METRIC

MIL-DTL-1394G(AR)
3 MAY 2006
SUPERSEDING
MIL-P-1394F(AR)
23 November 1983

DETAIL SPECIFICATION

PRIMER, ELECTRIC: M52A3B1

Reactivated after 3 May 2006 and may be used for new and existing designs and acquisitions.

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

1. SCOPE

1.1 Scope. This specification covers the electric primer M52A3B1, for use in the assembly of 20mm ammunition (see 6.1).

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 or 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 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 cited in the solicitation or contract (see 6.2).

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-A-70625	-	Automated Acceptance Inspection Equipment Design, Testing and Approval, of

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-1916	-	DOD Preferred Methods for Acceptance of Product
MIL-STD-1168	-	Ammunition Lot Numbering and Ammunition Data Card

Comments, suggestions, or questions on this document should be addressed to: Commander, U.S. Army ARDEC, ATTN: AMSRD-AAR-AIS-SS, Picatinny, New Jersey 07806-5000, or ardec-stdzn@pica.army.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST online database at http://assist.daps.dla.mil.

AMSC N/A FSC: 1305

2.2.2 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 of these documents are those cited in the solicitation or contract.

U.S. ARMY ARMAMENT RESEARCH, DEVELOPMENT, AND ENGINEERING CENTER (ARDEC) PUBLICATIONS

SCATP-20	-	Ammunition Ballistic Acceptance Test Methods, Test Procedures for 20mm Cartridges

(This publication is available from US Army ARDEC, AMSRD-AAR-QEM-F, Picatinny, NJ 07806-5000.)

U.S. ARMY ARMAMENT RESEARCH, DEVELOPMENT, AND ENGINEERING CENTER (ARDEC) DRAWINGS

7548057	Cup, Primer
7548058	Button, Primer
7548066	Primer, Electric, M52A3B1 Assembly
7258817	Cartridge, 20mm, Target Practice, M55A2
7548108	Cup, Support, Primer
1575AS300	Cartridge, 20mm, Target Practice, PGU-27/B

(Copies of these drawings may be requested on line at Drawing-Request@pica.army.mil or from US Army ARDEC, AMSRD-AAR-AIS-TD, Picatinny, NJ 07806-5000.)

ARMY MATERIAL COMMAND PUBLICATIONS

ORD-SIP-S314	-	Visual Inspection Standards for Small Arms Ammunition Primer Defects

(This publication is available from US Army ARDEC, AMSRD-AAR-QEM-F, Picatinny, NJ 07806-5000.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, 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 First article. When specified, a sample shall be subjected to first article inspection in accordance with 4.2.

3.2 Parts and Subassemblies. Materials, parts and assemblies shall comply with requirements specified on the applicable drawings and referenced specifications.

3.3 Insulation strength. The cup-insulator-button assembly shall withstand an electrical potential as specified on drawing 7548066.

3.4 Electrical resistance. The electrical resistance of the primer assembly (dry) shall be as specified on drawing 7548066.

3.5 Pellet weight. The total dry weight of the primer mix shall be as specified on drawing 7548066.

3.6 Electric primer sensitivity. The primer shall function when energized by a 10 microsecond discharge from a 2 microfarad condenser charged at 160 volts DC.

3.7 Electric primer time. The primer time shall not exceed 300 microseconds when energized by a 10 microsecond discharge pulse from a 2 microfarad condenser charged at 160 volts DC.

3.8 Action time. The action time of the test cartridge shall be as specified on drawing 7548066.

3.9 Function and casualty. The primer shall function without casualty in the test cartridge (see Table VII).

3.10 Workmanship. All parts and assemblies shall be fabricated, loaded, and assembled in a thorough workmanlike manner. They shall be clean and free of burrs, sharp edges, cracks, scratches, dents, folds, wrinkles, buckles, dirt, grease, oil, rust, and other foreign matter. Exterior surface coatings shall be continuous; however, light scratches not exposing base material may be permitted.

4. VERIFICATION

TABLE I. Requirement/verification cross reference matrix

METHOD OF VERIFICATION
N/A - Not applicable
1 - Analysis
2 - Demonstration
3 - Examination
4 - Test

CLASSES OF VERIFICATION
A - First article
B - Conformance

Section 3 Requirement		Verification Methods					Verification Class		Section 4 Method
		N/A	1	2	3	4	A	B	
3.1	First article				X	X	X		4.2
3.2	Parts and subassemblies					X	X	X	Table IV
3.3	Insulation Strength					X	X	X	4.4.1
3.4	Electrical resistance					X	X	X	4.4.2
3.5	Pellet weight				X		X	X	4.4.3
3.6	Electric primer sensitivity					X	X	X	4.4.4
3.7	Electric primer time					X	X	X	4.4.5
3.8	Action time					X	X	X	4.4.6
3.9	Function and casualty					X	X	X	4.4.7
3.10	Workmanship				X		X	X	Table IV

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

a. First article inspection (see 4.2)
b. Conformance inspection (see 4.3)

4.2 First article inspection. When specified, a sample of 2000 M52 primers and primer components as identified in Table II shall be subjected to first article verification inspections and tests with quantities in accordance with Table II and Table IV.

4.2.1 First article rejection. If any assembly, component or test specimen fails to comply with any of the applicable requirements, the first article sample shall be rejected.

TABLE II. First article inspection

Examination or Test	Conformance Criteria		Requirement Paragraph	Inspection Method	Defect Classification
	Sample	Acc/Rej			
Examination for defects Cup, primer Button, primer Cup, support, primer Primer, electric	 125 125 125 2000	 0/1 0/1 0/1 0/1	3.2/3.10	Table IV	Table IV
Insulation Strength	2000	0/1	3.3	4.4.1	Major
Electrical resistance	2000	0/1	3.4	4.4.2	Major
Pellet weight	2000	0/1	3.5	4.4.3	Critical
Electric primer sensitivity 4/	800	0/1	3.6	4.4.4	Major
Electric primer time 5/	50	0/1	3.7	4.4.5	Critical
Action time -65°F 6/	50	0/1	3.8	4.4.6	Critical
Function and casualty	1100	0/1	3.9	4.4.7	Major

See Notes after Table III

4.3 Conformance verification.

4.3.1 Conformance inspection. The sample cartridges shall be subjected to conformance verification in accordance with Table III and Table IV.

4.3.2 Classification of characteristics. Critical, major and minor characteristics are defined in MIL-STD-1916.

4.3.3 Inspection lot formation. Lot formation shall be in accordance with MIL-STD-1916. Lot numbering shall be in accordance with MIL-STD-1168.

4.3.4 Conformance rejection. If any sample fails to comply with the conformance inspection requirements, the lot shall be rejected.

4.3.5 Examinations and tests. The attribute sampling plan required for the examination for defects in Table IV shall be in accordance with the attribute sampling plan of MIL-STD-1916, using Verification Level IV for major characteristics and Level II for minor characteristics unless otherwise noted. One hundred percent inspection shall be used on all critical characteristics. The lot shall be suspended if a malfunction or casualty not covered by this specification occurs in any firing test (see 6.9).

4.3.6 Alternative conformance acceptance. Unless otherwise specified, alternate conformance procedures may be proposed (see 6.2).

TABLE III. Conformance inspection

Examination or Test	Conformance Criteria		Requirement Paragraph	Inspection Method	Defect Classification
	Sample	**Acc/Rej**			
Examination for defects Cup, primer Button, primer Cup, support, primer Primer, electric	Table IV	0/1 0/1 0/1 0/1	3.2/3.10	Table IV	Table IV
Insulation Strength	100%	see 1/	3.3	4.4.1	Major
Electrical resistance	100%	see 2/	3.4	4.4.2	Major
Pellet weight	100%	see 3/	3.5	4.4.3	Critical
Electric primer sensitivity	800	see 4/	3.6	4.4.4	Major
Electric primer time	50	see 5/	3.7	4.4.5	Critical
Action time -65°F	50	see 6/	3.8	4.4.6	Critical
Function and casualty	300	Table VII	3.9	4.4.7	Major

Notes:

1/ A cup-insulator button assembly which fails to comply with the insulation strength requirement shall be rejected.

2/ A primer which fails to comply with the applicable electrical resistance requirement shall be rejected.

3/ A primer which fails to comply with the applicable minimum dry weight requirement shall be rejected.

4/ If the average firing voltage (V) plus three standard deviations (3σ) exceeds 160 volts, the lot shall be rejected or the first article sample will fail. For conformance inspection, the lot shall be subject to retest. If on retest, $V + 3\sigma$ exceeds 160 volts the lot shall be rejected. If in either the first test or the retest, a primer fails to fire at 160 volts, the lot shall be rejected (see 6.8).

5/ If the sample average primer time plus four standard deviations exceeds 300 microseconds or if an individual primer time of the test sample exceeds 300 microseconds, the lot shall be rejected or the first article sample will fail (see 6.8).

6/ If the sample average action time plus four standard deviations exceeds 3.5 milliseconds, or an individual primer action time of the test sample exceeds 3.5 milliseconds, the lot shall be rejected or the first article sample will fail (see 6.8).

TABLE IV. Examination for defects

Primer Cup, Dwg. 7548057				
Classification	Examination or Test	Conformance Criteria	Requirement Paragraph	Inspection Method 1/
Critical	None defined	N/A	N/A	N/A
Major				
101	Cracks, split, or lamination	Level IV	3.10	Visual
102	Dent, ragged edge (V or U)	Level IV	3.10	Visual
103	Wire-like edge, or slivers lodged in or attached to cup	Level IV	3.10	Visual
104	Foreign matter, stain or corrosion	Level IV	3.10	Visual
Minor				
201	Height	Level II	3.2	Gage
202	Outside diameter	Level II	3.2	Gage
203	Scratch or nick	Level II	3.10	Visual
204	Evidence of poor workmanship	Level II	3.10	Visual
Primer Button, Dwg. 7548058				
Classification	Examination or Test	Conformance Criteria	Requirement Paragraph	Inspection Method 1/
Critical	None defined	N/A	N/A	N/A
Major				
101	Improperly formed	Level IV	3.2	Visual
102	Cracks, split, or lamination	Level IV	3.10	Visual
103	Dent	Level IV	3.10	Visual
104	Scratch or nick	Level IV	3.10	Visual
105	Foreign matter, stain or corrosion	Level IV	3.10	Visual
Minor				
201	Overall height	Level II	3.2	Gage
202	Outside diameter	Level II	3.2	Gage
203	Web thickness	Level II	3.2	Gage
204	Evidence of poor workmanship	Level II	3.10	Visual
Primer Support Cup, Dwg. 7548108				
Classification	Examination or Test	Conformance Criteria	Requirement Paragraph	Inspection Method 1/
Critical	None defined	N/A	N/A	N/A
Major				
101	Ragged edge (V or U)	Level IV	3.10	Visual
102	Flash hole missing or obstructed	Level IV	3.2/3.10	Visual
103	Edge crooked or eared	Level IV	3.2	Visual
104	Burr at flash hole	Level IV	3.10	Visual
105	Foreign matter, stain or corrosion	Level IV	3.10	Visual
Minor				
201	Height	Level II	3.2	Gage
202	Outside diameter	Level II	3.2	Gage
203	Crack, split, or lamination	Level II	3.10	Visual
204	Scratch, nick, or dent	Level II	3.10	Visual
205	Evidence of poor workmanship	Level II	3.10	Visual

TABLE IV. Examination for defects – Continued

Electric Primer, M52A3B1, Dwg. 7548066				
Classification	Examination or Test	Conformance Criteria	Requirement Paragraph	Inspection Method 1/, 3/
Critical				
1	Missing, inverted, or insecure support cup	100%	3.2	AAIE
2	Oil or grease on electric primer	100%	3.10	AAIE
3	Inverted button	100%	3.2	AAIE
Major				
101	Mixed types	Level IV	3.2	Visual
102	Crushed or mutilated	Level IV	3.10	Visual
103	Missing, misplaced, or protruding insulator	Level IV	3.2	Visual
104	No button or insulator covering button	Level IV	3.2	Visual
105	Presence of metal slivers on outside of primer or bridging the primer cup and button across insulator	Level IV	3.10	Visual
106	Foreign matter other then oil or grease	Level IV	3.10	Visual
Minor				
201	Height	Level II	3.2	Gage
202	Diameter	Level II	3.2	Gage
203	Depth of button	Level II	3.2	Gage
204	Missing, slipped, or punctured disc	Level II	3.2	Visual
205	Cocked support cup	Level II	3.2	Visual
206	Explosive composition on disc or support cup	Level II	3.10	Visual 2/
207	Evidence of poor workmanship	Level II	3.10	Visual

Notes:

1/ ORD-SIP-S314 shall apply in defining and evaluating cartridge visual defects. Defect classifications of ORD-SIP-S314 are revised as shown in Table V.

2/ Minute particles of explosive material are not cause for rejection.

3/ Automated acceptance inspection equipment (AAIE) shall be used to perform all critical defect inspections. AAIE shall be in accordance with MIL-A-70625 and approved by the government.

Table V. ORD-SIP-S314 Revisions

Component	Defect	SIP Classification	Revised Classification
Cup	Lamination	Minor	Permissible
Cup	Dent	Minor	Permissible
Cup	V or U	Minor	Permissible
Cup	Stain or corrosion	Minor	Permissible
Cup	Scratch or nick	Major	Minor
Button	Dent	Minor	Major
Button	Stain or Corrosion	Minor	Permissible
Button	Scratch or nick	Minor	Major
Support Cup	Stain or corrosion	Minor	Permissible
Support Cup	V or U	Minor	Permissible
Support Cup	Flash hole missing or obstructed	Minor	Major
Support Cup	Edge crooked or eared	Minor	Major
Primer Assembly	Inverted button	Major	Critical
Primer Assembly	Missing, misplaced, or protruding insulator	Minor	Major
Primer Assembly	Foreign matter other than oil or grease	Minor	Major

4.4 Method of inspection.

4.4.1 Insulation strength. The insulation strength of the cup-insulator-button assembly shall be determined applying the specified current, voltage, and timing.

4.4.2 Electrical resistance. Each primer shall be tested for the electrical resistance limits of 3.4. The inspection equipment shall limit the current and voltage to 1.4 milliamperes and 7.5 volts.

4.4.3 Pellet weight. The minimum total dry weight of the primer mix shall be determined by measuring the recompressed bridge thickness of the primer. Bridge thickness is defined as the dimension between the center of the outside face of the primer button and the disc, or between the center of the outside face of the primer button and the exposed face of the primer support cup. The dry primer mix in the primer assembly shall be recompressed prior to measuring the bridge thickness using force of approximately 100 pounds in excess of the pressure required to move the cup support with respect to the primer cup. The minimum bridge thickness dimension used to assure minimum total dry weight of the primer mix and the recompression force shall be established by the supplier and approved by the procuring activity.

4.4.4 Electric primer sensitivity. The method of test shall be as specified in SCATP-20. The primer firing device shall be adjusted for a 10 microsecond discharge time from a 2 microfarad condenser. The electrical sensitivity limit of the sample primers shall be determined using the specified test method and procedure.

4.4.5 Electric primer time. The method of test shall be as specified in SCATP-20. The test equipment shall be adjusted to comply with the specified current and voltage requirements.

4.4.6 Action time. The method of test shall be as specified in SCATP-20. The test sample primers shall be assembled as Cartridge, 20MM, Target Practice, M55A2, conforming to drawing

7258817, or Target Practice, PGU-27, conforming to drawing 1575AS300, and inspected in accordance with 4.4.7. The test cartridges shall be conditioned at -65°F for a period of not less then four hours after the conditioning chamber has stabilized at -65°F ± 5°F. Timing for the conditioning period shall start after the chamber has stabilized following the sample being placed in the conditioning chamber.

4.4.7 Function and casualty. The method of test shall be as specified in SCATP-20. The test sample primers shall be inserted into cases that have been previously inspected for depth and diameter of primer pocket and length to shoulder basic diameter. The sample primed cases shall be assembled as Cartridges, 20MM, Target Practice, M55A2, conforming to drawing 7258817; or Target Practice, PGU-27, conforming to drawing 1575AS300. Prior to firing, the test cartridges shall be inspected for depth of primer seating, primer crimp missing, loose primer, metal slivers on case head of primer, profile and alignment max., and presence of foreign matter on primer button. The sample test cartridges at ambient temperature shall be fired in bursts of 50 rounds in the quantities and weapons as specified in Table VI below. The gun barrels shall be at ambient temperature at the beginning of each burst.

TABLE VI. Function and casualty testing

Accepted primers will be used in	M61 Weapon (5500 SPM, min)	M39 Weapon (1400 SPM, min)
20mm PGU Ammunition:	300	
All other 20mm ammunition:		300 1/
Primer First Article Test:		1100 1/

1/ Customers, through the procuring activity, may substitute the M61 Weapon for acceptance of primers that will be used to fulfill their orders.

TABLE VII. Casualties

Defect Description	Accept	Reject	Cumulative Reject	Classification
Missing button	0	1	N/A	Major
Misfire	0	1	N/A	Major
Primer leak 2/	3	9	9	Minor
Blown primer 1/	0	1	N/A	Major

Notes:

1/ The sample cartridge case shall be classed defective only if it is evident by visual inspection that both the primer pocket and case head are enlarged and deformed.

2/ If during conformance inspection, more then three but less then nine primers show evidence of leakage, a second sample of double the number specified by Table III (Production Lot Only) shall be tested. If, in the accumulated samples, a button is missing, a misfire occurs, or nine or more primers show evidence of leakage, the lot shall be rejected. Misfiring test cartridges test shall be retested in the equipment specified in 4.4.6. Any misfires during retest shall be classified as to cause of failure and recorded as misfires in the test record.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system

commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

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

6.1 Intended use. This item is military unique, and these primers are intended for ammunition to be used in U.S Army, Navy, Marines and Air Force 20mm automatic gun systems that have been designed for firing cartridges having the M52 type primer configuration.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number and date of this specification and all reference documentation cited in this specification (see 2.2.1).
b. Requirements for submission of first article: A first article sample, either in part or complete (Table II), may be required for the commencement of production after the award of a new contract, a change in production venue, a process change for any part or subassembly, or after a production stoppage in excess of 90 days as directed by the government contracting officer.
c. Requirement for submission of inspection equipment designs and manufacturing process.
d. Requirement and provisions for submission of test data as required.
e. Provisions for the inclusion of MIL-STD-1168, Ammunition Data Cards on DD form 1423, Contract Data Requirement List.
f. Provisions for critical characteristic controls.
g. Serialization requirements, if applicable.
h. Critical inspection equipment requirement.
i. Quality Conformance inspection, other than specified in Section 4 of this specification.
j. Applicable National Stock Number.
k. Lists of drawings, publications and specifications, showing applicable revision dates.
l. Certificate of conformance for each lot or shipment of product, if applicable.
m. Place of inspection, if not at place of manufacture.
n. Government Furnished Material or Equipment
o. Packaging, Packing, Marking and Unitization: For packaging and marking of inner containers, reference ARDEC drawings 9329662 and 9329663. For packing and marking of outer wire bound box, reference ARDEC Drawing 9329664. For unitization, reference DACs drawing 18-48-4116/159A-20PA1002.

6.3 Automatic acceptance inspection equipment (AAIE). Provision concerning the AAIE used to verify the requirements of this specification should be specified in the contract if applicable.

6.4 Submission of inspection equipment designs for approval. Submit copies of designs as required to: Commander, US Army ARDEC, Attn: AMSRD-AAR-QEM-F, Picatinny, NJ 07806-5000. This address will be specified on the Contract Data Requirements List, DD Form 1423 in the contract.

6.5 Firing tests. In order to minimize inspection costs, the firing tests will be performed after the sample has been provisionally accepted for all other requirements. Additional cartridges may be required by the test facility (see 4.2). Tests may be performed concurrently on the sample cartridge provided that the test results are not affected by this procedure to minimize testing costs.

6.6 Test validity. If for any reason the test activity considers that the test conditions have detrimentally affected the test results, the test activity may request the Government to declare the test invalid and authorize a new test.

6.7 Intermediate point inspection. The classification of defects identifies the defect characteristics for acceptance inspection. It may be necessary to modify the sequence of inspection stations to best suit the manufacturing process. Inspection for defect characteristics which will be hidden or altered by subsequent processing operations (including unrelated operations), should be scheduled to prevent premature acceptance which could be detrimental to the attainment of optimum product quality of the end item.

6.8 Standard Deviation. Standard deviation (σ) should be calculated from the following formula or other approved formula:

$$\sigma = \sqrt{\frac{\sum \left(X_i - \overline{X}\right)^2}{n-1}}$$

where: X_i = Each individual value

$\overline{X}$ = Sample arithmetic mean

n = Sample size

6.9 Malfunction or casualty not covered by this specification. If a lot is suspended due to a malfunction or casualty not covered by this specification, the lot should be referred to the contracting officer.

6.10 Changes from previous issues. Asterisks and marginal notes are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

6.11 Critical defects.

6.11.1 Hangfire. A hangfire occurs when action time of a round is sufficiently long that the bolt unlocks before the projectile leaves the muzzle of the barrel. This results in unrestrained combustion and possible firing of the projectile out of battery. This could cause massive damage to the weapon system and weapon stoppage (see 6.11.2). In addition, in an aircraft application, due to the weapon's proximity to the user a hangfire will also present a safety hazard due to fragmentation and shrapnel from the weapon and the round.

6.11.2 Weapon stoppage. Due to the stand alone nature of the Land-based Phalanx Weapon System, when an ammunition defect prevents the weapon from functioning, this is considered a Mission Failure.

TABLE V. Critical defect justifications

Critical Defect	Justification
Missing, inverted, or insecure support cup	This could cause degradation of the primer pellet resulting in a low weight primer pellet and a hangfire.
Oil or grease on electric primer	Oil or grease on the primer has been demonstrated to lower the output of the primer to the extent that a hangfire results.
Inverted button	An inverted primer button would cause a low weight primer pellet and a hangfire.
Action time	Long enough action time will result in a hangfire.
Electric primer time	Long primer times could affect primer output or action time which could result in a hangfire.
Pellet weight	A low weight primer pellet is a demonstrated cause of hangfires.

6.12 Subject term (key words) listing.

20 millimeter
Electric Primers

Custodian: Army-AR

Preparing activity: Army-AR
(Project 1305-2006-001)

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at http://assist.daps.dla.mil