

**DEPARTMENT OF THE ARMY TECHNICAL BULLETIN**  
**OPERATOR/MAINTENANCE INFORMATION ON**  
**CARTRIDGE, 120MM: M829 (APFSDS-T), M829A1 (APFSDS-T),**  
**M830 (HEAT-MP-T), M831 (TP-T) AND M865 (TPCSDS-T)**

HEADQUARTERS, DEPARTMENT OF THE ARMY,  
 WASHINGTON, D. C.

30 April 1992

**REPORTING OF ERRORS**

You can help improve this bulletin. If you find any mistakes or know of a way to improve the procedures, please let us know. Mail your DA Form 2028 (Recommended Changes to Publications and Blank Forms), direct to Commander, U.S. Army Armament Research, Development and Engineering Center, ATTN: SMCAR-LSB, Picatinny Arsenal, NJ 07806-5000. A reply will be furnished to you.

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\*This bulletin supersedes TB 9-2350-320-14, dated 30 June 1990.

## SECTION I. INTRODUCTION

1. **Purpose.** The purpose of this bulletin is to provide operator/maintenance level information on Cartridge, 120mm: M829, M829A1 (APFSDS-T), M830 (HEAT-MP-T), M831 (TPT), M865 (TPCSDS-T), and M865 (TPCSDS-T, short sabot). These rounds are designed for firing by the M256 gun mounted on the M1A1 tank and associated NATO 120mm tank systems.

2. **General.** This bulletin contains data that will be incorporated into the following ammunition and weapons technical manuals.

a. TM 9-1300-251-20, Organizational Maintenance Manual, Artillery Ammunition for Guns, Howitzers, Mortars, Recoilless Rifles, and 40mm Grenade Launchers.

b. TM 9-1300-251-34, Direct Support and General Support Maintenance Manual, Artillery Ammunition for Guns, Howitzers, Mortars, Recoilless Rifles, and 40mm Grenade Launchers.

c. TM 43-0001-28, Army Ammunition Data Sheets, Artillery Ammunition Guns, Howitzers, Mortars, Recoilless Rifles, Grenade Launchers, and Artillery Fuzes.

d. TM 43-0001-28-3, Interoperable Ammunition Data Sheets for Artillery Ammunition, Guns, Howitzers, Mortars, and Artillery Fuzes.

## SECTION II. INFORMATION AND PROCEDURES TO BE INCORPORATED INTO OPERATOR/MAINTENANCE TECHNICAL MANUALS

### WARNING

**IF VEHICLE CATCHES FIRE, EVACUATE TANK, START FIRE SUPPRESSION SYSTEM AND MOVE 2000 FEET UPWIND FROM TANK (AVOID INHALING SMOKE EMITTED FROM VEHICLE).**

3. **General.** The information in the following paragraphs will be incorporated as changes to the ammunition chapter of the affected manuals.

#### 4. Description and Tabulated Data.

a. Description for Cartridge 120mm: APFSDS-T, M829 and M829A1 (figs. 1 and 2). The M829 and M829A1 are U.S. designed and developed 120mm APFSDS-T cartridges. The complete round contains a propulsion system consisting of a metal cartridge case base with combustible sidewall, granular propellant within a containment device to prevent spillage, M125 primer for M829, and M129 primer for M829A1, while the projectile consists of the subprojectile and aluminum sabot. The depleted uranium (DU) penetrator is a one piece design which is assembled into the sabot by means of grooves. There is a six bladed aluminum fin with tracer assembly fitted to the rear of the subprojectile and a windshield fitted to the front. The aluminum sabot is composed of four 90-degree (M829) and three 120-degree (M829A1) noninterchangeable segments with internal grooves matching those on the outer diameter of the subprojectile. The sabot has a silicone rubber seal at the rear to prevent leakage of gases.

(1) Use. The M829 and M829A1 are kinetic energy, armor-piercing antitank rounds intended for use with the 120mm smooth bore M256 cannon.

(2) Functioning. The M829 and M829A1 are loaded and fired from the 120mm tank gun in the normal manner. Upon initiation of the electric primer in the breech of the weapon, the resulting flash ignites the propelling charge and combustible case, generating gases which drive the projectile from the gun and ignite the tracer. The rear seal of the sabot prevents gas leakage between the sabot segments and the driving forces (gas) propelling the subprojectile downbore. Upon leaving the gun, aerodynamic forces cause the sabot to separate from the subprojectile allowing the subprojectile to continue on a true course to target while the sabot segments fall quickly to earth. Target penetration is affected strictly by the high kinetic energy of the subprojectile's high density core when it impacts.

CHANGE )  
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NO. 1    )

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
Washington, DC, 12 February 1993

**OPERATOR/MAINTENANCE INFORMATION ON  
CARTRIDGE, 120MM: M829 (APFSDS-T), M829A1 (APFSDS-T),  
M830 (HEAT-MP-T), M831 (TP-T) AND M865 (TPCSDS-T)**

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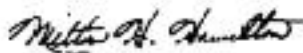
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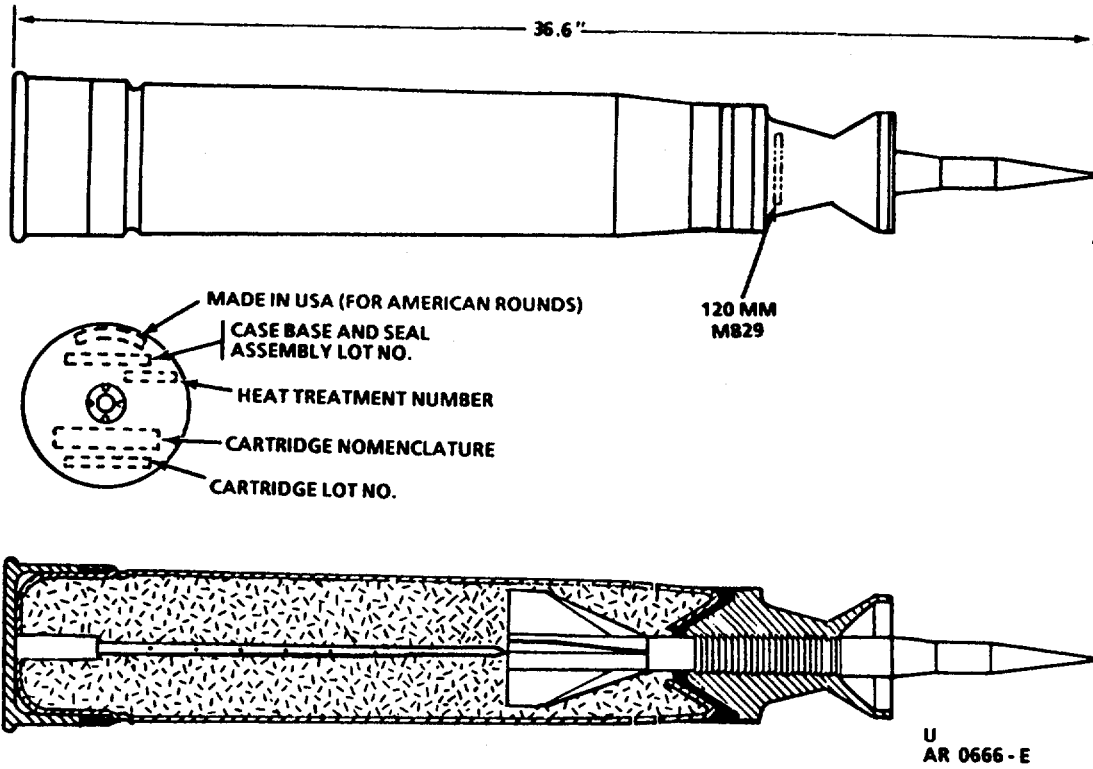


Figure 1. Cartridge, 120mm: APFSDS-T, M829.

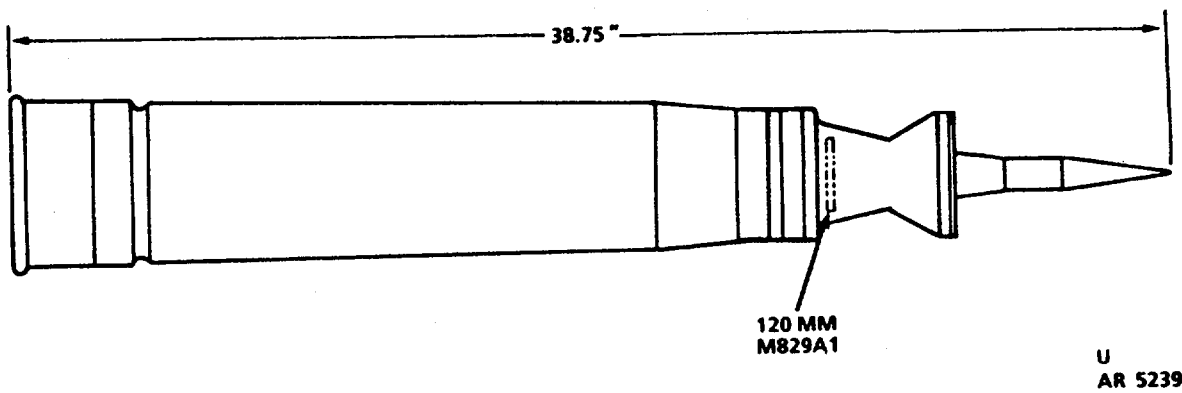


Figure 2. Cartridge, 120mm: APFSDS-T, M829A1.

b. Tabulated data for Cartridge, 120mm:  
APFSDS-T, M829 AND M829A1.

M829:

Type classification.....STD - Nov 84  
SMR code.....XB000  
Container, Ammunition,  
Metal, PA116 for Ctg,  
120mm: APFSDS-T,  
M829:  
National stock No.....8140-01-229-3823  
Part No.....12630717  
Fed Supply code for mfg..19203

Complete round:

Type .....Fixed, APFSDS-T  
Weight .....41.2 lb (18.7 kg)  
Length .....36.8 in.  
Assembly drawing.....12525600  
Color .....Black w/white  
markings

Temperature limits:

\*Firing:  
Lower limit .....-50.0°F (-46.8°C)  
Upper limit .....+145.0°F (+63.0°C)  
\*Storage:  
Lower limit .....-50.0°F (-46.0°C)  
Upper limit .....+145.0°F (+63.0°C)

\*Note: The M829 may be fired at these temperatures; however, performance degradation may occur.

Performance:

Chamber pressure (peak) .....73950 psi at 70°F;  
5100 bars at 21°C  
Velocity (nominal) .....5510 ft/sec

Packaging (Metal

Container):  
Packing and Marking  
Drawing .....12630717  
Dimensions .....44.5 x 7.75 x 7.75 in.  
Cube.....1.5 cu ft  
Total Weight (with ctg) .....63.2 lb  
Total Explosive weight .....17.95 lb  
\*\*Packing .....1 round per metal  
container, 30 metal  
containers per pallet

\*\*Note: See SC for complete packing data including NSN's. M829 ammunition will be stored with other tank ammunition except items having SCGG (pyrotechnics and incendiaries).

Shipping and storage data:

Quantity distance class .....(08) 1.2  
Storage compatibility group....C  
Field storage category.....A  
DOT shipping class .....B  
Dot designation.....AMMUNITION  
FOR CANNON  
WITH SOLID  
PROJECTILES  
DODAC.....1315-C786  
Drawing number.....12525600

Limitations:

Projectile is not to be disposed of by burning or detonation.

The M829 is a full service round which may only be fired during war emergency. All peacetime firings are prohibited except on ranges which are NRC (Nuclear Regulatory Commission) approved and/or have host nation agreement. The M829 will not be fired over the heads of friendly troops, unless troops are protected by adequate cover. Troops may be struck by the discarded sabot.

M829A1:

Type classification .....STD, Classified  
SMR code.....SB000  
Federal supply code for mfg...19200

Complete round:

Type .....Fixed, APFSDS-T  
Weight .....46.22 lb  
Length.....38.75 in.  
Cannon used with .....M256  
Assembly drawing.....12527400  
Color .....Black w/white  
markings on projec-  
tile

Temperature limits:

Firing:  
Lower limit .....-25°F (-32°C)  
Upper limit .....+ 120°F (+49°C)

Storage:

Lower limit .....-50.0°F (-46.0°C)  
Upper limit .....+145.0°F (+63.0°C)

Performance:

Chamber pressure .....96,000 psi @ 120°F  
and 82,650 psi  
70°F  
Velocity (Nominal).....5150 ft/sec

Packing:

Packing drawing.....12527481  
Packing and marking  
drawing .....12526435  
Weight (lb).....67.44 lb  
Total explosive weight .....17.5 lb  
Cube (ft) .....1.55 cu ft  
Packing .....1 round per light  
weight metal con-  
tainer, 30 containers  
per pallet

Light Weight Container:

(PA116)  
Dimensions .....7.75 x 7.75 x 44.5 in.  
Weight .....21.22 lb  
Cube.....1.55 cu ft

Shipping and storage data:

DOD hazard class (subject to  
change) .....(08) 12  
Storage compatibility group  
(subject to change) .....C  
DOT shipping class  
(subject to change) .....B  
DOT designation .....AMMUNITION  
FOR CANNON  
WITH SOLID  
PROJECTILES  
DODAC.....1315-C380

Limitations:

Projectiles are not disposed of by burning or detonation.

The M829A1 is a full service round which may only be fired during war emergency. All peace-time firings are prohibited except at locations having a Nuclear Regulatory Commission (NRC) license and host nation agreement.

**WARNING**

- IF THE CARTRIDGE IS DAMAGED TO THE POINT WHERE THE INTERNAL PROJECTILE COMPONENTS ARE VISIBLE, THE ITEM SHALL BE TREATED AS CONFIDENTIAL. THE DAMAGED CARTRIDGE SHALL BE PLACED IN A CONTAINER OR OTHERWISE COVERED TO PREVENT EXPOSURE. THE CARTRIDGE SHALL BE RETURNED IN A SEALED CONTAINER (AS A CLASSIFIED ITEM) TO THE APPROPRIATE ASP FOR DISPOSITION.
- DO NOT FIRE OVER THE HEADS OF FRIENDLY TROOPS UNLESS TROOPS HAVE ADEQUATE COVER. TROOPS MAY BE STRUCK BY THE DISCARDED SABOT.

**NOTE**

Loss or unauthorized firings of the M829 or M829A1 must be reported to the HQ, AMCCOM RPO within 2 hours of the discovery. Report to: Cdr USA AMCCOM ATTN: AMSMC-SF (RPO) Rock Island, IL 61299-6000  
 Autovon: 793-2969/2964/2965/2966  
 Commercial: (309)782-2969/2964/2965/2966

c. Description for Cartridge, 120mm: HEAT-MP-T, M830 (fig. 3).

(1) The M830 HEAT-MP-T, 120mm cartridge is a direct translation of the German DM12A1 round with the exception that a U.S. designed fuzing system and explosive (Comp A3, Type II) is used.

(2) The 120mm HEAT-MP-T M830 is a high explosive round having both antiarmor and antipersonnel capabilities. The round consists of a steel body loaded with explosive surrounding a copper shaped charge liner and wave shaper. The projectile embodies a steel spike with a shoulder and nose switching mechanism for full frontal area functioning and graze impact which initiates a base detonating fuze. The fuse is located at the rear of the projectile body. The projectile body has a copper obturator, boom and fin assembly for flight stabilization. The fin contains a tracer for projectile to target visual tracking.

(3) The propellant system utilizes a metal cartridge case base with a rubber obturator at the stub case mouth. M123A1 primer and a combustible wall which encapsulates stick propellant within six containment devices to prevent spillage should breakage or separation occur.

(4) The weight of the complete cartridge is approximately 53.4 pounds (24.2 kg) with the approximate weight of the projectile being 30 pounds (13.5 kg).

(a) Use. This cartridge is a high explosive multipurpose cartridge which has antiarmor and antipersonnel capabilities. The cartridge is fired from the 120mm smooth bore M256 cannon.

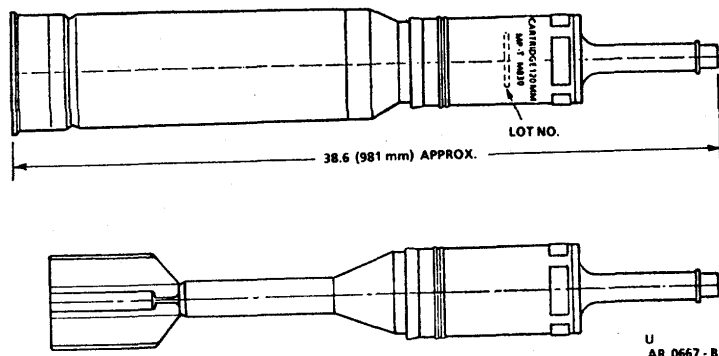


Figure 3. Cartridge, 120mm: HEAT-MP-T-M830.

(b) Functioning. The M830 is loaded and fired in the normal manner from the 120mm M256 smooth bore tank gun. When the electric primer in the breech of the weapon is initiated, the resulting flash ignites the propelling charge and combustible case. This generates gases which drive the projectile from the gun and ignite the tracer element. Upon impact, one of the fuze sensors is initiated. The fuze then detonates the high explosive shaped charge which collapses the cone assembly creating a high velocity focused shock wave and a jet of metal particles that penetrate the target. Antipersonnel capability results from fragmentation of the projectile body sidewall.

d. Tabulated data for Cartridge, 120mm:

HEAT-MP-T, M830.

Type classification.....TC Nov 84  
 SMR code.....XB000  
 Container, Ammunition, Metal,  
 PA116 for Cartridge, 120mm,  
 HEAT-MP-T: M830:  
     National stock No.....8140-01-228-7917  
     Part No.....2630718  
 Fed supply code for mfg .....19203  
 Complete round:  
     Type .....Fixed, High  
                                             Explosive Antitank  
                                             Multipurpose  
                                             w/Tracer  
 Weight .....53.4 lb (24.2 kg)  
 Length .....38.6 in. (981 cm)  
 Assembly drawing.....12526622  
 Color .....Black w/yellow  
                                             markings  
 Temperature limits:  
 Firing:  
     Lower limit .....-50.0°F (-46.0°C)  
     Upper limit .....+145.0°F (+63.0°C)  
 Storage:  
     Lower limit .....-50.00F (-46.0°C)  
     Upper limit .....+145.0°F (+63.0°C)  
 Performance:  
     Chamber pressure (peak) .....69,600 psi at 70°F  
     Velocity (nominal) .....3740 ft/sec  
 Packaging (Metal Container):  
     Packing and marking  
         drawing .....12630718  
     Dimensions .....44.5 x 7.75 x 7.75 in.  
     Cube.....1.55 cu ft  
     Total weight (with cartridge). 75.4 lb  
     Total explosive weight .....17.0 lb  
     \*Packing .....1 round per metal  
                                             container; 30 metal  
                                             containers per pallet  
 \*Note: See SC for complete packing data including  
 NSN's.  
 Shipping and storage data:  
     DOD hazard class.....(08) 1.2  
     Storage compatibility group....E

Field storage category.....A  
 DOT shipping class .....A  
 DOT designation.....AMMUNITION  
                                             FOR CANNON  
                                             WITH EXPLOSIVE  
                                             PROJECTILES  
 DODAC.....1315-C787

Limitation:

The M830 will not be fired over the heads of friendly troops, unless troops have adequate protection. M830 may prematurely detonate downrange.

e. Description for Cartridge, 120mm: TP-T, M831 (fig. 4).

(1) The M831 cartridge external appearance is identical to that of the M830 HEAT-MP-T service round. Internally the round does not contain any explosives, shaped charge liner base fuze or nose cap. The round consists of a steel body with aluminum spike and copper obturator, in addition to a fin and boom assembly with tracer. The complete round propellant system comprises a stub metal case with combustible sidewall and M123A1 primer. The propellant is a single perforated stick propellant and is bagged with additional segments fitted over each fin.

(2) The propellant system utilizes a metal cartridge case with a rubber obturator at the stub case mouth, M123A1 primer, and a combustible wall which encapsulates stick propellant within six containment devices to prevent spillage should breakage or separation occur.

(3) The weight of the complete cartridge is approximately 53.4 pounds (24.2 kg) with the approximate weight of the projectile being 30 pounds (13.5 kg).

(a) Use. This cartridge is a target practice round to simulate the ballistics of the M830 High Explosive Antitank Multipurpose with Tracer ammunition. The cartridge is fired from the 120mm smooth bore M256 cannon.

(b) Functioning. The M831 is loaded and fired in the normal manner from the 120mm M256 smooth bore tank gun. When the electric primer in the breech of the weapon is initiated, the resulting flash ignites the propelling charge and combustible case. This generates gases which drive the projectile from the gun and ignites the tracer element. The flight characteristics simulate those of the service round, but does not result in an explosion or penetration upon target impact.

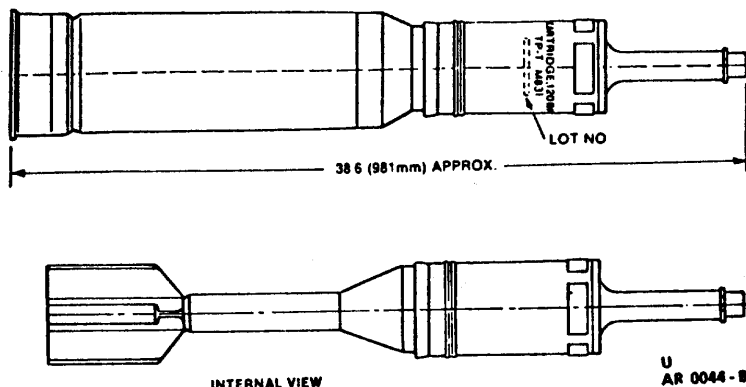


Figure 4. Cartridge, 120mm: TP-T, M831.

f. Tabulated data for Cartridge, 120mm:

TP-T, M831.

Type classification.....	STD - Apr 84
SMR code .....	XB000
Part No.:	
Wood box .....	12527240
Fiber container.....	12527220
Federal supply code for mfg .....	19203
Complete round:	
Type .....	Fixed, target practice
Weight .....	53.4 lb (24.2 kg)
Length .....	38.6 in. (981 mm)
Assembly drawing . .....	12527100
Color .....	Blue w/white markings
Temperature limits:	
Firing:	
Lower limit .....	-50.0°F (-46.0°C)
Upper limit .....	+145.0°F (+63.0°C)
Storage:	
Lower limit .....	-50.0°F (-46.0°C)
Upper limit .....	+145.0°F (+63.0°C)
Performance:	
Chamber pressure (peak) .....	69,600 psi at 70°F
Velocity (nominal) .....	3740 ft/sec
Packaging (Wooden Box):	
Inner pack drawing.....	12527220
Outer pack drawing.....	12527240
Dimensions.....	45.6 x 9.02 x 10.24 in.
Explosive weight .....	13.93 lb
Weight (with cartridge) .....	89.4 lb
Cube .....	2.4 cu ft
*Packing .....	1 round per fiber container; 1 container per wooden box; 20 boxes per pallet
Packaging (Metal Container):	
Packing and marking drawing.....	12561274
Dimensions .....	44.5 x 7.75 x 7.75 in.
Total Weight (with cartridge). .....	75.4 lb
Total explosive weight .....	13.93 lb
Cube.....	1.56 cu ft
*Packing .....	1 round per metal container; 30 metal containers per pallet

\*Note: See SC for complete packing data including NSN's.

Shipping and storage data:

DOD hazard class.....	1.3 (box), (08) 1.2 (can)
Storage compatibility group....	C
Field storage category.....	A
DOT shipping class .....	B
DOT designation. ....	AMMUNITION FOR CANNON WITH EMPTY PROJECTILES
DODAC.....	1315-C784

g. Description for Cartridge, 120mm: TPCSDS-T, M865 (fig. 5).

The complete round contains a propulsion system consisting of a stub metal case with combustible sidewall granular propellant, and electric M125 primer while the projectile consists of the subprojectile and aluminum sabot. The core is a one piece steel design with a tail cone assembly which is assembled into the sabot by means of threads. There are two M865 cartridges, the standard sabot (old) and the shorter sabot (new), (see table 1 for the characteristics comparison and fig. 7). The tail cone contains nine holes, or six slots, which in conjunction with the conical shape, provide stabilization. Reduced range is achieved by the aerodynamic blocking effect of the holes or slots. The tail cone assembly also contains a tracer. The aluminum sabot is composed of three 120 degree noninterchangeable segments with internal screw threads matching those on the outer diameter of the subprojectile. The sabot has a silicone rubber seal at the rear to prevent gas leakage.

(1) Use. This cartridge is a kinetic energy, target practice round for use with the 120mm smooth bore M256 cannon. It is designed to simulate the service round characteristics at reduced maximum ranges to allow practice firings on short-range proving grounds and training areas.





DOT designation .....AMMUNITION  
 FOR CANNON  
 WITH SOLID  
 PROJECTILES  
 DODAC..... 1315-C785

**WARNING**  
**DO NOT FIRE OVER THE HEADS OF FRIENDLY TROOPS, UNLESS TROOPS HAVE ADEQUATE COVER. TROOPS MAY BE STRUCK BY DISCARDED SABOT.**

**CAUTION**  
**EVEN THOUGH THIS IS A TARGET PRACTICE ROUND, THE CORE CAN CAUSE DAMAGE AND PENETRATE ARMORED VEHICLES.**

Limitations:  
 Even though this is a target practice round, the core can cause damage and penetrate light-armored vehicles.

Do not fire over the heads of friendly troops, unless troops have adequate cover. Troops may be struck by the discarded sabot.

Table 1 shows the differences between NSN's.

*i. Markings.* Typical markings for the projectile are shown in figure 6. A difference in location and size will distinguish the M865 with the slotted cone and reduced sabot size, NSN 1315-01-288-5545, from the 9-hole cone and standard length sabot as follows (fig. 7):

(1) Marking for 9-hole cone/std sabot: 1/2 inch letters (12mm+) in 3 lines on sabot midsection. Sabot with nylon holding ring on bourrelet.

(2) Marking for 6-slot cone/reduced length sabot: 1/4 inch letters (6mm+) in 2 lines on sabot midsection or bourrelet. Sabot without nylon holding ring on bourrelet.

**Table 1. Characteristics Comparison**

1315-01-165-6488	1315-01-242-4796	*1315-01-288-5545
9 hole cone	9 hole cone	6 slotted cone
Standard sabot	Standard sabot	1 inch shorter sabot
Markings located on sabot midsection (3 lines of 12mm letters.	Markings located on sabot midsection (3 lines of 12mm letters.	Markings located on front bourrelet or with reduced letter height (6.35mm) and two lines on sabot midsection.
Sabot with nylon holding ring on bourrelet.	Sabot with nylon holding ring on bourrelet.	Sabot without nylon holding ring on bourrelet.
Wood/box fiber container	Metal container (PA116)	*Metal container (PA116) *Note: Cartridges of this NSN must be replaced in metal containers of the same lot number due to the shortened sabot requiring a different internal container support.

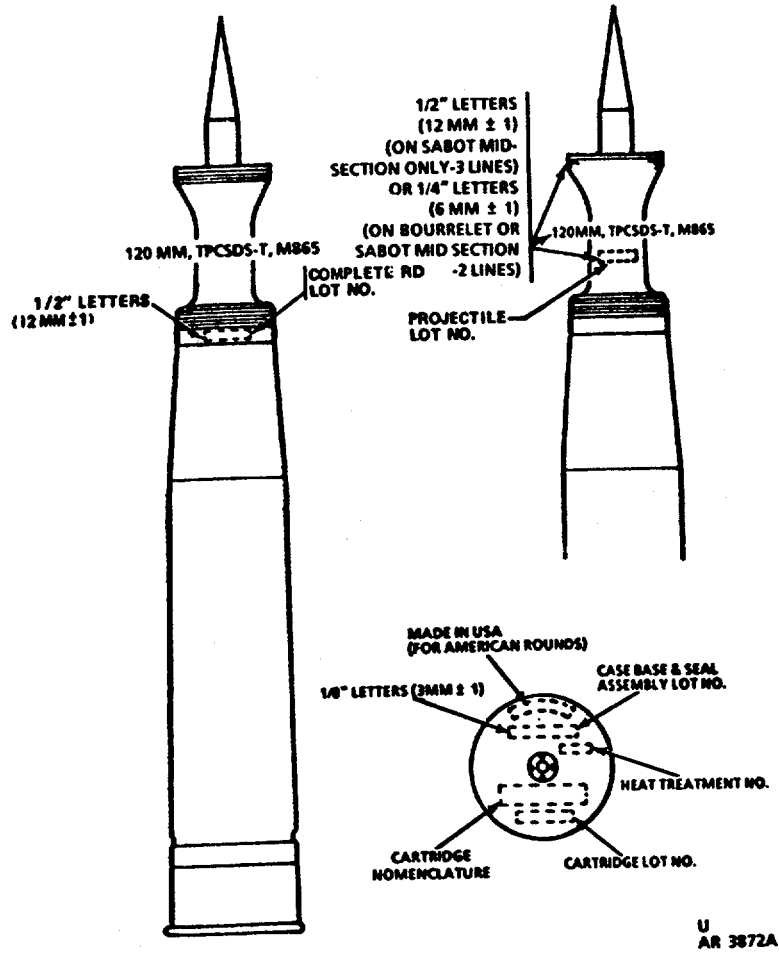
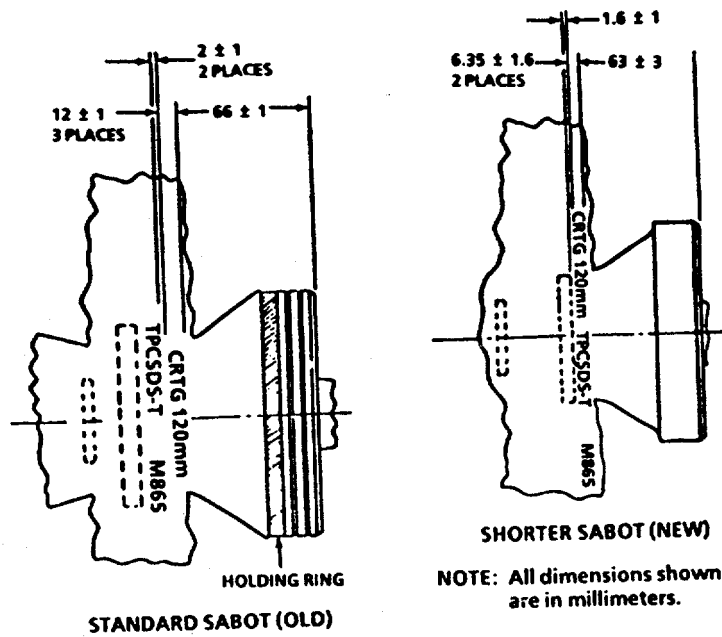


Figure 6. Typical marking for 120mm gun cartridges, M865.



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AR 5092

Figure 7. Differences between standard and shorter Sabot for 120mm Gun Cartridge, M865.

j. Description for Cartridge, 120K: HEATMP-T, DM12A1 (fig. 8).

(1) The 120K HEAT-MP-T, DM12A1 is a high-explosive round having both antiarmor and antipersonnel capabilities. The round consists of a steel body loaded with explosive surrounding a copper-shaped charge liner and wave shaper. The projectile embodies a steel spike and nose cap which initiates a base detonating fuze located at the rear of the projectile body. The projectile body has a boom and fin assembly for flight stabilization and the fin contains a tracer for projectile to target visual tracking.

(2) The propellant system utilizes a DM10 steel stub base case with a rubber obturator at the stub case mouth and a combustible wall which encapsulates stick propellant.

(a) Use. This cartridge is a high-explosive multipurpose cartridge which has antiarmor and antipersonnel capabilities. The cartridge is fired from the 120mm smooth bore cannon.

(b) Functioning.

1. The DM12A1 is loaded and fired in the normal manner from the 120mm smooth bore tank gun. When the electric primer in the breech of the weapon is initiated, the resulting flash ignites the propelling charge and combustible case. This generates gases which drive the projectile from the gun and ignite the tracer element.

2. Upon impact, the nose cap is crushed, initiating the fuze which detonates the high explosive shaped charge which collapses the cone assembly creating a high velocity

focused shock wave and a jet of metal particles that penetrate the target. Antipersonnel capability results from fragmentation of the projectile body sidewall.

k. Tabulated data for Cartridge, 120K: HEAT-MP-T, MP-T, DM12A1.

Complete round:

Type ..... Fixed, High Explosive Antitank, Multipurpose w/Tracer  
 Weight ..... 50.7 lb (23.0 kg)  
 Length ..... 38.6 in. (981 cm)  
 Color ..... Black w/yellow markings

Temperature limits:

Firing:  
 Lower limit ..... -40.0°F (-40.0°C)  
 Upper limit ..... + 140.0°F (+60.00C)

Storage:

Lower limit ..... -65.0°F (-53.80C)  
 Upper limit ..... +160.0°F (+71.1°C)

\*Packing ..... 1 round per fiber container; 1 fiber container per wooden box

Packing box:

Weight ..... 89 lb  
 Dimensions ..... 45.6 x 9.02 x 10.24 in.  
 Cube ..... 2.4 cu ft

Shipping and storage data:

DOD hazard class ..... (12) 1.2E  
 DOT shipping class ..... A  
 DOT designation ..... AMMUNITION FOR CANNON WITH EXPLOSIVE PROJECTILES

DODAC ..... Not assigned

Dwg No ..... Not available

\*Note: See SC for complete packing data including NSN's.

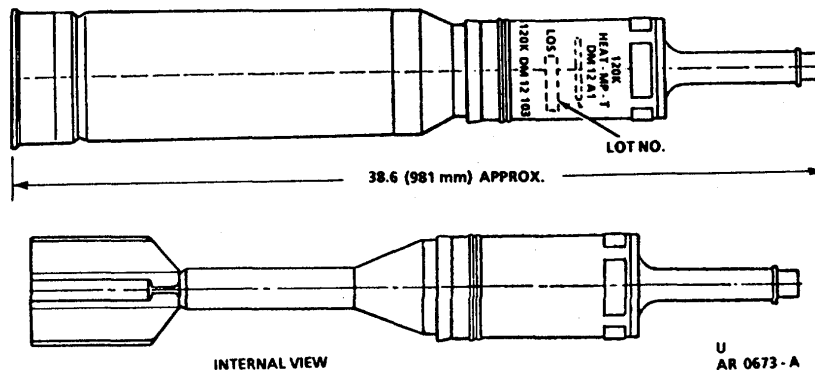


Figure 8. Cartridge, 120K: HEAT-MP-T, DM12A1.

l. Description for Cartridge 120K: APFSDS-T, DM13 AND DM23 (fig. 9). The complete round contains a propulsion system consisting of a DM10 stub case with combustible sidewall, propellant and DM72A2 primer while the projectile consists of the subprojectile and aluminum sabot. The KE penetrator is a two piece core of heavy metal which is screwed and pressed into the sabot. The sabot is made of aluminum and consists of three segments with internal threads. The segments are held together by the obturating, sealing band, and sleeve seal. The fin assembly of the subprojectile is a single piece with five fins and tracer assembly.

(1) Use. The 120K (120mm) DM13 and DM23 cartridge is used to engage single and multiple plated layered, armored targets. It has a fin stabilized subcaliber projectile and a cartridge case of combustible material.

(2) Functioning.

(a) The flame of the burning propellant charge ignites the igniter composition of the tracer. The projectile is forced out of the tube of the weapon by the pressure of the propellant charge gases on the base of the sabot and the fin assembly. The cartridge case and cartridge cover burn at the same time.

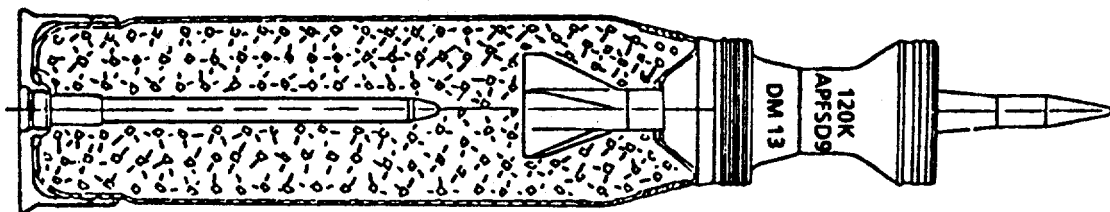
(b) The air resistance acting in the air pocket of the sabot presses the three segments of the sabot outward. The sabot segments separate from the KE penetrator

and fall to the ground after a short time. The KE penetrator continues to travel and is stabilized by the fin assembly (subcaliber projectile).

(c) The target armor material is plastically deformed by the subcaliber projectile impacting at high velocity and the associated high energy effect and displaced by the KE penetrator.

m. Tabulated data for Cartridge 120K: APFSDS-T, DM13 AND DM23.

Complete round:  
 Type ..... Fixed, APFSDS -T  
 Weight ..... 18.1 kg (41.2 lb)  
 Projectile weight ..... 7.22 kg  
 Propelling chg weight ..... 7.3 kg  
 Muzzle velocity ..... 1650 m/s  
 Max gas pressure..... (21°C) 5100 bar  
 Max range..... 98.7 km  
 Temperature limits:  
 Firing: ..... DM13 DM23  
     Lower limit ..... +32°F -40°F  
     Upper limit ..... +130°F +140°F  
 Storage:  
     Lower limit ..... -40°F (-40°C)  
     Upper limit ..... +140°F (+60°C)  
 \*Packaging:..... (1.3 C, class B explosive)  
 One cartridge with insert, ammunition packaging material (INSERT) DM79060 in a CONTAINER, AMMUNITION, FIBER MATERIAL (BEHFA) DM79057: 1 BEHFA DM79057 (1 cartridge) in a BOX, AMMUNITION (KIMU) DM79058.  
 Supply information:  
 Stock No ..... 1315-12-178-2867  
 Ammunition code ..... CR02  
 \*Ammunition for cannon with solid projectiles.  
 Limitations:  
 Do not fire over the heads of friendly troops, unless troops have adequate cover. Troops may be struck by the discarded sabot.



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Figure 9. Cartridge, 120K: APFSDS-T, DM13 and DM23.

n. Description for Cartridge, 120K: UIB-T, DM18 (Übungsgeschoss-Leuchtspur/Training Projectile with Tracer) (fig. 10). The DM18 cartridge external appearance is identical to that of the DM12 HEAT-MP-T service round. Internally the round does not contain any explosives, shaped charge liner base fuze or nose cap. The round consists of a steel body with aluminum spike and plastic obturator, in addition to a fin and boom assembly with tracer. The complete round propellant system comprises a metal cartridge case base with combustible sidewall and DM12A2 primer. The propellant is a single perforated stick propellant, both bagged and unbagged with additional segments fitted over each fin.

(1) Use. The 120K (120mm) DM18 cartridge is a target practice round used to simulate the ballistics of the high explosive antitank multipurpose with tracer ammunition. The cartridge is fired from the 120mm smooth bore cannon.

(2) Functioning. The DM18 is loaded and fired in the normal manner from the 120mm smooth bore tank gun. When the electric primer in the breech of the weapon is initiated, the resulting flash ignited the propelling charge and combustible case. This generates gases which drive the projectile from the gun and ignite the tracer element. The flight characteristics simulate those of the service round, but does not result in an explosion or penetration upon impact.

o. Tabulated data for Cartridge 120K: TB-T, DM18 (Übungsgeschoss-Leuchtspur/Training Projectile with Tracer).

Complete round:

Type .....	Fixed, target practice
Weight .....	50.7 lb (23 kg)
Length .....	38.6 in. (981 mm)
Color .....	Blue w/white markings

Temperature limits:

Firing:	
Lower limit .....	-8°F (-22.2°C)
Upper limit .....	+127°F (+52.3°C)

Storage:

Lower limit .....	-40°F (-40°C)
Upper limit .....	+ 140°F (+60°C)

*Packing .....	1 round per fiber container, 1 container per wooden box
----------------	---------------------------------------------------------

Packing box:

Weight .....	89 lb
Dimensions .....	45.6 x 9.02 x 10.24 in.
Cube .....	2.4 cu ft

Shipping and storage data:

DOD hazard class .....	(08) 1.2C
DOT shipping class .....	B
DOT designation .....	AMMUNITION FOR CANNON WITH EMPTY PROJECTILES

DODAC.....To be assigned

\*Note: See SC for complete packing data including NSN's.

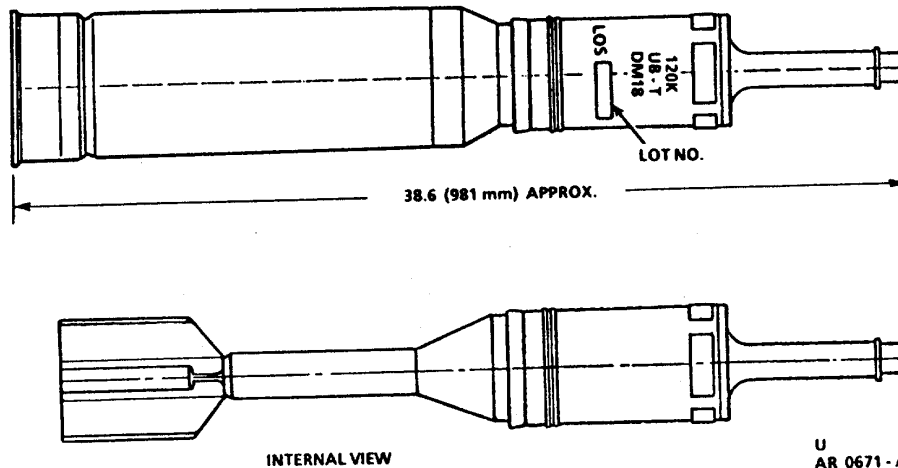


Figure 10. Cartridge, 120K: UFB-T, DM18.

p. Description for Cartridge, 120K: UB-T, DM38 (Ubungsgeschoss-Leuchtspur/Training Projectile with Tracer) (fig. 11).

(1) Complete round. The complete round contains a propulsion system consisting of a metal cartridge case base with combustible side wall, granular propellant, and DM72A2 primer while the projectile consists of the subprojectile and aluminum sabot. The core is a one piece steel design with a tail cone assembly which is assembled into the sabot by means of threads. The tail cone contains nine holes which, in conjunction with the conical shape, provide stabilization. A reduction of range is obtained by the aerodynamic blocking effect of the holes. The tail cone assembly also contains a tracer. The aluminum sabot is composed of three 120-degree noninterchangeable segments with internal screw threads matching them on the outer diameter of the subprojectile. The sabot has a silicone rubber seal at the rear to prevent gas leakage.

(2) Complete cartridge weight. The weight of the complete cartridge is approximately 18.4 kg (40.6 lb) and the weight of the subprojectile is approximately 3.2 kg (7.1 lb).

(3) Use. This cartridge is a kinetic energy, target practice round for use with the 120mm smooth bore cannon. It is designed to simulate the service round characteristics at reduced maximum ranges to allow practice firings on short-range proving grounds and training areas.

(4) Functioning. The DM38 is loaded and fired from the 120mm tank gun in the normal manner. Upon initiation of the electric primer in the breech of the weapon, the resulting flash ignites the propelling charge and

combustible case generating gases which drive the projectile from the gun and ignite the tracer. The rear seal of the sabot prevents gas leakage between the sabot segments and the driving forces (gas) propelling the subprojectile down bore. Upon leaving the gun, aerodynamic forces cause the sabot to separate from the subprojectile allowing the subprojectile to continue to target while the sabot segments fall quickly to earth. The tail cone segment of the subprojectile, due to the nine hole arrangement, causes aerodynamic slowing of the subprojectile to limit its range to 7500m.

q. Tabulated data for Cartridge, 120K: UB-T, DM38 (Ubungsgeschoss-Leuchtspur/ Training Projectile with Tracer).

Complete round:

Type .....	Fixed, TPCSDS-T
Weight .....	40.6 lb (18.4 kg)
Color .....	Blue w/white markings

Temperature limits:

Firing:

Lower limit .....	-35°F (-31.6°C)
Upper limit .....	+125.0°F (+51.7°C)

Storage:

Lower limit .....	-50.8°F (-46.0°C)
Upper limit .....	+ 145.4°F (+63.0°C)

Performance:

Chamber pressure .....	56500 psi at 70°F
.....	(3900 bars at 21°C)

Packaging: Standard German Packaging as Supplied (Government Furnished Material).

\*Packing .....

.....	1 round per fiber
.....	container; 1 container per wooden
.....	box

Packing box:

Standard German packaging (wooden box) as supplied (Government Furnished Material).

Weight .....	78 lb
Dimensions .....	45.6 x 9.02 x 10.24
.....	in.
Cube .....	2.4 cu ft

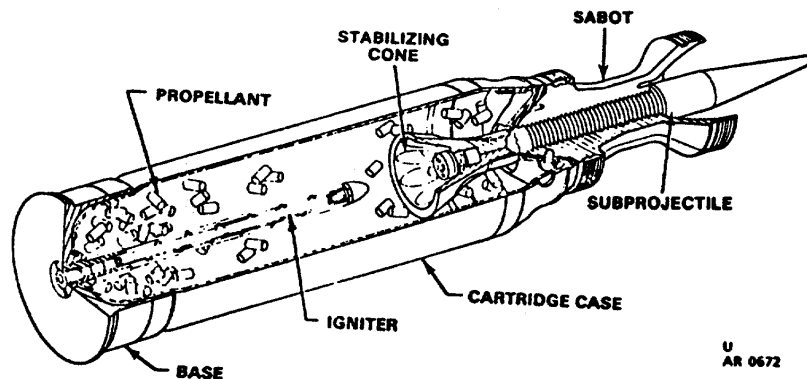


Figure 11. Cartridge, 120K: UB-T, DM38.

Shipping and storage data:

DOD hazard class.....(08) 1.2  
 Storage compatibility group....C  
 DOT shipping class.....B  
 DOT designation.....AMMUNITION  
 FOR CANNON  
 WITH SOLID  
 PROJECTILES

DODAC.....Not assigned

\*Note: See SC for complete packing data including NSN's.

Limitations:

The core/penetrator or target practice rounds can cause damage and penetrate eight armored vehicles.

Do not fire over the heads of friendly troops, unless troops have adequate cover. Troops may be struck by the discarded sabot.

**5. Authorized Ammunition for 120mm Gun M256** (table 2).

**WARNING**

- **USE OF UNAUTHORIZED AMMUNITION FOR THE 120MM GUN M256 MAY RESULT IN DEATH OR INJURY TO PERSONNEL.**
- **USE CARE TO PREVENT SPILLING ACIDIC FLUIDS (SOFT DRINKS, BEER, FRUIT JUICES, VINEGAR, CLEANER LUBRICANT PRESERVATION (CLP), ETC.) ON 120MM AMMUNITION. IF ANY OF THESE FLUIDS COME IN CONTACT WITH THE AMMUNITION, WIPE WITH DAMP RAG. DRY THOROUGHLY, AND INSPECT FOR SIGNS OF CORROSION.**

Ammunition for the 120mm gun M256 may be interchanged with authorized Federal Republic of Germany produced 120mm tank gun ammunition. It is fixed ammunition ready to fire. It uses a combustible side wall cartridge case with a metallic stub base. All but the stub base and primer are consumed when the round is fired. The HEAT-MP-T and APFSDS-T (fig. 12) complete rounds (1) consist of an electric primer (2) a propelling charge (3) inside the combustible cartridge case (4) and a projectile (5). The HEAT-MP-T round has an explosive shaped charge assembled with a point initiating base detonating fuze (6). The APFSDS-T round has a heavy metal penetrator (8) and discarding sabots (9). The combustible sidewall case is secured to the projectiles (5) and to the metallic case base (7).

For the APFSDS-T (KE) M829 series, figure 13 shows the projectile cartridge case interface.

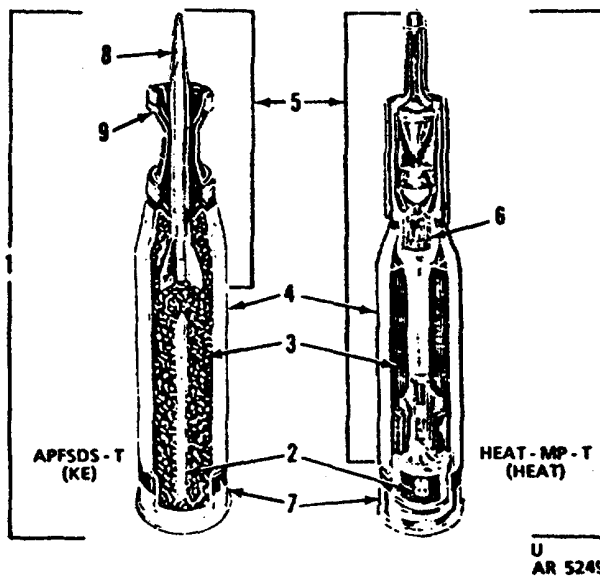


Figure 12. HEAT-MP-T and APFSDS-T complete rounds.

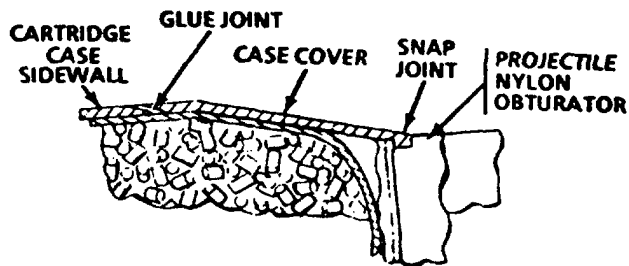


Figure 13. KE M829 series (projectile cartridge case interface).



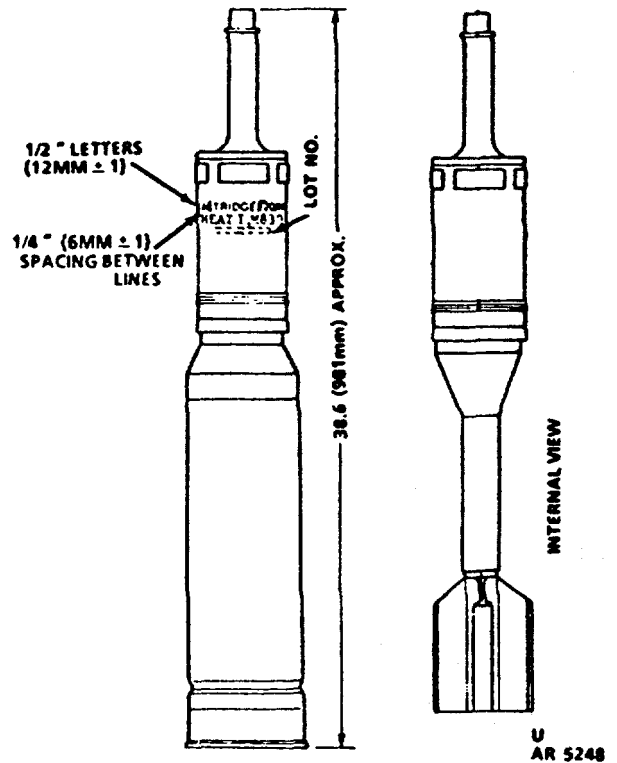
**Table 2. Authorized Rounds**

Standard Nomenclature	Complete round		Projectile weight as fired (approx)
	Weight (approx)	Length (approx)	
ARMOR PIERCING:			
Cartridge, 120mm: APFSDS-T, DM13 AND DM23	41.2 lb 18.7 kg	36.8 in. 935.0 mm	15.7 lb 7.1 kg
Cartridge, 120mm: APFSDS-T, M829*	41.2 lb 18.7 kg	36.8 in. 935.0 mm	15.7 lb 7.1 kg
Cartridge, 120mm: APFSDS-T, M829A1*	46.2 lb 21.0 kg	38.7 in. 984.0 mm	XXX XXX
HIGH EXPLOSIVE:			
Cartridge, 120mm: HEAT-MP-T, M830 (DM12A1)	53.4 lb 24.2 kg	38.6 in. 981.0 mm	29.8 lb 13.5 kg
PRACTICE:			
Cartridge, 120mm: TP-T, M831 (DM18)	53.4 lb 24.2 kg	38.6 in. 981.0 mm	29.8 lb 13.5 kg
Cartridge, 120mm: TPCSDS-T, M865 (LKL CKE - U6 M.VR., DM38)	41.9 lb 19.0 kg	34.7 in. 881.0 mm	13.0 lb 6.9 kg

\*The M829 and M829A1 are full service rounds which may only be fired during war emergency except when approved by the Nuclear Regulatory Commission (NRC) and/or when there is a host nation agreement.

6. Markings. Markings on projectiles indicate cartridge 120mm gun, projectile model, type with tracer, and projectile lot number as listed below (figs. 14, 15 and 16).

- a. Cartridge, 120mm APFSDS-T: M829  
Projectile Lot No.
- b. Cartridge, 120mm TPCSD-T: M865  
Projectile Lot No.
- c. Cartridge, 120mm TP-T: M831  
Projectile Lot No.
- d. Cartridge, 120mm HEAT-MP-T: M830  
Projectile Lot No.



**Figure 14. Typical marking for 120mm gun cartridge M830.**

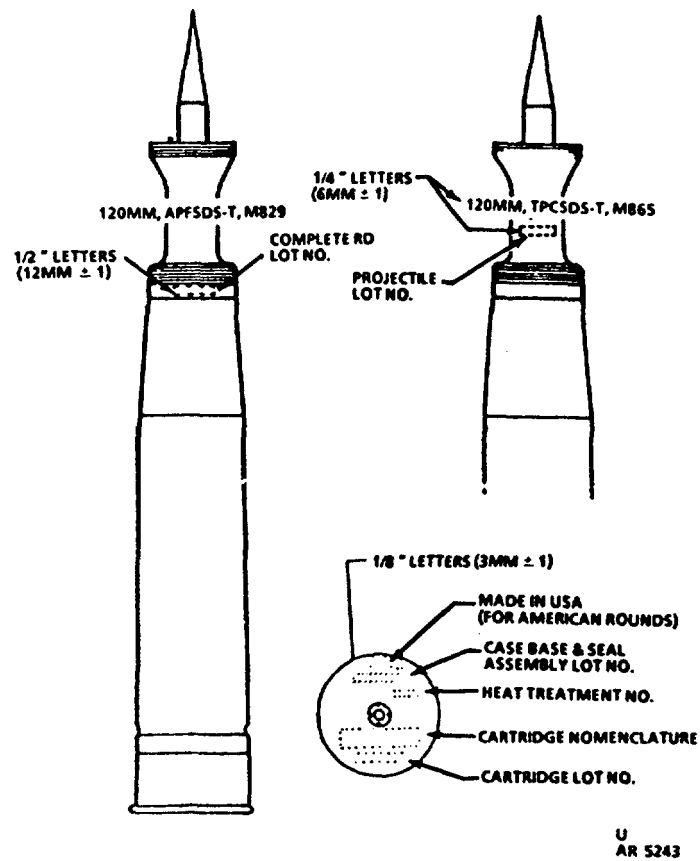


Figure 15. Typical marking for 120mm gun cartridges M829, M829A1 and M865.

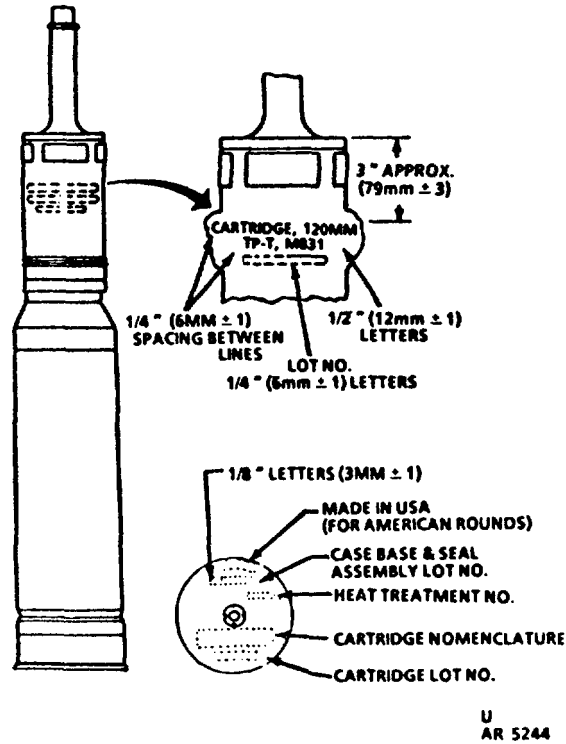


Figure 16. Typical marking for 120mm gun cartridge M831.

**7. Unpacking Procedures from Metal Containers (figs. 17 and 18).**

**NOTE**

When removing ammunition from the palletized metal containers, it is advisable to begin unpacking the ammunition from the bottom of the pallet proceeding to the top. This will permit removal of the cartridges from the palletized metal can to move without hindrance from the nylon strap loop.

- a. Cut lead seal wire with pliers and remove.
- b. Flip latch 180 degrees to unseal cover assembly. Rotate cover assembly counterclockwise to disengage the assembly shaft from the container notches.
- c. Remove cover assembly and spacer material from the container and place them on top of pallet.

**NOTE**

Do not misplace cover assembly and spacer material. Cover assembly and spacer material must be replaced after all cartridges have been removed from the containers.

- d. Grasp and pull nylon strap loop until internal stop is engaged (round and foam sleeve will move out of container approximately 4 inches.)

**NOTE**

Do not use an excessive amount of force when pulling nylon loop strap. If cartridge and foam sleeve will not move, place nylon strap loop in container, perform steps i and j below, and use tag or mark container "Stuck Round".

- e. Release the nylon strap loop from grasp, loop must hang clear of container rim.

**CAUTION**

THE CARTRIDGE CASE OF THE 120MM AMMUNITION IS MADE OF A COMBUSTIBLE (CELLULOSE FIBER) MATERIAL AND AS SUCH, CARE SHOULD BE EXERCISED SO AS NOT TO DAMAGE OR SCRATCH THE CARTRIDGE CASE.

- f. Grasp rim of cartridge case base and pull round out of container.

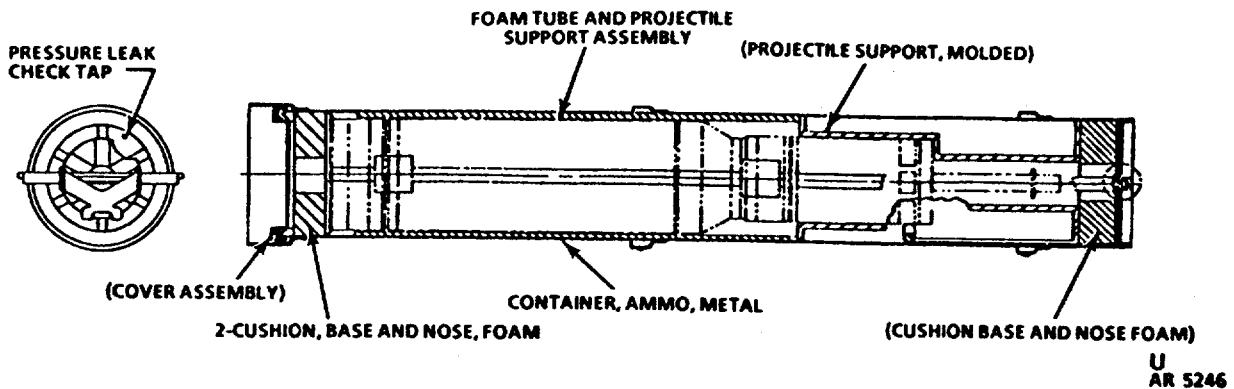


Figure 17. Metal containers, PA116, for Cartridge, 120mm: HEAT-MP-T, M830.

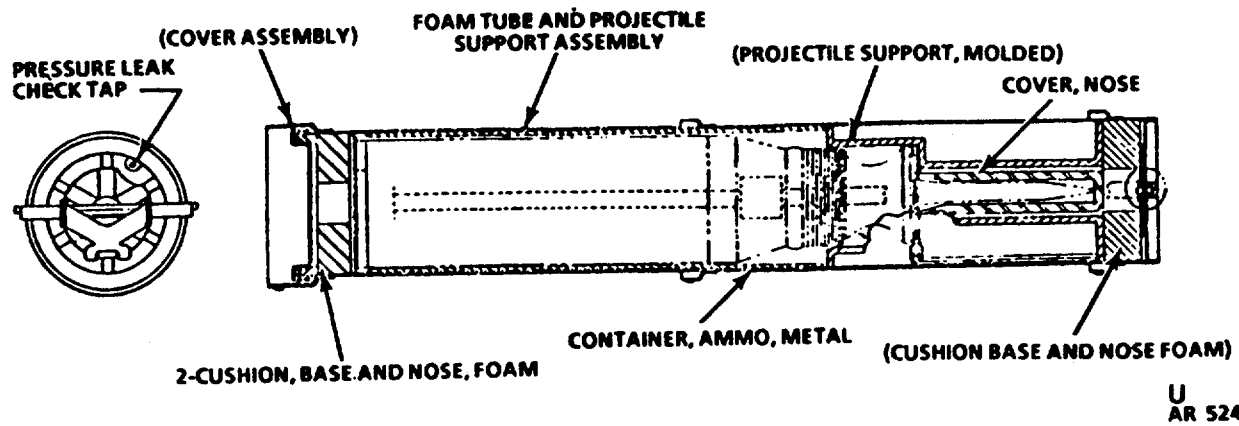


Figure 18. Metal container, PA116, for Cartridge, 120mm: APFSDS-T, M829.

**NOTE**

- The combustible cartridge case must be grasped by its metal base.
- APFSDS-T ammunition must be grasped by the sabot NOT THE WINDSHIELD.
- HEAT-MP-T ammunition must be grasped by the body NOT THE SPIKE.
- The penetrator and spike should not be banged, used as a resting point, or stepped on.

g. Place the nylon strap within the foam sleeve. Return the APFSDS-T nose cover to the APFSDS-T container for future use. (The nose cover should not be removed from the APFSDS-T round until just prior to placing the round in the tank's Ammo rack).

h. Push the foam sleeve fully into the container.

i. Obtain the cover assembly and spacer material from the top of the pallet and position the cover in the container opening fully rotating the cover clockwise to engage the container notches.

j. Lock the cover assembly latch.

**NOTE**

- Keep the interior of the container clean of debris and dirt.
- Do not leave the containers open overnight or for an extensive period of time.

**8. Repacking Procedures.****NOTE**

- When placing 120mm ammunition into palletized containers, it is advisable to begin packing from the top of the pallet down. This will permit the packing of the cartridges on the pallet without hindrance from the nylon strap loops.
- Repack HEAT Ammo in HEAT containers and APFSDS in APFSDS. The interior foam liners differ for each type of ammo.

a. Flip latch 180 degrees to unseal cover assembly.

b. Rotate cover assembly counterclockwise to disengage the assembly shaft from container notches..

c. Remove the cover assembly and the spacer material from the container and place them on top of the pallet.

**NOTE**

**Do not misplace cover assembly and spacer material. Cover assembly and spacer material must be replaced after the cartridge has been placed in container.**

d. Grasp and pull the nylon strap loop until the internal stop is engaged. Foam sleeve will move out of container approximately 4 inches.

**NOTE**

**Do not use an excessive amount of force when pulling the nylon strap. If the foam sleeve will not move, place the nylon strap loop in the container, place the foam and cardboard spacer in the container, place and secure the cover**

**assembly to the container, and tag or mark the container "Stuck Sleeve".**

e. Release the nylon strap loop from grasp, loop must hang clear of container rim.

(1) Remove the projectile protective nose cover from the container (APFSDS-T round only).

(2) Place the nose cover over the APFSDS-T round's projectile tip.

f. Visually inspect (use flashlight) interior of container for debris. If debris is present, remove by using broom handle, shovel handle, etc. (If container is not palletized, face open end of container downward until debris falls out.) If debris cannot be removed from container, place nylon strap loop into foam sleeve, push sleeve fully into container, place foam and cardboard cover spacer in container, place and secure cover assembly to container, and tag or mark the container "Debris".

**CAUTION**

**THE CARTRIDGE CASE OF THE 120MM AMMUNITION IS MADE OF A COMBUSTIBLE (CARDBOARD) MATERIAL AND AS SUCH CARE SHOULD BE EXERCISED SO AS NOT TO DAMAGE OR SCRATCH THE CARTRIDGE CASE.**

g. Insert cartridge (nose first) approximately halfway into foam sleeve/containers.

h. Grasp nylon strap loop and hold, insert cartridge fully into the foam sleeve. The cartridge case base should protrude by approximately 1/2 inch from the foam sleeve.

i. Release nylon strap loop, push cartridge and foam sleeve fully into the container.

j. Place the nylon strap loop into the container.

k. Obtain the cover assembly and spacer material from the top of the pallet, perform trial fit of cover and spacer material on container. Add foam and/or cardboard spacer material into container until cover does not readily latch. Remove cover and remove the thinnest spacer in the container. Replace cover assembly and lock latch.

9. **Inspection Criteria for Packaging (Metal Container)** (table 3)

**Table 3. Inspection criteria for packing (metal container)**

Item	Acceptable	Repairable	Irreparable at organizational level
Body	Dents less than 1/4-inch deep.	Dents deeper than 1/4-inch which may be removed without weakening structure of container.	Dents which impair the structural integrity of the material, or prevent removal of contents.
	Flanges which are bent, but do not prevent placement or removal of cover with normal hand pressure.	Flanges which can be straightened to allow placement and removal of cover with normal hand pressure.	Flanges which cannot be straightened.
	Tight seams which prevent entrance of moisture.	None.	Loose or leaking seams.
	Free from rust.	Minor rust which can be removed.	Rust which has caused pitting and perforations.
	Free from perforations.	None.	Perforated.
	Supports which are integral to container present and in serviceable condition.	Supports which can be replaced.	Damaged supports which are integral to the container.
Container interior	Foam liners and cover cushions free of moisture.	Moisture/water which can be removed.	Wet foam liners or cover cushions.

10. **Inspection Criteria for Ammunition (Nonmetallic Cartridge Case)** (table 4)

**Table 4. Inspection criteria for ammunition (nonmetallic cartridge case)**

Item	Acceptable	Repairable	Irreparable at organizational level
All 120mm cartridge cases	Side wall of case scratched, exposing combustible case (yellowish-white), no more than 6 pinstripe scratches per case.	Superficial scrapes/marks penetrating outer polyurethane coating but exposing white case surface.  Side wall of case with 7 or more pinstripe scratches, or combustible casing (to include shoulder) with scrapes, abrasions. or surface coating voided revealing yellowish/white case material. Damage area(s) reveal yellowish/white case material totaling less than 10% (30 in. <sup>2</sup> /194 cm <sup>2</sup> ) of cartridge case area.	Abrasions, scrapes exposing yellowish/white case material totaling 10% (30 in. <sup>2</sup> /194 cm <sup>2</sup> ) or more of total cartridge case area. Cracked, split, punctured, or dented cartridge case. Glue joint or case base separated, loose, or showing a gap.

11. **Classification of Material Defects** (table 5)

**Table 5. Classification of material defects**

Component	Category	Defect	Method of Inspection	Reference	AQL
Fixed Ammunition (Except 152mm)					
Projectile	Critical	Distorted or out-of-round projectile	Gage	-	1.00
	Critical	Erudition of filler around fuze well	Visual	-	1.00
	Major	Corrosion in nose fuze well or supplementary charge	Visual	-	0.40
	Major	Rust or corrosion at bourrelet	Visual	-	0.40
	Major	Damaged rotating band	Visual	-	0.40
Projectile, Spike	Major	Damaged, bent	Visual	-	0.40
Projectile, Spoiler	Major	Missing, bent or damaged	Visual	-	0.40
Fuze	Major	Corrosion on nose fuze body (See Nose Fuzes for additional defects)	Visual	-	0.40
Cartridge case	Critical	Cracked or split cartridge case	Visual	-	1.00
	Critical	Unraveled to extent propellant can escape (spiral wrap cartridge case)	Visual	-	1.00
	Critical	Liner of 106mm recoilless rifle cartridge case damaged to extent that propellant can escape	Visual	-	1.00
	Major	Corrosion on cartridge case and/or primer	Visual	-	0.40
	Major	Severe cartridge case dents	Visual	-	0.40
	Major	Liner of 106mm recoilless rifle cartridge case damaged but not to the extent that propellant can escape	Visual	-	0.40
Marking	Major	Incorrect and/or illegible	Visual	-	0.40
Fixed Ammunition (120mm Tank Ammo)					
Projectile HEAT-MP-T and TP-T Spike - TP	Major	Damage preventing chambering	Visual/Gage	-	1.00
-HEAT	Major	a. Missing or damaged Spike tip		-	1.00
	Major	b. Disc around tip missing or damaged	Visual	-	0.40
	Major	c. Stamped arrows missing	Visual	-	1.00
	Major	Flange on spike tip damaged or distorted	Visual	-	1.00
Shoulder Switch	Major	Loose, bent or cocked	Visual	-	1.00
Copper Band	Major	Missing or damaged	Visual	-	1.00
Projectile Rubber Seal	Major	Split, torn, or piece missing	Visual	-	0.40
Projectile APFSDS-T					
Windshield	Major	Bent or tip loose	Visual/Gage	-	1.00
Sabot Segments	Major	Misaligned	Visual	-	1.00
Forward nylon retaining band	Major	Missing	Visual	-	1.00
	Minor	Broken or gouged	Visual	-	0.40

Table 5. Classification of material defects (continued)

Component	Category	Defect	Method of Inspection	Reference	AQL
Fixed Ammunition (120mm Tank Ammo) continued					
Rear nylon seal	Major	Broken or missing	Visual	-	1.00
	Minor	Gouged	Visual	-	0.40
Rubber seal	Major	Split or piece missing	Visual	-	1.00
	Minor	Partially torn or gouged	Visual	-	0.40
Forward bore riding surface	Major	Gouged or burred	Visual	-	1.00
Combustible Cartridge Case Projectile/Case Cap Assembly	Incidental	Subprojectile (penetrator) loose/rattles within sabot.	Visual/ Gage	-	0.40
Combustible Case and Cap	Incidental	a. Superficial scrapes/marks penetrating outer polyurethane coating but not exposing white case surface.	Visual	-	0.40
	Incidental	b. Scrapes/scratches (pinstripe) on side wall revealing yellowish-white case material. No more than 6 scratches per case.	Visual	-	0.40
	Major	c. Abrasion damage to the cartridge case exposing yellowish/white case material. Damaged area(s) revealing yellowish/white case material totaling 10% (30 in. <sup>2</sup> , 194 cm <sup>2</sup> ) or less of total cartridge case area.	Visual	-	0.40
	Major	d. Damage as in c above but 10 percent or more of case coating.	Visual	-	1.00
	Major	e. Case broken exposing propellant.	Visual	-	1.00
	Major	f. Yellowish-white case material visible on case shoulder. (Scratches and/or spots).	Visual	-	0.40
	Major	g. Side wall of case revealing spots or scuffed areas of combustible case material (yellowish-white).	Visual	-	0.40
	Major	h. Shoulder and side wall of case cracked, punctured, dented or split.	Visual	-	0.40
	Major	i. Glue joint (connection between case side wall and case cap) partially or fully separated.	Visual	-	0.40
	Major	j. Snap joint fully or partially sheared. Shearing is evident by gap between obturator and case adapter (M829 Series only).	Visual	-	0.40
	Major	k. Moisture contamination (cartridge case soft to the touch and/or swollen).	Visual	-	0.40



Table 5. Classification of material defects (continued)

Component	Category	Defect	Method of Inspection	Reference	AQL
Fixed Ammunition (120mm Tank Ammo) continued					
Case Base and Seal	Major	a. Pulled away from combustible case.	Visual	-	1.00
	Major	b. Rubber seal chipped, gouged, or partially torn.	Visual	-	1.00
	Major	c. Rubber seal completely torn and/or pulled way from case base.	Visual	-	1.00
	Major	d. Base completely separated from combustible case.	Visual	-	1.00
	Major	e. Visible water marks (a transition line from a light-colored area to a dark-colored area).	Visual	-	1.00
	Major	f. Corrosion on case base/primer causing pitting.	Visual	-	0.40

### SECTION III. PROCEDURE FOR TOUCHING-UP 120MM COMBUSTIBLE CARTRIDGE CASES

12. **General.** The information contained in this section will be incorporated into TM 91300-251-34 Intermediate Direct Support and Intermediate General Support Maintenance Manual, Artillery Ammunition for Guns, Howitzers, Mortars, Recoilless Rifles and 40mm Grenade Launchers.

13. **Touch-Up Criteria.** Cartridge cases which have yellowish-white combustible material showing less than ten percent (30in.2/194cm<sup>2</sup>) of the total surface area of the cartridge case, will be touched up. Damaged cartridge cases, which are deemed unserviceable, (tables 4 & 5) will be turned in as unserviceable.

#### 14. Preparation of Cartridge Case.

a. Remove cartridge to be touched up from shipping container.

b. Protect primer by taping (masking tape) cardboard backing disc over it. Tape base of cartridge case, but do not apply any tape directly to primer.

#### WARNING

- DO NOT DIRECTLY APPLY ANY FORM OF TAPE TO THE SURFACE OF THE COMBUSTIBLE CARTRIDGE CASE. IF TAPE IS APPLIED TO THE COMBUSTIBLE CASE, REMOVAL OF THE TAPE MAY CAUSE PEELING OFF OF THE POLYURETHANE FINISH.
- DO NOT USE ANY FORM OF CLEANING SOLVENT OR WATER TO CLEAN THE COMBUSTIBLE CARTRIDGE CASE.

c. Cover metal base obturator and projectile obturator/rotating band with two-inch wide masking tape.

#### NOTE

**Electrically ground cartridge before cleaning. Secure ground clip to metal lip of cartridge case base.**

d. Remove dirt, mud, and any other foreign material from the cartridge by using dry rags (preferably cotton rags). Exercise care when cleaning case as not to further damage/degrade polyurethane finish.

e. Using a nonsparking knife, gently scrape off loose polyurethane/aluminum oxide paint from the cartridge case. Care must be taken when scraping to prevent unnecessary removal of paint.

#### WARNING

**DO NOT BUFF AREA WITH YELLOWISH-WHITE COMBUSTIBLE MATERIAL SHOWING. COMBUSTIBLE MATERIAL IS FRICTION SENSITIVE AND CAN AUTOIGNITE CAUSING A SERIOUS FIRE HAZARD.**

#### NOTE

- Personnel directly involved with buffing operations will wear disposable dust mask.
- Buffing operation will be conducted in well ventilated work areas.
- No power tools will be used to perform buffing operation. Buffing operation will be done manually.

f. Buff area adjacent to bare (yellowish-white) combustible material of cartridge case to be touched up with 320 grit abrasive paper. Buffing shall consist of short-slow strokes with minimum amount of force applied to the abrasive paper.

g. Clean buffed area with a dry clean rag (cotton) and using an OSHA-approved compressed air blow off gun, blow off remaining debris.

15. **Paint Application.**

**CAUTION**

**USE OF ANY PAINT OTHER THAN THAT PRESCRIBED BELOW IS NOT AUTHORIZED. USE OF UNAUTHORIZED PAINTS MAY DESTROY OR DEGRADE THE COMBUSTIBLE CARTRIDGE CASE MATERIAL.**

a. Obtain and prepare paint (Rust-Oleum Bright Coat Metallic Finish Aluminum 7715, NSN: 8010-01-347-8920) as per directions on spray can.

**NOTE**

- **Three individual thin layers of paint must be applied in order to obtain the desired protection of the combustible cartridge case.**
- **Personnel involved with the paint spraying application will wear an NIOSH approved dust and vapor respirator.**

b. Position spray can nozzle approximately eight inches from surface or cartridge case area to be painted. Apply paint with slow and even strokes. Spray over the polyurethane finish, extend perimeter of paint application into the polyurethane finish by approximately one inch. Paint must evenly and completely cover effected area.

**NOTE**

**Do not permit paint to run or drip! Use clean, dry rags to remove runs or drips.**

c. Visually inspect touched area for workmanship.

d. To facilitate adequate protection of the combustible cartridge case, three thin layers of paint must be applied to the case area being touched up. For best results, ensure the prior layer of paint is dry to the touch before application of the next paint coating.

**NOTE**

**After application of third layer of paint, establish time for the paint to be dry to the touch. Repack the other touched-up cartridges based on this established time.**

e. Upon completion of the third layer, paint must be allowed to dry before repacking.

**NOTE**

**Exercise care when removing tape from cartridge case not to crack or chip new paint.**

f. Prior to repacking, remove tape from projectile and base obturator. Also remove cardboard packing disc from base of cartridge.

16. **Equipment and Material Requirements.**

a. **Equipment Requirements:**

- (1) Compressor, air OSHA approved.
- (2) Knife, nonsparking NSN: 511000-344-9900.
- (3) Air respirator, dust and vapor, NIOSH approved.

b. **Material Requirements:**

- (1) Mask, dust locally procured.
- (2) Spray paint, Rust-Oleum Bright Coat Metallic Finish Aluminum 7715, NSN: 8010-01-347-8920.
- (3) Paper, abrasive, 320 grit NSN: 5350-00-224-7203
- (4) Tape, masking, two inch wide NSN: 7510-00-266-6710.
- (5) Tape, masking, one inch wide NSN: 7510-00-266-6712.

**SECTION IV PROCEDURE FOR WINDSHIELD TIP INSPECTION FOR  
120MM: M829 AND M829A1**

**17. General.** The information contained in this section will be incorporated into TM 91300-251-34, Intermediate Direct Support and Intermediate General Support Maintenance Manual, Artillery Ammunition for Guns, Howitzers, Mortars, Recoilless Rifles and 40mm Grenade Launchers.

**18. Windshield Tip Runout Gaging/ Acceptance Gaging for M829.**

a. Description of Operation for Runout Gaging.

- (1) Remove cartridge from shipping container.
- (2) Position cartridge between "V" blocks.

**NOTE**

**APFSDS-T Ammunition must be grasped by the Sabot NOT THE WINDSHIELD.**

- (3) Electrically ground cartridge case base.

**WARNING**

- **ALCOHOL AND ACETONE ARE HIGHLY FLAMMABLE (FLASHPOINT OF LESS THAN 100°F); KEEP AWAY FROM HEAT, SPARKS AND OPEN FLAME; KEEP CONTAINER CLOSED: USE WITH ADEQUATE VENTILATION; AVOID PROLONGED OR REPEATED BREATHING OF THE VAPORS.**
- **DO NOT ALLOW ACETONE TO COME IN CONTACT WITH THE COMBUSTIBLE CARTRIDGE CASE.**

(4) Using a rag dampened with acetone, thoroughly clean windshield tip and tip area of subprojectile.

(5) Place cap/probe assembly range selector switch of runout gage on 0.012 position. (Meter scale reads -0.012 inch to +0.012 inch for a total of 0.024 inch.)

**NOTE**

**If flush-pin member cannot be properly seated on windshield of subprojectile, mark cartridge as "WINDSHIELD UNSERVICEABLE".**

(6) Seat flush-pin member of runout gage on windshield, with knurled end toward aft of cartridge.

**NOTE**

**Assure that the indicator needle is resting within the scale limits. Adjust, if necessary, using "Zero" knob.**

(7) Place cap/probe assembly into flush-pin member of gage.

**NOTE**

**While rotating cap/probe assembly, total runout indicator reading must not exceed 0.020 inch (0.50mm).**

(8) Completely rotate cap/probe assembly about windshield tip, hold flush-pin member firmly in place.

**NOTE**

**Cartridge shall undergo two attempts at windshield tip replacement.**

(9) Remove runout gage from subprojectile.

(10) If windshield tip fails runout gage for the first time, mark base of cartridge "1" indicating first attempt. If windshield tip fails runout gage for the second time, mark "Unserviceable".

b. Description of Operation for Acceptance Gaging.

(1) Remove cartridge from shipping container.

(2) Place cartridge in vertical position on felt padded worktable (protect primer) tip pointing upward.

**NOTE**

**APFSDS-T Ammunition must be grasped by the Sabot NOT THE WINDSHIELD.**

(3) Electrically ground cartridge case base.

**WARNING**

- **ALCOHOL AND ACETONE ARE HIGHLY FLAMMABLE (FLASHPOINT OF LESS THAN 100°F); KEEP AWAY FROM HEAT, SPARKS AND OPEN FLAME; KEEP CONTAINER CLOSED: USE WITH ADEQUATE VENTILATION; AVOID PROLONGED OR REPEATED BREATHING OF THE VAPORS.**
- **DO NOT ALLOW ACETONE TO COME IN CONTACT WITH THE COMBUSTIBLE CARTRIDGE CASE.**

(4) Using a rag dampened with acetone, thoroughly clean windshield tip and tip area of subprojectile.

(5) Set flush-pin handle in upper position of bayonet slot (fig. 19).

(6) Slide Tip Acceptance Gage housing over windshield and windshield tip.

(7) Release the flush-pin handle, let flush-pin drop to assure that the tip goes through the flush pin-hole (small diameter, 0.157 inch).

**NOTE**

The acceptable windshield tip must meet both the following requirements: The tip must go through the flush-pin hole and the flush-pin top surface below the upper step and above the lower step of the gage housing. Otherwise, mark "Unserviceable Windshield Tip" on cartridge case and case base.

(8) Remove Tip Acceptance Gage from projectile.

(9) If windshield tip fails acceptance check for first time, mark base of cartridge, "1" indicating first attempt. If windshield tip fails acceptance for the second time, mark "Unserviceable".

**c. Equipment Requirements.**

- (1) Approved can, flammable waste.
- (2) Coveralls, explosive handlers', flame-retardant.

(3) Runout gage, windshield tip, Honeywell Drawing No. 12525609-GIA, (Government Drawing No. 12525683, NSN: 5220-01-352-9297).

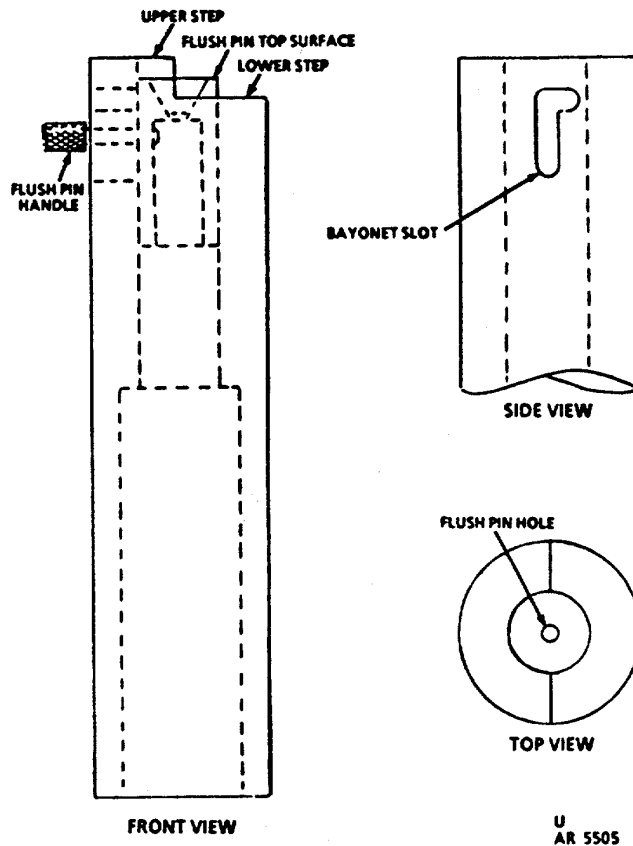
(4) M829 Tip Acceptance Gage, flush-pin type, Government Drawing No. 12900341, NSN: 5220-01-352-9298 (gage); NSN: 5220-01353-1039 (carrying case).

(5) Shoes, safety, conductive.

(6) 'V' blocks, locally fabricated, 2 x 6 with a 7 inch opening by 90 degrees.

**d. Material Requirements.**

- (1) Acetone, technical grade.
- (2) Cotton cloth rags.



**Figure 19. M829 tip acceptance gage, flush pin type, Government drawing no. 12900341.**

19. Windshield Tip Alignment Inspection for M829A1.

a. Description of Operation.

- (1) Remove cartridge from shipping container.
- (2) Position cartridge between "V" blocks.

**NOTE**

**APFSDS-T Ammunition must be grasped by the sabot NOT THE WINDSHIELD.**

- (3) Electrically ground cartridge case base.

**WARNING**

- **ALCOHOL AND ACETONE ARE HIGHLY FLAMMABLE (FLASHPOINT OF LESS THAN 1000F); KEEP AWAY FROM HEAT, SPARKS AND OPEN FLAME; KEEP CONTAINER CLOSED: USE WITH ADEQUATE VENTILATION; AVOID PROLONGED OR REPEATED BREATHING OF THE VAPORS.**
- **DO NOT ALLOW ACETONE TO COME IN CONTACT WITH THE COMBUSTIBLE CARTRIDGE CASE.**

(4) Using a rag dampened with acetone, thoroughly clean windshield tip and tip area of subprojectile.

(5) Slide alignment fixture over windshield and windshield tip. If windshield tip is flush or above flush, part is acceptable.

(6) Place a straight edge across the face to assure that the tip is flush or above.

**NOTE**

- **Cartridge shall undergo two attempts at windshield tip replacement.**

- **If windshield tip is not flush or above face, mark cartridge as "Windshield Tip Unserviceable".**

(7) Remove alignment fixture from projectile.

(8) If windshield tip fails acceptance check for first time, mark base of cartridge, "1" indicating first attempt. If windshield tip fails acceptance for the second time, mark "Unserviceable".

b. Equipment Requirements.

- (1) Approved can, flammable waste.
- (2) Coveralls, explosive handlers', flame-retardant.
- (3) Alignment fixture, windshield tip, Honeywell Drawing No. 12527516.
- (4) Shoes, safety, conductive.
- (5) "V" blocks, locally fabricated, 2 x 6 with a 7 inch opening by 90 degrees.
- (6) Ruler, straight edge.

c. Material Requirements.

- (1) Acetone, technical grade.
- (2) Cotton cloth rags.

**SECTION V PROCEDURE FOR USING 120MM RING GAGES**

**20. General.** The information contained in this section will be incorporated into TM 91300-251-34, Intermediate Direct Support and Intermediate General Support Maintenance Manual, Artillery Ammunition for Guns, Howitzers, Mortars, Recoilless Rifles and 40mm Grenade Launchers.

(b) Place cartridge in vertical position on felt padded work table (protect primer) with tip pointing upward.

(c) Wipe cartridge with a clean cloth.

(d) Pass the obturator ring gage over the forward bourrelet, and seat the gage gently on the obturator (fig. 20, view a).

**21. 120MM Ring Gages.**

a. Obturator Ring Gage for M829 and M829A1.

(1) Description of Operation.

(a) Remove cartridge from shipping container.

**NOTE**

**Hold gage firmly and assure front surface of gage is in horizontal position.**

(e) Cartridge is acceptable if front surface of rear bourrelet is flush or above flush with front surface of ring gage (fig. 20, view b).

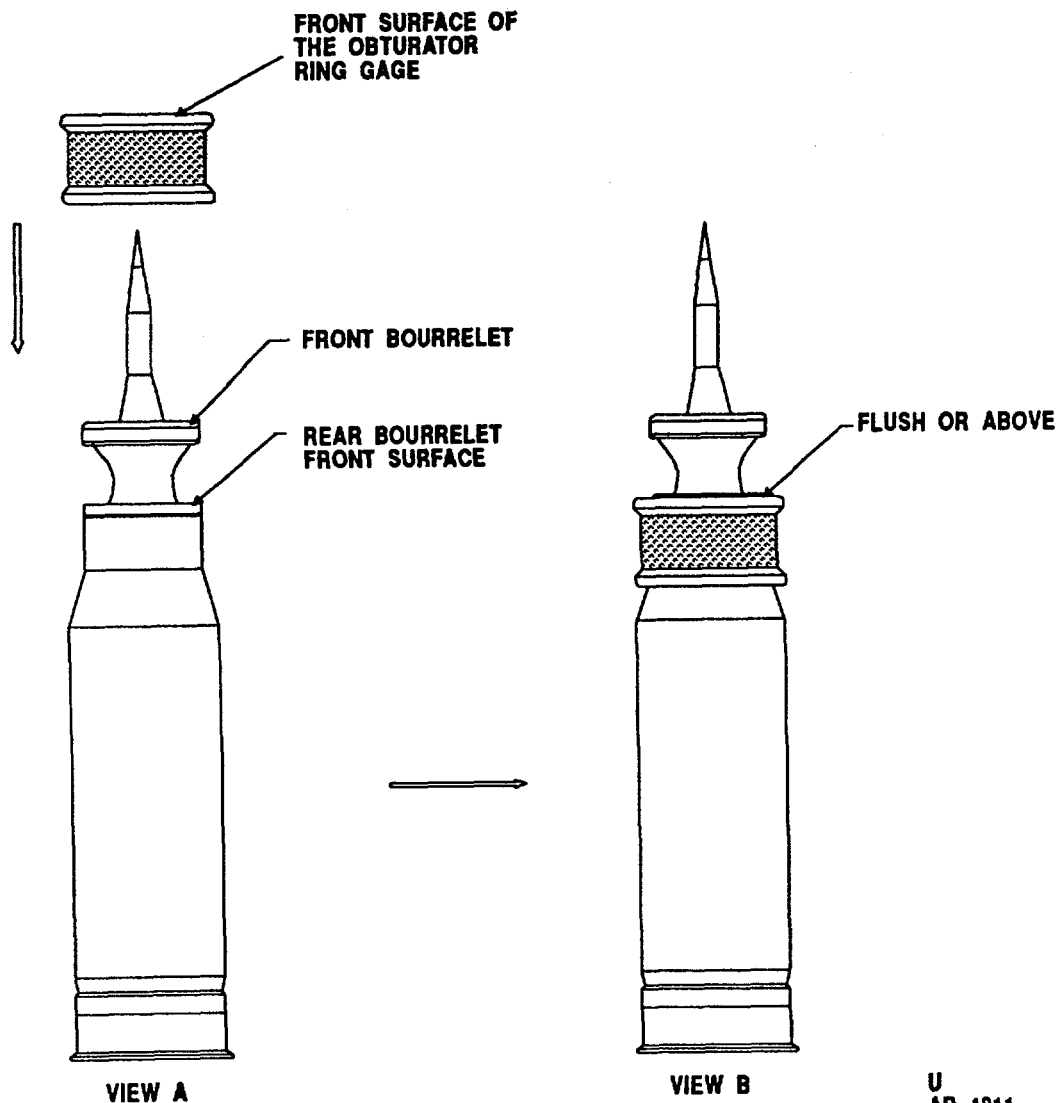


Figure 20. Obturator ring gage.

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**NOTE**

If front surface of rear bourrelet is not flush or above on the first attempt, rotate gage 90 degrees horizontally. If second attempt fails, mark projectile "Unserviceable Failed Obturator Ring Gage".

- (f) Remove obturator ring gage from projectile.
- (g) Pack acceptable cartridge into shipping container.
- (h) Pack unserviceable cartridges in containers marked "Unserviceable Failed Obturator Ring Gage".

b. Bourrelet Ring Gage for HEAT and KE Round.

(1) Description of Operation for HEAT Round.

- (a) Remove cartridge from shipping container.
- (b) Place cartridge in vertical position on felt padded work table (protect primer) spike pointing upward.
- (c) Wipe cartridge with a clean cloth.
- (d) Apply bourrelet ring gage over the bourrelet and pass gage slowly down to the copper band (fig. 21).

**NOTE**

Hold gage firmly and assure front surface of gage is in horizontal position.

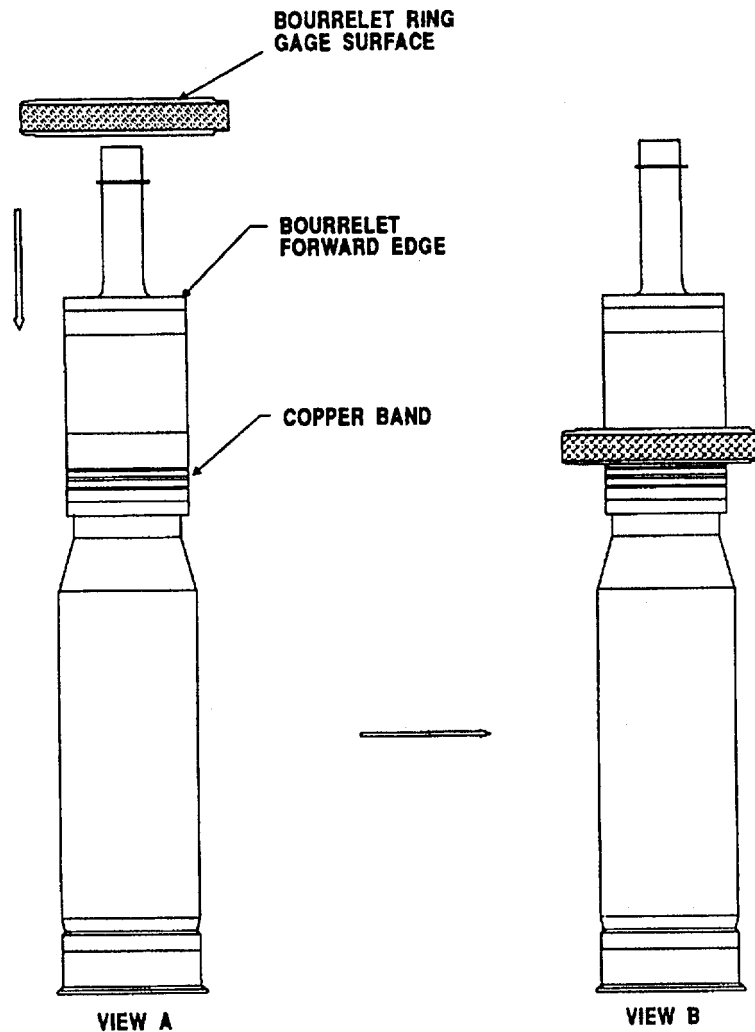


Figure 21. Bourrelet ring gage.



**WARNING**  
**IMPROPER USING OF THIS GAGE MAY CAUSE DAMAGE TO THE SPIKE NOSE OR PROJECTILE BODY.**

(e) Cartridge is acceptable if ring gage passes bourrelet down to copper band.

**NOTE**  
**If ring gage did not pass forward bourrelet on first attempt, rotate gage 90 degrees horizontally. If second attempt fails, mark projectile "Unserviceable Failed Bourrelet Ring Gage".**

(f) Remove bourrelet ring gage from projectile.

(g) Pack acceptable cartridge into shipping container.

(h) Pack unserviceable cartridges in containers marked "Unserviceable Failed Bourrelet Ring Gage".

(2) KE Round. For KE round, Front and Rear Bourrelet (Optional).

**NOTE**  
**The bourrelet ring gage may be used on KE cartridges following above procedure. The cartridge is acceptable if ring gage passes front and rear bourrelets down to obturator.**

c. Cartridge Case Ring Gage-Description of Operation for All 120mm Tank Cartridges.

(1) Remove cartridge from shipping container.

(2) Place cartridge in vertical position on felt padded work table (protect primer) projectile upward.

(3) Wipe cartridge with a clean cloth.

(4) Slowly pass ring gage over the cartridge case down to the rubber seal of the metal case base.

**CAUTION**  
**IMPROPER USE OF THIS GAGE MAY DAMAGE THE COMBUSTIBLE CARTRIDGE CASE COATING.**

**NOTE**  
**Hold the ring gage firmly and assure the front surface of the gage is in horizontal position.**

(5) Cartridge is acceptable if ring gage should pass down to rubber seal of metal case base (fig.22).

**NOTE**  
**If ring gage fails to pass down to rubber seal, measure distance from rear face of case base to position where gage stops. Mark cartridge "Over-size at the Measured Distance".**

(6) Remove cartridge case gage from cartridge.

(7) Pack acceptable cartridge in shipping container.

(8) Pack unserviceable cartridges in containers marked "Over-size at X inch distance".

d. Maintenance Requirements for 120mm Ring Gages.

(1) Using a clean cloth, wipe or clean inside surface of the gage after each round gaged.

**WARNING**  
**• ACETONE IS HIGHLY FLAMMABLE (FLASH POINT OF LESS THAN 100°F). KEEP AWAY FROM HEAT, SPARKS, AND OPEN FLAME. KEEP CONTAINER CLOSED.**

**• DO NOT ALLOW ACETONE TO COME IN CONTACT WITH THE COMBUSTIBLE CARTRIDGE CASE.**

(2) Using a rag dampened with acetone, clean inside surface of the gage after ten rounds are gaged.

(3) Before storing gage, using a rag dampened with acetone, clean inside surface of gage, then apply one coat of light machine oil on inside surface.

e. Equipment Requirements.

(1) Approved can, flammable waste.

(2) Carrying case for 120mm ring gage acceptance set, Drawing No. 12900357. NSN: 5220-01-361-2865

(3) Ring gage, 120mm, obturator, Drawing No. 12900353. NSN: 5220-01-361-2799

(4) Ring gage, 120mm, bourrelet, Drawing No. 12900351. NSN: 5220-01-369-5464

(5) Ring gage, 120mm cartridge case, Drawing No. 12900352. NSN: 5220-01-361-2798

- (6) Cartridge, 120mm, ring gage acceptance set, Drawing No. 12900358. NSN 5220-01359-3001
- (7) Shoes, safety, conductive.
- (8) 'V' blocks, locally fabricated, 2 x 6 with a 7 inch opening by 90 degrees.

f. Material Requirements.

- (1) Acetone, technical grade.
- (2) Cotton, cloth rags.

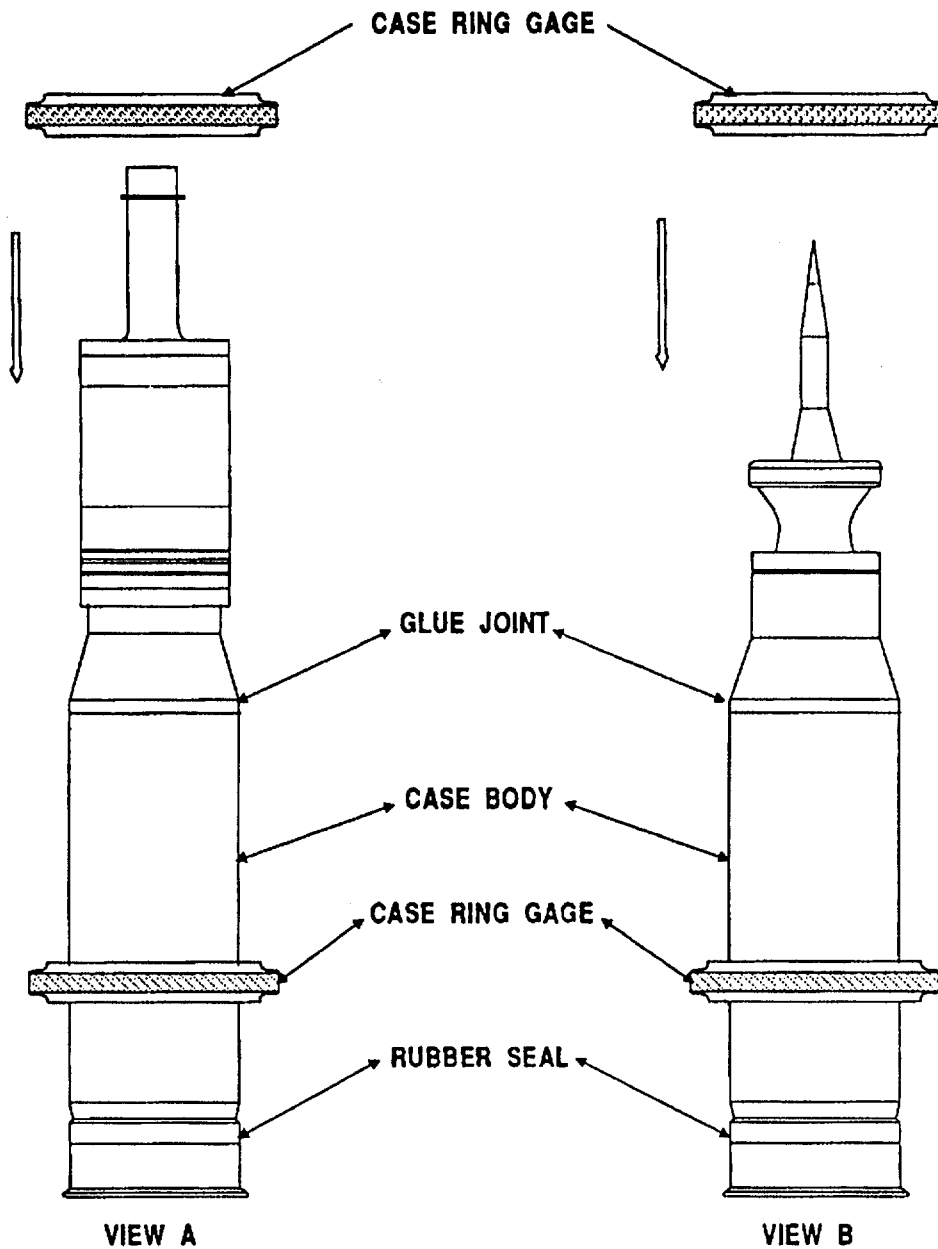


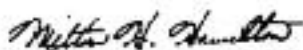
Figure 22. Case ring gage.

Change 1 33 (34 blank)

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★ U.S. GOVERNMENT PRINTING OFFICE: 1992 643-025/71024

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# The Metric System and Equivalents

## Linear Measure

1 centimeter = 10 millimeters = .39 inch  
 1 decimeter = 10 centimeters = 3.94 inches  
 1 meter = 10 decimeters = 39.37 inches  
 1 dekameter = 10 meters = 32.8 feet  
 1 hectometer = 10 dekameters = 328.08 feet  
 1 kilometer = 10 hectometers = 3,280.8 feet

## Weights

1 centigram = 10 milligrams = .15 grain  
 1 decigram = 10 centigrams = 1.54 grains  
 1 gram = 10 decigrams = .035 ounce  
 1 dekagram = 10 grams = .35 ounce  
 1 hectogram = 10 dekagrams = 3.52 ounces  
 1 kilogram = 10 hectograms = 2.2 pounds  
 1 quintal = 100 kilograms = 220.46 pounds  
 1 metric ton = 10 quintals = 1.1 short tons

## Liquid Measure

1 centiliter = 10 milliliters = .34 fl. ounce  
 1 deciliter = 10 centiliters = 3.38 fl. ounces  
 1 liter = 10 deciliters = 33.81 fl. ounces  
 1 dekaliter = 10 liters = 2.64 gallons  
 1 hectoliter = 10 dekaliters = 26.42 gallons  
 1 kiloliter = 10 hectoliters = 264.18 gallons

## Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch  
 1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches  
 1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet  
 1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet  
 1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres  
 1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

## Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch  
 1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches  
 1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

## Approximate Conversion Factors

To change	To	Multiply by	To change	To	Multiply by
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29.573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.356	metric tons	short tons	1.102
pound-inches	newton-meters	.11296			

## Temperature (Exact)

°F Fahrenheit temperature      5/9 (after subtracting 32)      Celsius temperature      °C

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