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00Y-TR-61-47

NOVEMBER 1961

OOAMA

AIRMUNITIONS TEST REPORT

SERVICEABILITY AND
FUNCTION TEST OF
PRIMER DETONATOR, M14.

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SERVICEABILITY AND FUNCTION TEST

OF

PRIMER DETONATOR, M14

by

James L. Higgins

PUBLICATION REVIEW

This report has been reviewed and is approved



ALEX D. PERESICH
Chief, Engineering & Test Division
2705th Airmunitions Wing

NOVEMBER 1961

2705TH AIRMUNITIONS WING
OGDEN AIR MATERIEL AREA
AIR FORCE LOGISTICS COMMAND
UNITED STATES AIR FORCE
Hill Air Force Base, Utah

NOTICES

The information furnished herewith is made available for study with the understanding that the Government's proprietary interests in and relation thereto shall not be impaired. It is desired that the Judge Advocate's Office, (WCJ), Aeronautical Systems Division, Wright-Patterson Air Force Base, Ohio, be promptly notified of any apparent conflict between the Government's proprietary interests and those of others.

The conclusions and recommendations made in this report are not to be considered directive in nature. This type information becomes official only when published in Technical Orders and/or other applicable Air Force publications.

ADMINISTRATIVE DATA

PURPOSE OF TEST:

The purpose of this test was to determine the serviceability of the Primer Detonators M14 stored in two overseas and two Zone of Interior Ammunition Depots.

MANUFACTURER:

Picatinny Arsenal, NJ
Arkansas Ordnance Plant, Arkansas

FEDERAL STOCK NUMBERS:

1325-028-5634-G300	Non-Delay
1325-028-5632-G302	.01
1325-125-0665-G299	.025
1325-301-1115-G305	.10
1325-028-5636-G306	.24

DRAWING, SPECIFICATIONS AND TECHNICAL ORDERS:

Drawing Number 73-8-70
Specification MIL-P-20365A
Technical Order 11A1-1-7

SECURITY CLASSIFICATION:

Unclassified

DATE COMPLETED:

9 August 1961

TEST CONDUCTED BY:

OOAMA (OOYET - Test Branch, Engineering and Test Division)

Test Director: Hoyt O. Brown, Major, USAF

Project Engineers: James L. Higgins, Electronics Engineer

OOY-TR-61-47

DISPOSITION OF SPECIMENS:

All metal parts generated were inspected and certified inert and then turned over to the Redistribution and Marketing Division in accordance with Technical Order 11C3-1-3 and HAFBR 136-2.

ABSTRACT

The purpose of this test was to determine the serviceability of Primer Detonators, M14, stored at two Air Force Ammunition Depots overseas and two U.S. Army Ammunition Depots within the United States. These detonators are used in conjunction with bomb tail fuzes (M100, M160 and M190 Series) and consist of five delays. Samples were selected from 28 lots stored at depots, which were considered to be the best storage conditions and representative of various climatic conditions.

All primer detonators were visually inspected, function tested and the time delays recorded. Only 3 out of 28 lots were within specification.

Based on the results of this test it is recommended that: All lots of the delay type Primer Detonator, M14 manufactured in 1945 by the Arkansas Ordnance Plant (AOP) be declared unserviceable; Lots PA-24-10, PA-35-15, PA-24-16 and PA-35-19 (delay type) manufactured by Picatinny Arsenal be declared unserviceable; and Lots PA-26-10, PA-26-32 and PA-26-36 (non-delay) also be declared unserviceable.

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INTRODUCTION

The purpose of this test was to determine the serviceability of all lots of Primer Detonators, M14, stored at two Air Force overseas ammunition depots and two U.S. Army ammunition depots within the United States.

Test Directive OOO-52-60 was established to accomplish the test. The directive was prepared by the Explosives Evaluation Branch (OOYEE), and tests were conducted by the Test Branch (OOYET), Engineering and Test Division (OOYE), 2705th Airmunitions Wing (OOY), OCOMA.

Test samples were obtained from the following installations: St Mihiel Ammunition Storage Station, France; Anderson Air Force Base, Guam; Sierra Ordnance Depot, California and Anniston Ordnance Depot, Alabama.

DESCRIPTION

Primer Detonators, M14, are used in conjunction with bomb tail fuzes (M100, M160, and M190 Series) and are available in five delays; non-delay, .01, .025, .10 and .24 seconds. The primer detonators are interchangeable in order to obtain the desired delay.

Upon impact of the bomb, the firing pin in the tail fuze strikes the M39 Primer. The flame from the exploding primer ignites the delay charge, which burns the required time, and ignites the igniter charge. The igniter charge functions the relay charge which explodes the M17 detonator (Figures 1 and 2).

EQUIPMENT

The following equipment was used to accomplish the test:

Firing Jig (Figures 3 and 4)
Potter Electric Counter (Figure 5)
C-6 Press Camera

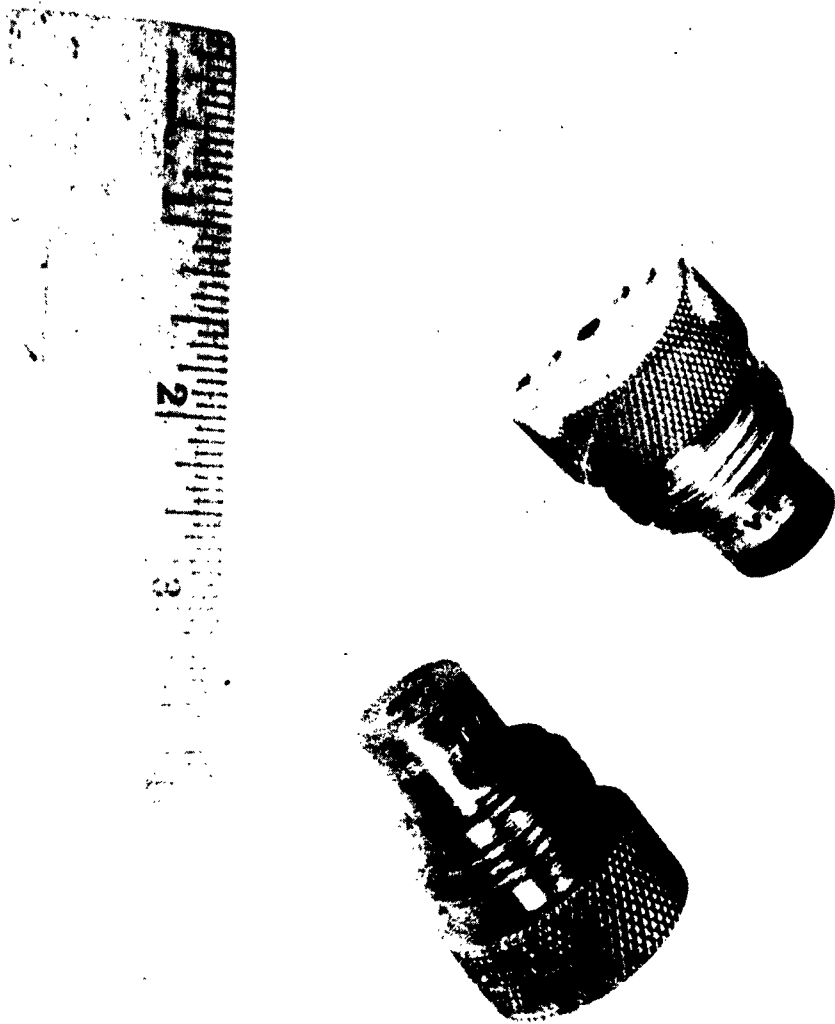


FIGURE 1. Primer Detonator, M14.

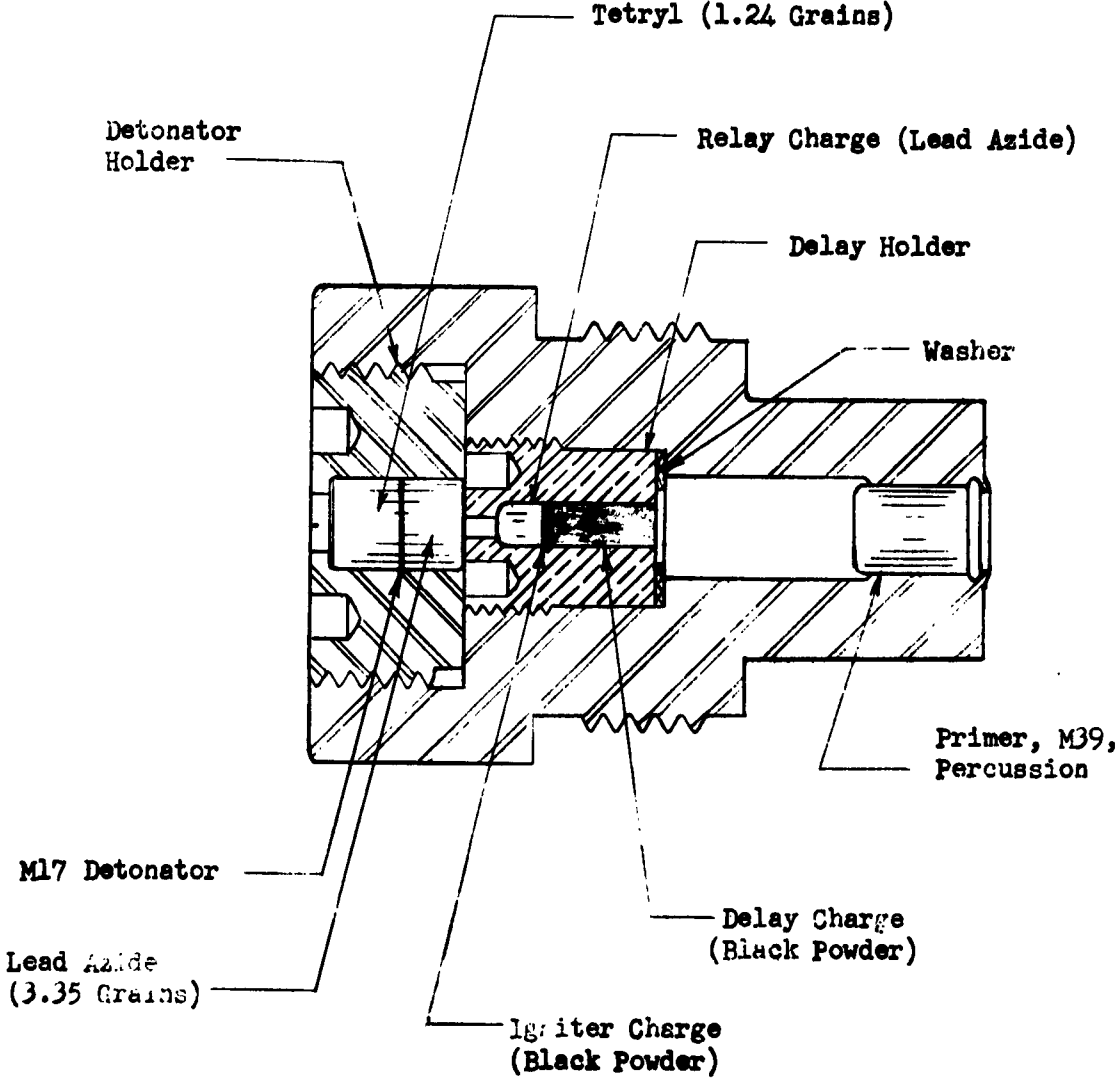


FIGURE 2. Primer Detonator, M14, Assembly

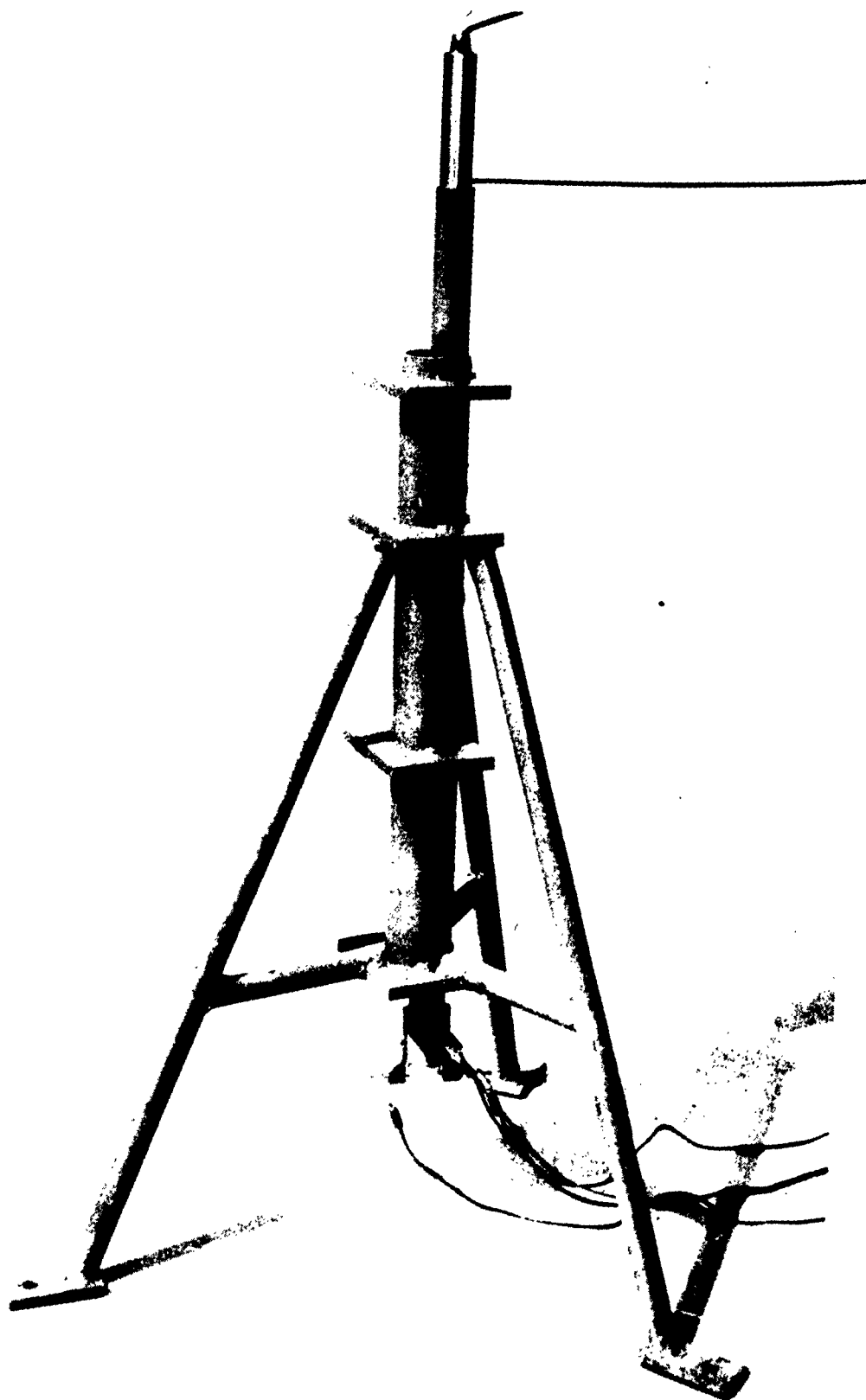


FIGURE 3. Test Stand.

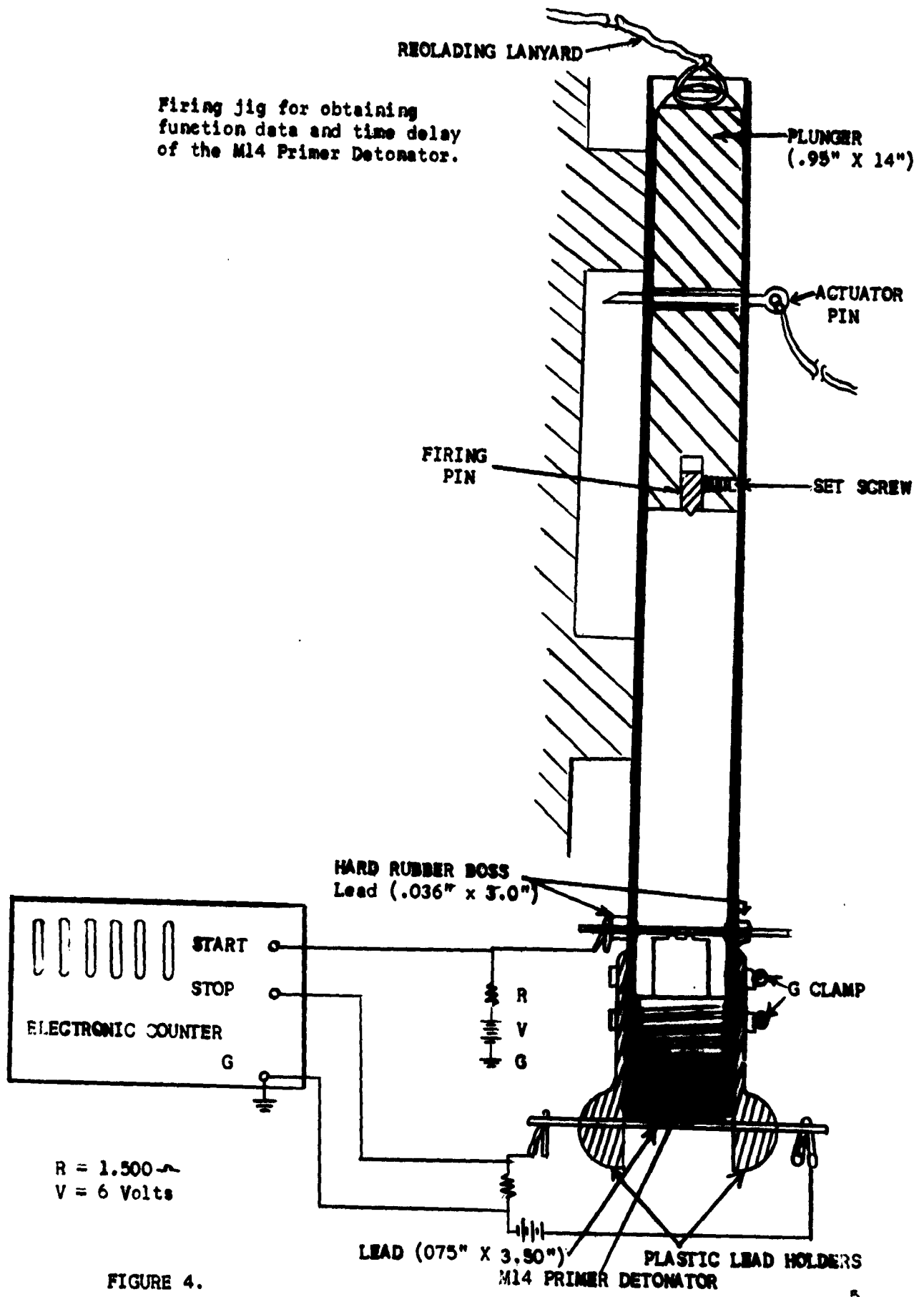


FIGURE 4.

FIGURE 5. Electronic Counter.



VISUAL INSPECTION

All primer detonators (1378 samples) were externally inspected for correct marking, physical damage, rust, corrosion or other deterioration. Fifteen per cent of primer detonators were disassembled (except for the M39 Primer) and the component parts inspected for any deterioration and completeness of assembly. These were reassembled for function testing.

FUNCTION TESTING

Eighty-five per cent of the total samples of primer detonators were function tested with the M17 detonator removed in accordance with specification MIL-P-20365A. The remaining fifteen per cent were function tested intact for comparison purposes with primer detonators with the M17 detonator removed. The following criteria was used to determine the serviceability of the primer detonators as specified in specification MIL-P-20365A.

NON-DELAY.

The maximum allowable time delay of the non-delay primer detonators is .003 seconds.

DELAY.

The allowable mean square deviations when measured from the applicable time delays are as follows for primer detonators loaded with one of the indicated time delays:

<u>DELAY</u>	<u>MEAN SQUARE DEVIATION, MAXIMUM</u>
.01	6.25 Square milliseconds
.025	12.25 Square milliseconds
.10	1.7 Square centiseconds
.24	5.0 Square centiseconds

The mean square deviation shall be computed as follows:

The deviation or difference of each sample delay is obtained from the desired average delay. The squares of these deviations are added and divided by the number of sample delays. The quotient is the mean square deviation. A sample which fails to function is not included in the computation of the mean square deviation. The failure rate cannot exceed one in thirty.

TEST RESULTS

The visual inspection revealed no defects except for a slight amount of rust on the delay holder and detonator holder of some of the primer detonators. This deterioration was present on approximately 2 per cent of the 1378 primer detonators tested and was not prevalent in any one lot nor did it affect the functionability of the test samples.

Table 1 contains the data on time delay and functionability of delay type primer detonators. Table 2 contains similar data on the non-delay primer detonators tested.

All failures were complete in that the primer did not function and therefore neither the delay element or detonator functioned. In no instance did the primer function and fail to cause complete functioning of the remaining explosives contained in the primer detonator. Figure 6 shows an expended M14 Primer Detonator.

All lots of delay type primer detonators tested exceeded the specification limits with regard to time delay (Table 1).

Three of the six lots of non-delay primer detonators exceeded the specification with regard to time delay. Two of the remaining three lots of non-delay detonators met the specification with regard to failure rate and time delay. The sixth lot (PA-26-14) was satisfactory for the fifteen samples tested, however, at least thirty (30) samples should have been tested in order to obtain a definite conclusion (Table 2).

LOT NUMBER	SAMPLE SIZE	#FUNCTION FAILURES	DESIRED TIME DELAY (SEC)	MEAN SQUARE DEVIATION	AVERAGE TIME DELAY (SEC)	STORAGE LOCATION	MFG DATE
ACP-5-2	7	0	.24	11.2 Sq Centiseconds	.273	Sierra Ord, Calif	2-45
ACP-70-68	7	0	.025	124.0 Sq Milliseconds	.029	Sierra Ord, Calif	6-45
ACP-7-6	55	2	.01	3012.0 Sq Milliseconds	.053	Sierra Ord, Calif	4-45
ACP-8-14	61	0	.1	8.2 Sq Centiseconds	.130	Sierra Ord, Calif	4-45
ACP-30-2	71	0	.1	43.4 Sq Centiseconds	.118	Sierra Ord, Calif	4-45
ACP-30-1	72	0	.1	86.4 Sq Centiseconds	.108	Sierra Ord, Calif	5-45
ACP-7-5	70	0	.01	15.0 Sq Milliseconds	.010	Sierra Ord, Calif	4-45
ACP-12-38	72	0	.01	15.0 Sq Milliseconds	.009	Sierra Ord, Calif	7-45
ACP-1-6	10	0	.1	17.5 Sq Centiseconds	.156	St Mhiel, France	Unk
ACP-11-19	29	5	.01	36.6 Sq Milliseconds	.012	St Mhiel, France	3-45
ACP-50-27	32	5	.025	300.0 Sq Milliseconds	.035	St Mhiel, France	4-45
ACP-70-26	36	10	.025	508.0 Sq Milliseconds	.040	Anderson AFB, Guam	6-45
ACP-10-1A	15	0	.24	9.0 Sq Centiseconds	.27	Anderson AFB, Guam	6-45
ACP-12-24	67	13	.01	715 Sq Milliseconds	.022	Anderson AFB, Guam	6-45
ACP-8-1A	61	13	.1	39.1 Sq Centiseconds	.136	Anderson AFB, Guam	2-45
ACP-11-4A	56	17	.01	650.0 Sq Milliseconds	.02	Anniston Ord, Ala	2-45
ACP-11-29	45	21	.01	68.0 Sq Milliseconds	.009	Anniston Ord, Ala	3-45
ACP-70-67	7	0	.025	26.4 Sq Milliseconds	.027	Anniston Ord, Ala	6-45
PA-24-10	10	4	.025	144 Sq Milliseconds	.033	Anniston Ord, Ala	11-50
PA-35-15	10	0	.1	4.2 Sq Centiseconds	.114	Anniston Ord, Ala	3-55
PA-35-16	71	1	.1	7.8 Sq Centiseconds	.116	Anniston Ord, Ala	3-55
PA-35-19	75	0	.1	17.6 Sq Centiseconds	.118	Anniston Ord, Ala	3-55

TABLE 1. Results of Tests Conducted on Delay Type Primer Detonators.

*As per ORD-SIP-M16-101 The failure rate cannot exceed one in thirty.

DELAY	MEAN SQUARE DEVIATION, ALLOWABLE
.01	6.25 Sq Milliseconds
.025	12.25 Sq Milliseconds
.1	1.7 Sq Centiseconds
.24	5.0 Sq Centiseconds

LOT NUMBER	SAM- PLE SIZE	**FUNC- TION FAIL- URES	TIME DELAY		STORAGE LOCATION	MFG DATE
			*MAX	AVG		
PA-26-10	40	0	.008	.006	St Mihiel, France	7-53
PA-26-32	72	3	.009	.008	Anderson AFB, Guam	2-54
PA-26-36	74	3	.008	.008	Sierra Ord, Calif	3-54
PA-26-14	15	0	.003	.002	Anniston Ord, Ala	8-53
PA-26-40	110	1	.003	.002	Sierra Ord, Calif	8-53
AOP-80-23	30	0	.003	.001	Anniston Ord, Ala	3-54

TABLE 2. Results of Tests conducted on Non-delay Primer Detonators.

* Maximum allowable time delay is .003 sec. There is no minimum functioning time (ORD-SIP-M16-101)

** The allowable failure rate is one in 30 (MIL-P-20365A).
Only 15 samples were available for testing from Lot PA-26-14.

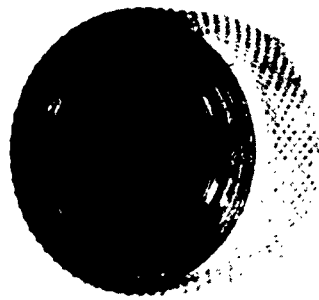


FIGURE 6. Fired Primer Detonator, M14.

CONCLUSIONS

It is concluded that:

All lots of delay type Primer Detonators, M14, tested and manufactured by the Arkansas Ordnance Plant (AOP) in 1945, exceeded specification limits and therefore are considered unserviceable. Eight lots also exceeded the failure rate limit. Four lots of delay type Primer Detonators, M14, manufactured by Picatinny Arsenal (PA) in 1950 and 1955 exceeded specification limits and are considered unserviceable. One lot also exceeded the failure rate limit.

Three of the five lots of non-delay Primer Detonators, M14, manufactured by Picatinny Arsenal in 1953 and 1954 exceeded the specification limits and are considered unserviceable. Two of these three lots also exceeded the failure rate limits. One lot (PA-26-40) was satisfactory in all respects. The fifth lot (CPA-26-14) was satisfactory for the fifteen (15) samples tested, however, at least thirty (30) detonators should have been tested before a definite conclusion is made.

RECOMMENDATIONS

It is recommended that:

1. All lots of delay type Primer Detonators, M14, manufactured by the Arkansas Ordnance Plant (AOP) in 1945 be declared unserviceable.
2. Primer Detonators, M14, .025 second delay, Lot Number PA-35-15, manufactured in 1950, be declared unserviceable.
3. Primer Detonator, M14, non-delay, Lot Numbers PA-26-10, PA-26-32 and PA-26-36, manufactured in 1953 and 1954 be declared unserviceable.
4. Primer Detonators, M14, non-delay, Lot Numbers PA-26-40 and AOP-80-23, manufactured in 1953 and 1954 be considered serviceable and available for issue and use.
5. At least fifteen (15) more samples of Lot PA-26-14, manufactured in 1953 be tested in order to determine serviceability as defined in MIL-P-20365A.

6. A world-wide inventory be accomplished for all Primer Detonators, M14, (all delays). Inventory should include location, quantity, lot number and manufacturer's initials, delay and date of manufacture. From this inventory suitable size test samples should be selected and further testing conducted. Additional testing will be necessary to determine the serviceability status of Air Force stocks.

DISTRIBUTION LIST

1 Dep IG of Safety, Hq USAF (AFIGS-B), Norton AFB, Calif
 1 Hq USAF (AFMSS-AE), Wash 25, DC
 1 AFLC (MCMTC), Wright-Patterson AFB, Ohio
 1 Det 4, ASD (ACR), Eglin AFB, Fla
 2 AU Lib, Maxwell AFB, Ala
 1 USAFA, Colorado Springs, Colo
 10 ASTIA, Arlington Hall Station, Arlington 12, Va
 1 ASESB, DOD, Wash 25, DC
 1 Bureau of Naval Weapons (Mtal Div), Dep of the Navy, Wash 25, DC
 1 Ord Fld Safety Ofc, Box 600, Jeffersonville, Ind
 1 Ofc of the Ch of Ord, Dept of the Army (ORDGU-SA), Wash 25, DC
 1 Ord Ammo Comd (ORDLY-Q), Joliet, Ill
 1 Pictinny Arsenal (Tech Lib), Dover, NJ
 1 CO US Naval Torpedo Station (QEL Tech Lib), Keyport, Wash
 1 Hq AFSC, Andrews AFB, Md
 11 OOAMA, Hill AFB, Utah (1-OOY, 1-OOYIT, 1-OOYS, 1-OOYET, 5-OOYEE,
 1-OOYID, 1-OCK)
 1 ASD, Wright-Patterson AFB, Ohio
 1 TAC (Dir of Requirements), Langley AFB, Va
 1 SAC (DM4E), Offutt AFB, Nebr
 1 ADC (ADMME-DE), Ent AFB, Colo
 1 ATC, Randolph AFB, Tex
 1 USAFE, APO 633, New York, NY
 1 PACAF, APO 953, San Francisco, Calif
 1 AMFEA, APO 10, New York, NY
 1 AAC, APO 942, Seattle, Wash
 1 NGB (NG-AFMS), Wash 25, DC
 1 QeLAB, Naval Ammo & Net Depot, Seal Beach, Calif
 1 QeLAB, Naval Ammo Depot, Concord, Calif
 1 Naval Ord Test Station, China Lake, Calif
 1 R-1, Naval Propellant Plant, Indian Head, Md
 1 WEL, NAD, Crane, Ind

<p>AD</p> <p>2700th Almunitions Wng (COMMA), Hill Air Force Base, Utah SERVICABILITY AND FUNCTION TEST OF PRIMER DETONATOR, M14, by James L. Hipple, November 1961, 14p incl. figures and tables. Unclassified Report (COF-TR-61-47)</p> <p>The purpose of this test was to determine the serviceability of Primer Detonators, M14, stored at two Air Force Ammunition Depots overseas and one U.S. Army Ammunition Depot within the United States. These deton- ators are used in conjunction with bomb tail fuses (M100, M160 and M170 Series) and consist of five delay types. Samples were selected from 28 lots stored at depots, and consisted of five delay types. All primer detonators and representive of various climatic conditions. All primer detonators were visually inspected, function tested and the time delays recorded. Only 3 out of 28 lots were within specification. Based on the results of this test it is recommended that: All lots of the delay type Primer Detonator, M14, manufactured in 1945 by the Arkansas Ordnance Plant (AOP) be declared unserviceable; Lots M-24-10, M-24-15, M-24-16 and M-25-19 (delay type) manufactured by Picatinny Arsenal be declared unserviceable; and Lots M-25-10, M-25-32 and M-25-35 (non-delay) also be declared unserviceable.</p>	<p>UNCLASSIFIED</p> <p>1. Detonators I. James L. Hipple</p>	<p>AD</p> <p>2700th Almunitions Wng (COMMA), Hill Air Force Base, Utah SERVICABILITY AND FUNCTION TEST OF PRIMER DETONATOR, M14, by James L. Hipple, November 1961, 14p incl. figures and tables. Unclassified Report (COF-TR-61-47)</p> <p>The purpose of this test was to determine the serviceability of Primer Detonators, M14, stored at two Air Force Ammunition Depots overseas and one U.S. Army Ammunition Depot within the United States. These deton- ators are used in conjunction with bomb tail fuses (M100, M160 and M170 Series) and consist of five delay types. Samples were selected from 28 lots stored at depots, which were considered to be the best storage conditions and representive of various climatic conditions. All primer detonators were visually inspected, function tested and the time delays recorded. Only 3 out of 28 lots were within specification. Based on the results of this test it is recommended that: All lots of the delay type Primer Detonator, M14, manufactured in 1945 by the Arkansas Ordnance Plant (AOP) be declared unserviceable; Lots M-24-10, M-24-15, M-24-16 and M-25-19 (delay type) manufactured by Picatinny Arsenal be declared unserviceable; and Lots M-25-10, M-25-32 and M-25-35 (non-delay) also be declared unserviceable.</p>	<p>UNCLASSIFIED</p> <p>1. Detonators I. James L. Hipple</p>
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