

MODIFIED

M16A1

RIFLE

OPERATION AND INSTRUCTION MANUAL

APRIL 23, 1981

Reference Contract: DAAK10-81-C-0054, dated Dec. 23, 1980.
M16A1 Product Improvement Program

Note: This is a temporary document not intended to replace CM101,
CM102, or applicable Government documents. It is intended
to be used for supplemental information only.

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WARNINGS

WARNING: If this firearm is carelessly or improperly handled, unintentional discharge could result and could cause injury, death or damage to property.

WARNING: If the barrel is very hot from firing there is a risk of cook-off (i.e., a round in the chamber discharging by absorbing heat from the barrel). A cook-off can occur any time after chambering a round in a very hot barrel. When this condition is suspected the chamber must be cleared immediately after firing.

WARNING: Do not attempt to fire if water is in the barrel from fording, heavy rain or thick fog. Open the bolt and allow water to drain before firing. Clean a wet rifle as soon as possible.

FIVE BASIC SAFETY RULES

1. Always point a firearm in a safe direction.
2. Keep fire control selector on safe until ready to fire.
3. Unload when not in use.
4. Always ensure a firearm is not loaded before cleaning or dismantling.
5. Practice handling an empty firearm before attempting to fire.

CAUTIONS FOR FIRING

1. Wear ear protection when shooting on a range to reduce the risk of cumulative long term permanent hearing loss.
2. Be sure of your target and the area behind it. Without an adequate backstop, bullets may travel up to 3 miles past or through your target.
3. Take precautions to avoid contamination by accumulations of toxic gas fumes or lead dust where firearms are used indoors or within a confined space.

CAUTIONS FOR MAINTENANCE

1. Ensure that magazine is removed and the rifle is not loaded before stripping, cleaning or inspecting so that it will not fire.
2. Wear safety glasses in case you lose control of some spring loaded component which could injure your eyes.
3. Do not permit live ammunition in or near the work area.
4. Take precautions when handling cleaning fluids and lubricants. If in doubt seek advice from the manufacturers of these products.

DESCRIPTION: The Modified M16A1 Rifle is a lightweight, air cooled, magazine fed, shoulder weapon. It is capable of semi-automatic or automatic fire. The rifle accommodates the US Model M7 Bayonet-knife, the US Model M3 Bipod and the US Model M203 Grenade Launcher. The rifle is easily opened to expose the working parts for inspection and cleaning.

Upper Receiver and Barrel Assembly Group

Barrel Group: The barrel group consists of the barrel and barrel extension assembly, the handguard cap, the front sight group, the flash suppressor, barrel nut and slip ring assembly, and the top and bottom handguards. The front sight group is comprised of the forward sling swivel assembly, the front sight and gas tube assembly, and the front sight post which is adjustable vertically for elevation. The Modified M16A1 barrel is designed for maximum stiffness with a minimum weight gain. The Modified M16A1 is equipped with a 1 in 7" twist or a 1 in 12" twist. The differentiation between the two rifles is made by examining the barrel between the flash suppressor and the front sight for a stamped "7" for 1 in 7" twist, or a "12" for a 1 in 12" twist. The handguards have a heat flow and heat resisting inner shield. The handguard shape has been redefined to a round configuration eliminating the former triangular left and right guard. The top and bottom handguards are identical and interchangeable.

Upper Receiver Group: The upper receiver group contains the upper receiver, bolt carrier assembly, forward assist assembly, charging handle, ejection port cover assembly, and mounting provisions for the barrel assembly. A carrying handle forms the top of the upper receiver. The rear sight, which is adjustable laterally for windage, is housed in the handle where provision is also made for a telescope sight to be attached.

Lower Receiver and Buttstock Assembly: The lower receiver and buttstock assembly consists of the lower receiver, the pistol grip, lower receiver extension, and buttstock. The lower receiver contains the trigger, fire control selector, bolt catch, disconnect, automatic sear, and magazine catch. The receiver extension which is the mounting device for the buttstock contains the buffer assembly and the action spring. The receivers are made of aluminum alloy, durable

yet lightweight. The pistol grip and buttcap are made of a high impact resistant, high chemical resistant thermoplastic which significantly improves the degree of durability found in the present weapon. The buttstock is made of the same impact and chemical resistant material with fibreglass reinforcement.

Bolt Carrier Assembly: The bolt carrier assembly consists of the bolt carrier, key, bolt assembly, firing pin, firing pin retaining pin, cam pin, extractor assembly and ejector. The proven M16A1 rotary bolt locking action is also one of the mechanical features of the modified M16A1. The bolt and barrel extension contain locking lugs which engage and lock the bolt firmly to the barrel extension. The initial force of the cartridge explosion is absorbed by the barrel, barrel extension, and bolt.

TABULATED DATA

Weight

M16A2 Rifle - empty (without magazine and sling)	7.1 lbs.
Sling (silent)	.4 lb.
Empty magazine (20 rnd.)	.16 lb.
Loaded magazine (20 rnd.)	.7 lb.
Loaded magazine (30 rnd.)	1. lb.
M16A2 Rifle with loaded 20 rnd. magazine and sling	8.2 lbs.
M16A2 Rifle with loaded 30 rnd. magazine and sling	8.5 lbs.

Length

Overall with flash suppressor	39"
Barrel	20"
Barrel with flash suppressor	21"

Mechanical features

Rifling, R.H. 6 grooves, 1 turn in	12"
Rifling, R.H. 6 grooves, 1 turn in	7"

Method of operation

Gas

Type of breech mechanism

Rotating Bolt

Method of feeding

Magazine

Cooling

Air

Ammunition: Caliber

5.56mm (cal. .223)

 Type

Ball, tracer,
dummy and blank

Firing characteristics: Using FN SS109 Ball ammunition
Muzzle velocity SS 109 approx. 947.5 m/s
Muzzle energy Approx. 1796 J
Chamber pressure (max.) 3500 bar
Cyclic rate of fire
Maximum rate of fire:
 Semi-automatic 45 to 65 rnds./min.
 Automatic 150/200 rnd./min.
Sustained rate of fire 12/15 rnds. min.
Maximum range
Maximum effective range 640 m.

OPERATION

Cocking (before firing): The M16A2 is cocked before firing by pulling the charging handle rearward, which pulls the bolt carrier group to the rear. As the carrier moves rearward, it cocks the hammer. If an empty magazine is installed at the time of cocking, the magazine follower will actuate the bolt catch to hold the carrier to the rear. If a loaded magazine is installed in the weapon or the magazine is removed, the bolt catch must be manually operated to hold the bolt to the rear.

Feeding and chambering: To feed a cartridge into the chamber, the bolt carrier group must be pulled to the rear by the charging handle or held there by the bolt catch. With a loaded magazine installed, the charging handle of the bolt catch is released and the action spring drives the carrier forward. As the carrier moves forward, the bolt picks up a cartridge from the magazine and feeds it into the chamber. As the bolt locking lugs enter the barrel extension, the ejector is compressed against the left side of the cartridge head and the extractor snaps into the extractor groove on the right side of the cartridge.

Locking: When the forward motion of the bolt and cartridge are stopped by the chamber, the bolt carrier continues forward until it is stopped by contact with the rear face of the barrel extension. This last portion of the forward travel of the carrier rotates the bolt through the action of the cam slot in the carrier on the cam

pin in the bolt. This engages the bolt lugs with the barrel extension lugs to lock the bolt in battery. The bolt, when locked, is said to be "closed."

Firing: When the fire control selector, located on the left side of the lower receiver is set to either "auto" or "semi" the rifle may be fired by pulling the trigger. When the trigger is pulled, it causes the sear to release the hammer. The hammer spring then drives the hammer against the firing pin, which strikes the cartridge primer to discharge the round.

Unlocking: As the pressure of the gas generated by the burning propellant drives the projectile down the barrel and past the gas port, a small quantity of the gas is bled off through the gas port, gas tube and bolt carrier key into a cylindrical section in the bolt carrier where it expands and drives the bolt carrier rearward. During the first rearward travel of the carrier, the bolt is rotated by the cam pin acted on by the bolt carrier cam slot. This rotation disengages the bolt lugs from the barrel extension to unlock the bolt. The carrier then continues rearward with the unlocked bolt under inertia from initial rearward velocity.

Extraction: As the bolt is moved rearward by the bolt carrier, the extractor, which is engaged in the extractor groove of the fired cartridge case, withdraws the spent case from the chamber.

Ejection: As soon as the extractor has drawn the spent case out of the chamber, the spring loaded ejector, acting against the left side of the case head, pushes the spent case out through the ejection port which is located on the right side of the upper receiver.

Cocking (after firing): As the carrier group continues rearward in recoil, it compresses the action spring and cocks the hammer. Two different actions now take place dependent upon whether the fire control selector is set on SEMI (semi-automatic) or AUTO (automatic).

These actions are as follows:

SEMI (semi-automatic): When the trigger is pulled, the firing action of the rifle is so much faster than human reaction that it would be impossible to release the trigger quickly enough to prevent several shots being fired. For this reason, a disconnect is used to catch and hold the hammer until the trigger is released and pulled a second time when the fire control selector is in the semi-automatic position. When the trigger is pulled, the disconnect is rotated forward by the action of the disconnect spring. As the hammer is cocked by the recoil action of the carrier group, the hook of the disconnect engages the upper inside notch of the hammer, holding it to the rear. When the trigger is released, the trigger spring returns the trigger to its normal position rotating the disconnect back with it. The hammer is thus released from the hook on the disconnect. However, before the disconnect hook actually releases the hammer, the trigger sear surface has moved in front of its hammer notch so that the hammer drops from the disconnect sear to the trigger sear. The rifle is then ready for a second shot.

AUTO (automatic): When the fire control selector is set on AUTO and the trigger is pulled, the trigger sear releases the hammer. The disconnect is prevented from moving forward to engage the hammer by a cam on the fire control selector. After the first shot, as the hammer is being cocked by the recoil action of the carrier group, the notch on the top outside edge of the hammer is engaged by the automatic sear. The hammer is then held in this position by the automatic sear until the bolt carrier strikes the upper edge of the automatic sear in counter-recoil, causing it to release the hammer near the end of the forward travel of the carrier. The hammer then falls to fire the next round. This cycle repeats until the magazine is emptied or the trigger is released. When the trigger is released, the hammer falls from the automatic sear but is held by the trigger sear, thus ending the cycle of automatic fire.

Buffering: The rearward or recoil movement of the carrier group is arrested by the buffer assembly acting against the bottom of the receiver extension.

Counter-Recoil: After buffering the action spring forces the carrier forward toward the chamber.

CONTROLS

Front Sight: To adjust elevation, depress detent and rotate post. Each notch moves point of impact 1 inch at 100 yards up or down (2.8cm @ 100 M). To raise point of impact, turn post in direction marked "UP" on sight (clockwise).

Rear Sight: Has two apertures for range. The unmarked or forward leaf is for ranges up to 300 meters and the leaf marked "L" is for ranges from 300 to 500 meters. To adjust windage, depress detent and rotate drum. Amount of correction per notch is same as front sight. To move point of impact to right, turn drum in direction marked "R" on sight.

Bolt Catch: Holds bolt carrier and bolt in open position. Press lower tang of catch to engage bolt, upper tang to release. Bolt catch is automatically engaged by pressure from the magazine follower if there are no cartridges remaining in the magazine.

Magazine Catch: Retains magazine in rifle. Press to release magazine.

Fire Control Selector: Used to select SAFE position and SEMI-automatic or AUTOMATIC fire modes.

Forward Assist Assembly: If bolt fails to close and lock, press forward assist until bolt is moved into locked position.

Charging Handle: Retracts bolt carrier and bolt. Has a thumb latch to hold it in forward position. Latch must be released before charging handle can be pulled toward the rear to retract the bolt.

Buttstock: Contains stowage cavity for cleaning material--bag, cleaning rod (4 sections), bore brush, cleaning brush (general purpose), chamber brush, bottle and swab holder.

OPERATING INSTRUCTIONS
USUAL CONDITIONS

GENERAL: This section contains instructions for the operation of the modified M16A1 Rifle under usual conditions which are defined as conditions of moderate temperatures and humidity.

Clearing Rifle: Step #1. Remove magazine. Step #2. Pull charging handle back and inspect chamber. Step #3. Set selector lever in safe position.

Lubrication: Lubricate modified M16A1 as indicated on page 8.

Loading the magazine: A magazine may be loaded with any number of rounds up to full capacity. The magazine follower has a raised portion resembling the outline of a cartridge. Cartridges are loaded into the magazine so that the tips of the bullet point in the same direction as the smaller end of the raised portion of the follower.

CAUTION: TO REDUCE RISK OF ACCIDENTAL DISCHARGE, SET FIRE CONTROL SELECTOR TO SAFE BEFORE LOADING THE RIFLE.

Loading the Rifle: The magazine may be inserted with the bolt opened or closed. Grasp the pistol grip, point the muzzle in a safe direction and insert the loaded magazine into the magazine housing. Push upward until the magazine catch engages and holds the magazine. If the bolt carrier is locked to the rear, push in the upper portion of bolt catch and allow the action to close, chambering a round. If the bolt carrier is in the forward position when the magazine is inserted, pull the charging handle fully to the rear and release it.

NOTE: Do not "ride" the charging handle forward with the hand. If the charging handle is eased forward from the open position, the bolt may fail to close fully and lock. If the bolt fails to lock, use the forward assist assembly.

The modified M16A1 is now loaded and can be fired with the fire control selector placed in the "auto" or "semi" mode.

FIRING

Fire Control Selector: The modified M16A1 may be fired semi-automatically or automatically by moving the fire control selector to the desired position.

SEMI-automatic Position. When the fire control selector is in this position, the rifle will fire one round each time the trigger is pulled.

AUTOMATIC Position: With the fire control selector in this position, the rifle will continue to fire until the magazine is empty or the trigger is released. When the rifle is fired in either SEMI or AUTO, the bolt will lock in open position when the last round from the magazine has been fired.

Pre-Functioning Lubrication

Step A. Coat all components of the lower receiver and the bolt carrier group with a light coating of LSA oil or equivalent using a lightly oiled cotton wiping cloth, cleaning swabs, and pipe cleaners.

Step B. Apply a drop of LSA oil or equivalent in the mouth of the bolt carrier key.

Step C. Apply a drop of LSA oil or equivalent in each of the bolt carrier exhaust ports.

PREVENTIVE MAINTENANCE

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| A. Before Operation | Wipe excessive oil from bore and chamber. |
| B. Before Operation | Hand function rifle to assure proper condition. |
| C. After Operation | Clean and lubricate. |
| D. Monthly by Armorer | Clean and lubricate detents and springs. |

Ammunition

The ammunition for the modified M16A1 Rifle is classified as small-arms ammunition and is in the form of a complete round.

The following cartridges are among those authorized for use with this
weapon:

A.	BALL	SS109	1-7" twist barrel
B.	BALL	M193	1-12" twist barrel
C.	TRACER	M196	1-12" twist barrel
D.	TRACER	L110	1-7" twist barrel
E.	DUMMY	M199	1-12" twist barrel
F.	BLANK	M200	1-12" twist barrel