, formation and presentation of lots shall be in accordance with "Submission of Product" and "Drawing of Samples" specified in MIL-STD-105.

4.4.2 Classification of examination and tests. Examinations and tests shall be performed on a defect (individual characteristic) basis in accordance with MIL-STD-105 and the Inspection Level and Sampling Plans specified in Tables II and III. Examinations and tests for packaging, packing and marking shall be in accordance with Section 5 and PPP-T-360.

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TABLE II - CLASSIFICATION OF DEFECTS

Level II of Table I with Sampling Plan Table II-A of MIL-STD-105

CRITICAL: None

<u>MAJOR:</u> AQL 1.5	<u>REQUIREMENT</u>	<u>TEST PROCEDURE</u>
101. Materials	3.2	4.4.6
102. Protective treatment	3.2.1	4.4.6
103. Design and construction	3.3	4.4.4
104. Controls	3.3.1	4.4.5
105. Functions	3.3.2	4.4.5
106. Movement	3.4	4.4.4
107. Mainspring	3.4.1	4.4.8.9
108. Dial	3.5	4.4.4
109. Hands	3.6	4.4.4
110. Case	3.7	4.4.5
111. Accuracy	3.8.8.1	4.4.8.8.1

MINOR: AQL 2.5

202. Identification marking	3.9	4.4.8.11
203. Workmanship	3.10	4.4.8.12

TABLE III - CLASSIFICATION OF DEFECTS

Level S-4 of Table I with Sampling Plan Table II-A of MIL-STD-105

CRITICAL: None

<u>MAJOR:</u> AQL 4.0	<u>REQUIREMENT</u>	<u>TEST PROCEDURE</u>
101. Operating force	3.8.1	4.4.8.1
102. Torque	3.8.2	4.4.8.2
103. Vibration	3.8.3	4.4.8.3
104. Shock	3.8.4	4.4.8.4
105. Waterproofness	3.8.5	4.4.8.5
106. Magnetism	3.8.6	4.4.8.6
107. Accuracy	3.8.8.2	4.4.8.8.2

MINOR: None

4.4.3 Test equipment. The accuracy of stop watches shall be determined by a mechanical, electric or electronic time measuring instrument having an accuracy rate of + 2 seconds per day.

4.4.4 Visual examination. Stop watches shall be examined visually for conformance to workmanship and requirements as specified in Tables II and III.

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4.4.5 Mechanical examination. Stop watches shall be checked for conformance of control operations and case dimensions.

4.4.6 Certification. Certification, when required herein, shall state that stop watches have been determined to be in full compliance with the specified requirements, and that workmanship and materials conform with recognized standards of commercial quality. The certification shall contain the following statement: "As the authorized representative of the contractor, the undersigned warrants and represents that all the information supplied herewith is true and accurate."

4.4.7 Test conditions.

4.4.7.1 Atmospheric. Unless otherwise specified, the examinations and tests shall be performed at 15 C to 35 C, at barometric pressure of 28 to 31 inches and a maximum relative humidity of 80 percent.

4.4.7.2 Temperature changes. Temperature changes, when required, shall be gradual to reduce the possibility of thermal shock.

4.4.7.3 Accuracy. When specified, stop watches shall not, following tests, exceed an accuracy tolerance of 0.2 second for 60 and 180 seconds operation in the position of crown-up, with the back of the case 45 degrees from horizontal.

4.4.8 Test methods.

4.4.8.1 Operating force. The force required on the crown to start, stop and restart the hands shall be 3 pounds + 1/2 pound. The force required on the push-button to return the hands to zero and immediately restart shall be 5 pounds + 1/2 pound.

4.4.8.2 Torque. With the stop watch fully wound, a torque of 32 inch-ounces shall be applied to the crown with a torque gauge. The stop watch shall not be damaged.

4.4.8.3 Vibration. The stop watch shall not be damaged when subjected to Method 201 of MIL-STD-202. The total duration of vibration shall be 4 minutes. The direction of vibration shall be through the crown. Following the test, the stop watch shall comply with 4.4.7.3.

4.4.8.4 Shock. The stop watch shall be dropped from a height of 3 feet onto the end grain of a hardwood block of beech, oak or hard maple, the size of which shall be a minimum of 8 inches square. Following the test, the stop watch shall be visually examined for loose or damaged parts and comply with 4.4.7.3.

4.4.8.5 Waterproofness. Prior to the start-stop mechanism tests (4.4.8.10 thru 4.4.8.10.2) the stop watch, at 24 C + 2 C, shall be suspended in distilled water contained in a partially filled transparent chamber which shall be evacuated to a negative gage pressure of 5 1/2 inches of mercury (24 1/2 inches absolute pressure) for a period of 15 seconds. Stop watches showing evidence of air leakage during the test period shall be rejected.

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NOTE: Bubbles which are the result of entrapped air on the exterior surface of the stop watch shall not be considered a leak.

4.4.8.6 Magnetism. The stop watch shall be placed in a magnetic field of 60 Gauss (+5 Gauss, -0 Gauss) for 5 seconds in each of the following positions:

- a. Vertical (with crown in any position)
- b. Horizontal (with dial up or down)

* Following the test, the accuracy tolerance for 180 seconds shall not exceed +0.4 second, -0.2 second.

* 4.4.8.7 Storage. The stop watch shall be exposed to temperatures of -54 C and +65 C for 24 hours at each temperature. Following the tests, the stop watch shall be visually examined for loose or damaged parts and comply with 4.4.7.3.

NOTE: Stop watches shall not run during this test.

4.4.8.8 Accuracy.

4.4.8.8.1 Room temperatures. The stop watches shall each be tested four times at the times specified below in the position of crown up, with the back of the case 45 degrees from horizontal. No watch shall exceed the tolerance specified.

<u>Time</u>	<u>Tolerance</u>
a. 60 seconds	+0.2 second, -0.0 second
b. 180 seconds	+0.2 second, -0.0 second
c. 60 minutes	+0.6 second, -0.0 second

4.4.8.8.2 High and low temperatures. In the position specified in 4.4.8.8.1, the stop watch shall be operated for 60 minutes at +5 C + 2 C and +41 C + 2 C. No watch shall have an error of more than + 1.0 second for 60 minutes.

4.4.8.9 Mainspring. Prior to the accuracy tests (4.4.8.8.1 and 4.4.8.8.2) the stop watches shall be fully wound and run 8 hours without rewinding.

4.4.8.10 Start-stop mechanism. The crown shall be depressed and the sweep second hand permitted to advance a minimum of 20 seconds before testing the crown and side push-button.

4.4.8.10.1 Crown. The crown shall be operated 2500 cycles of stopping and starting without damage or failure of operation. A minimum of 20 seconds shall be recorded before each stopping operation.

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4.4.8.10.2 Side push-button. The side push-button shall be operated 2500 cycles of stopping and re-starting from zero without damage or failure of operation. A minimum of 20 seconds shall be recorded before each stopping operation.

4.4.8.11 Identification marking. All numbers, names and location of identification marking on the back of the case shall be inspected for conformance to Figure 3.

4.4.8.12 Workmanship. Quality of workmanship in conjunction with industry standard practices shall be inspected at the discretion of the Government during in-process and on completed stop watches.

* 5. PACKAGING

5.1 Packaging and packing. Packaging and packing shall be as specified for Packaging Group 2 in PPP-T-360.

5.2 Marking. In addition to the marking requirements specified in PPP-T-360, the unit package, intermediate package and shipping container shall be marked with the date the stop watches were packaged, after acceptance by the Government.

6. NOTES

6.1 Intended use. The stop watches covered by this specification are intended for general use within the military services.

6.2 Ordering data. Procurement documents should specify the following:

- a. Title, number and date of this specification.
- b. Selection of applicable levels of packaging and packing required (see 5.1 and 5.2).
- c. List of assigned serial numbers (see 3.9).

6.3 Definitions.

6.3.1 Non-continuous running movement. A non-continuous running movement runs only while an interval of time is being recorded. It has a stop on the balance system which permits the movement to operate only when an action is initiated to indicate a time interval and stops the movement on completion of the timing action.

6.4 Qualification. With respect to products requiring qualification, awards will be made only for products which are at the time set for opening of bids, qualified for inclusion in the applicable Qualified Products List whether or not such products have actually been so listed by that date. The attention of suppliers is called to this requirement, and manufacturers are urged to arrange to have the products they propose to offer to the Federal

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Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. The activity responsible for the Qualified Products List is the U.S. Army Armament Research, Development and Engineering Center, ATTN: SMCAR-ESC-S, Picatinny Arsenal, NJ 07806-5000, and information pertaining to qualification of products may be obtained from that activity.

* 6.5 Subject term (key word) listing.

Crown
 Crystal
 Dial
 Hands
 Mainspring
 Push button, side
 Stop watch, military

* 6.6 Changes from previous issue. The margins of this specification are marked with asterisks to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was done as a convenience only, and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

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