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SAFETY FIRST

The Six Basic Rules of Firearms Safety

1. Treat every weapon as if it were loaded and conduct a safety check before handling.

2. Control the muzzle direction of weapons in a safe manner.

3. Keep the finger off the trigger until you have positive acquisition.

4. Keep your finger off the trigger unless your sights are on target and you are ready to shoot.

5. Be sure of your target background before engaging live fire.

6. Never ever leave loaded weapons unsecure or unattended.

Safety Procedures for Maintenance and Inspection

1. Before stripping, cleaning or inspecting, put the safety on and remove the magazine and unload the weapon to prevent firing.

2. Always wear safety glasses in case you lose control of a spring loaded component which might cause injury.

3. Keep any and all live ammunition out of and away from the work area.

4. Follow manufacturer's recommendations when using solvents and cleaning agents, and always take precautions. Error on the side of caution.

Warnings

1. If any firearm is improperly or carelessly handled, unintentional firing/discharge could occur and could cause death, injury, or damage to property.

2. Do not attempt to fire any firearm if there is any water in the barrel or action. Open the action and allow any moisture or water to drain before firing. Clean wet weapons as soon as possible.

3. Never fire any firearm that has dirt or some other type of obstruction in the barrel, chamber or action.

AR-15/M-16 Series Rifles Cautionary Information Warning

There are certain safety procedures relative to the handling and firing of the AR-15/M16 series of rifles and ammunition which every individual must follow to avoid possible injury or death.

Dangerous Procedures

Never interchange bolts and/or bolt carrier groups between two weapons without checking headspace before firing. Bolts may appear the same, however, interchanging them may result in incorrect headspace, which in turn may cause the weapon to blow up.

When assembling the bolt carrier group, insure that the *Bolt Cam Pin* is installed. The weapon may fire without it, but it will blow up.

Failure to remove water from the barrel may result in the weapon blowing up. If the weapon has been submerged in water, exposed to heavy rain and/or dew, or there is any reason to believe there is excess moisture in the barrel, point the muzzle of the weapon toward the ground and pull the charging handle 2 to 3 inches to the rear, breaking the seal formed by the chambered round and allowing the water to drain out of the barrel. Release the charging handle and strike the forward assist to make sure the round is reseated in the chamber and the bolt is locked.

If a noticeable difference in sound or recoil is experienced, further firing should be suspended. Either of these conditions could indicate an incomplete propellant combustion and present the possibility that the projectile has not been propelled with sufficient force to clear the bore. In such instances, the bolt should be retracted slowly to remove and identify the fired cartridge case. The weapon should be cleared and examined for the presence of unburned propellant grains in the receiver, or possible presence of a bullet remaining in the bore. Any unburned propellant or obstruction in the bore should be removed before further firing.

1

INTRODUCTION

Overview (Definition) and Nomenclature

AR-15/M16 Defined

The AR-15/M16 rifle is a .223cal/5.56mm, magazine-fed, gas operated, air cooled, shoulder fired weapon system. It is designed for either semiautomatic or fully automatic fire through the use of a selector lever. The rifle when equipped with a flash suppressor serves as a stationary piston, permitting the launching of rifle grenades without supplementary attachments.

The barrel is surrounded by two aluminum-lined handguards which are notched to permit air to circulate around the barrel, and further serve to protect the gas tube.

A hard rubber pad is attached to the butt of the stock to partially reduce the effects of recoil.

A forward assist assembly located on the right rear of the upper receiver permits manual locking of the bolt when this is not done by the force of the action spring.

The trigger guard is easily adapted for winter operations.

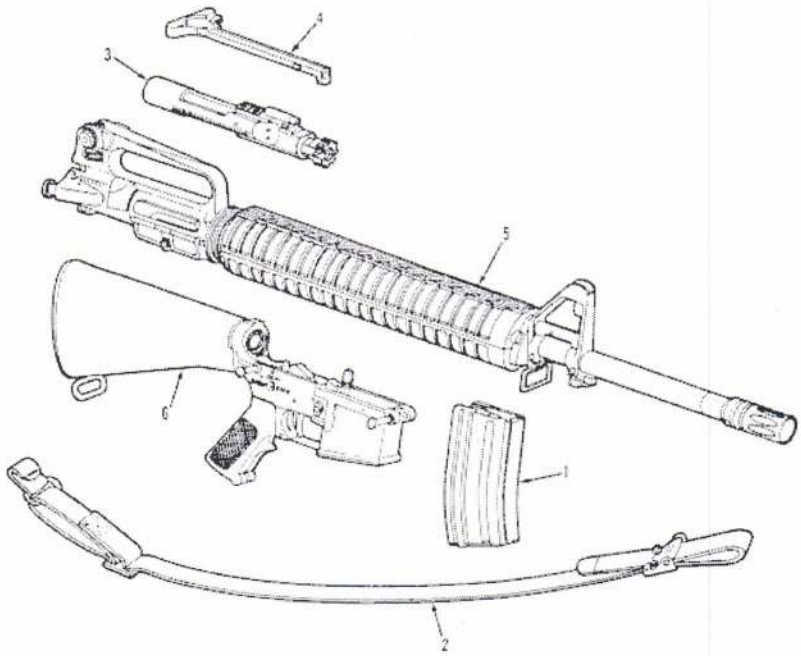
A spring-loaded retaining pin can be depressed to allow the trigger guard to be rotated down against the pistol grip to permit the user ready access to the trigger when they are wearing gloves.

A dust cover is provided to prevent dirt or sand from getting into the rifle through the ejection port. While in the field the dust cover should be kept closed at all times when the rifle is not being fired. It is opened automatically by the forward or rearward movement of the bolt carrier.

General Data

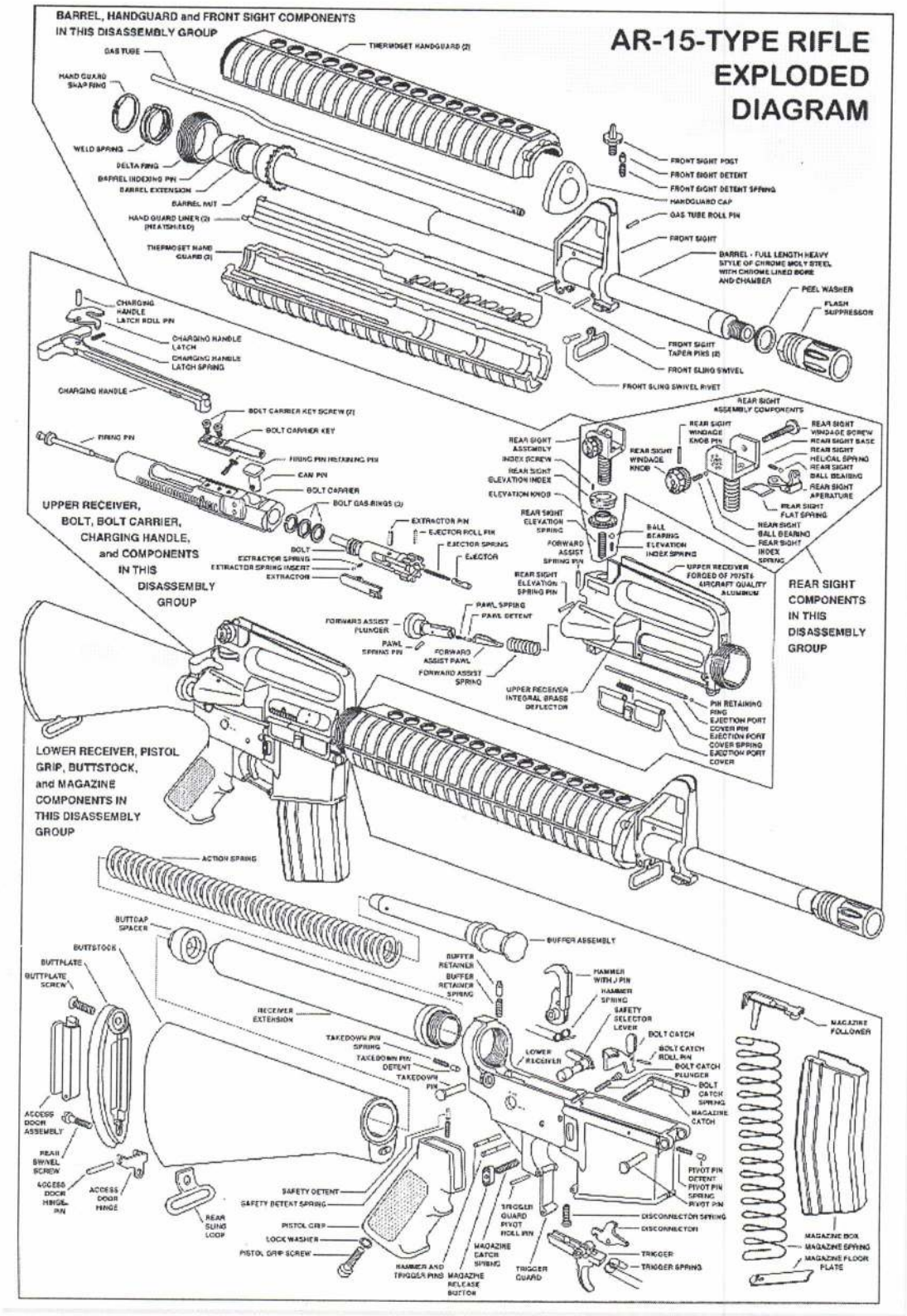
The muzzle velocity of the AR-15/M16 weapon system depends on the ammunition and barrel selection. On average the velocity is around 3250 feet per second. Its cyclic rate of fire is 700-800 rounds per minute. The maximum rate of fire for semiautomatic fire is 45-65 rounds per minute. Automatic fire is 150-200 rounds per minute. The sustained rate of fire is 12-15 rounds per minute. Maximum effective range is 460 meters.

AR-15/M-16 Weapon System Diagram

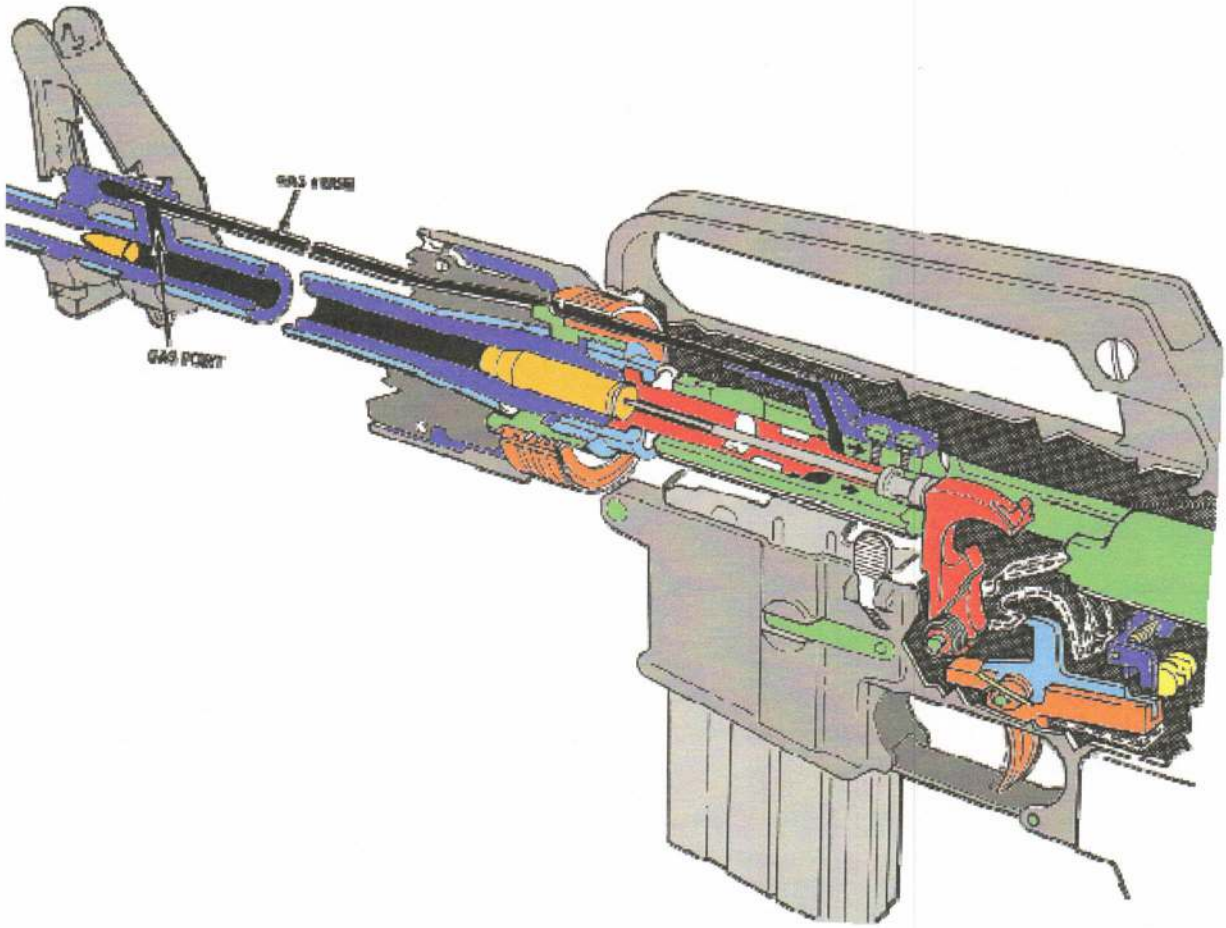


1. **Magazine**
2. **Sling**
3. **Bolt Carrier Assembly**
4. **Charging Handle**
5. **Upper Receiver Assembly**
6. **Lower Receiver Assembly**

AR-15 Type Rifle Exploded Diagram



How the AR-15 Works



When the trigger (orange) is pulled, the front edge of the trigger moves downward, disengaging the hammer (red), allowing the hammer spring to drive the hammer forward into the firing pin. This action causes the firing pin to move slightly forward impacting the primer of the cartridge, thus causing the powder charge to ignite.

The powder ignites causing a rapid build up of pressure inside the cartridge, until it overcomes the press fit of the bullet in the cartridge. This explains why the crimp is so important in cartridges. The lesser the crimp, the lesser the CUP and vice-versa. This action causes the bullet to be expelled from the cartridge and ride down the barrel. As the bullet rides down the barrel, tremendous gas pressure is trapped behind the bullet.

Once the bullet passes the gas port, part of this gas pressure is allowed to escape through the gas tube and back to the bolt carrier key. I have seen figures stating that the necessary minimum pressure to activate the mechanism is around 13,000 psi. Since the CUP is around 50,000 psi for this round, in most barrels, there is ample pressure to operate the weapon. With short barrels, the CUP becomes critical and only good quality ammunition should be used, otherwise short cycling is likely.

Since the key (blue) is hollow, the pressure passes through it and into the bolt (red). The gas pressure builds up inside the bolt, causing the bolt carrier (green) to be forced rearward, which in turn unlocks the bolt due to the fact that the bolt cam pin causes the bolt to turn inside the bolt carrier.

As the bolt carrier group is driven rearward, it recocks the hammer for the next round. The bolt also carries the empty shell case with it because the extractor has gripped the rim of the case. The ejector pin inside the bolt pushes forward on the shell case on the left side. This action causes the case to try to move to the right. Once the shell case has moved to the rear far enough that it can clear the ejection port, the case is flung from the rifle.

When all of the rearward momentum has been exhausted, the buffer spring takes over and drives the bolt carrier back forward. As the carrier moves forward, the next cartridge has been forced up to the top of the magazine by the magazine spring, and the lower portion of the bolt catches the cartridge and drives it forward into the chamber. As the bolt is driven forward into the chamber, it is also turned and locked by the action of the bolt cam pin.

During all of the above action, if the trigger has been held, then the disconnector (cyan) has grabbed the secondary sear of the hammer and held it in place. When the trigger is released, the lower portion of the trigger once again grabs the hammer as the hammer moves forward off of the disconnector.

If the trigger had not been held, then the hammer would have been grabbed by the lower portion of the trigger.

In either of the above two cases, the rifle is now ready to fire the next round.

CYCLES OF FIRE

1. **Feeding**
2. **Chambering**
3. **Locking**
4. **Firing**
5. **Unlocking**
6. **Extracting**
7. **Ejecting**
8. **Cocking**

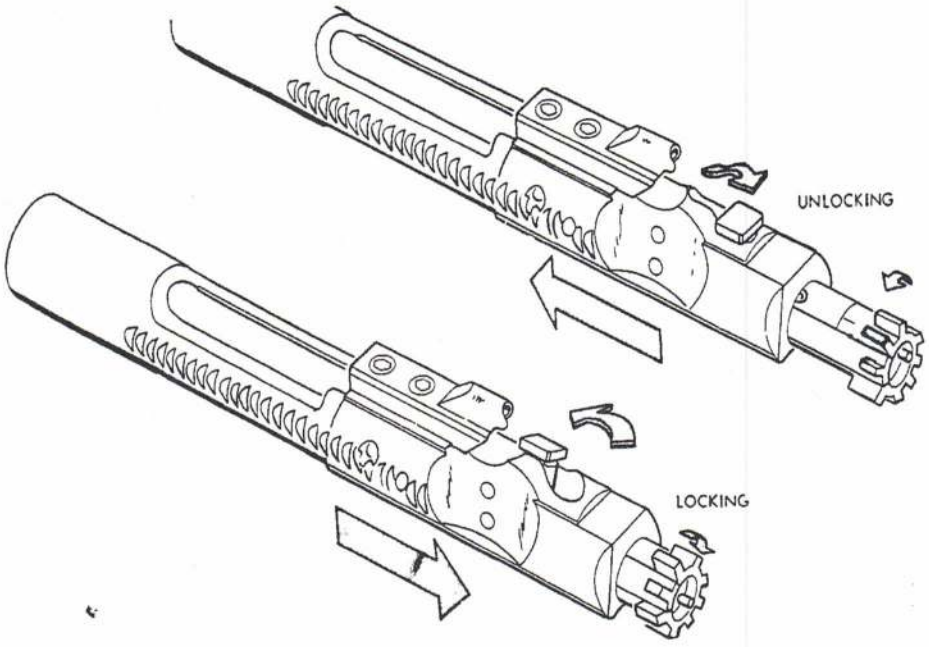
The cycles of fire/functioning consist of the eight above listed steps. More than one of these steps can take place at the same time. Functioning in the rifle may be either automatic or semiautomatic through the use of the selector lever.

Semiautomatic Fire

Feeding and Chambering: As the bolt carrier moves rearward and clears the top of the magazine, the follower and spring in the magazine push a new round up into the path of the bolt (feeding).

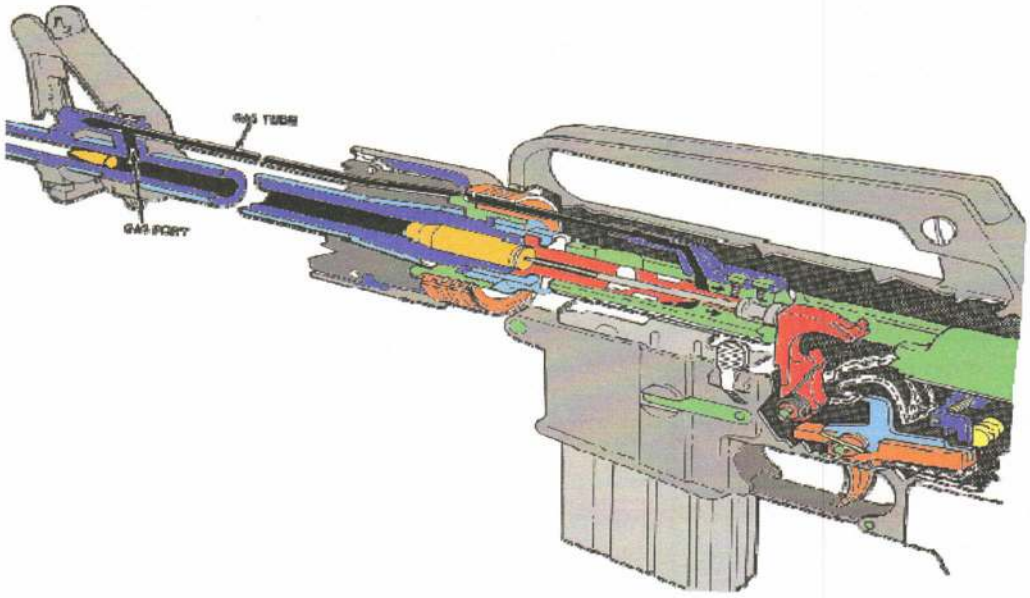
Note: As the bolt carrier moves rearward, the head of the buffer assembly is struck and moved rearward. Expansion of the action spring sends the buffer assembly forward with enough force to drive the bolt carrier forward to the chamber. The buffer assembly and action spring are designed to overcome recoil. As the bolt carrier moves forward, the face of the bolt strips a round from the top of the magazine and pushes it into the chamber. At the same time the extractor engages the rim of the cartridge and the ejector is forced into the face of the bolt by the base of the cartridge.

Locking: In the last half inch of the forward movement the bolt cam pin emerges from the guide channel in the upper receiver and moves along the cam track, rotating the bolt counterclockwise into the locked position. Locking is complete when the lugs on the bolt and barrel extension are aligned.



Firing: As the firer squeezes the trigger, it rotates on the trigger pin disengaging the nose of the trigger from the notch on the bottom of the hammer. The hammer is thrown forward by the action of the hammer spring. The hammer strikes the rear of the firing pin, driving the firing pin through the bolt into the primer of the round. The action of the rifle is so much faster than human reaction this it is impossible for the firer to release the trigger rapidly enough to prevent multiple firing. Therefore, it is necessary for the mechanism to be installed to enable the firer to fire single rounds.

The disconnector is attached to the trigger by the trigger pin and is rotated forward by the action of the disconnector spring. When the hammer is cocked by the recoil of the bolt carrier, the disconnector engages the lower hook of the hammer and holds it until the trigger is released. When the trigger is released, the disconnector rotates to the rear and down, disengaging the hammer and allowing it to rotate forward until the notch on the bottom of the hammer is caught by the nose of the trigger. This prevents the hammer from following the bolt carrier forward and causing automatic fire.



Note: <u>Action of the gas</u> – When the primer ignites the powder, the projectile is forced through the barrel. At the same time the gas moves through the barrel, passing the gas port located on the upper surface of the barrel (under the front sight assembly), as small portion of the gas passes through the gas port and into the gas tube. The gas tube directs the gas through the bolt carrier key into the cylinder between the bolt carrier, causing the bolt carrier to move rearward.

<u>Unlocking:</u> As the bolt carrier moves to the rear, the bolt rotates clockwise until the locking lugs of the bolt are no longer aligned with the lugs in the barrel extension.

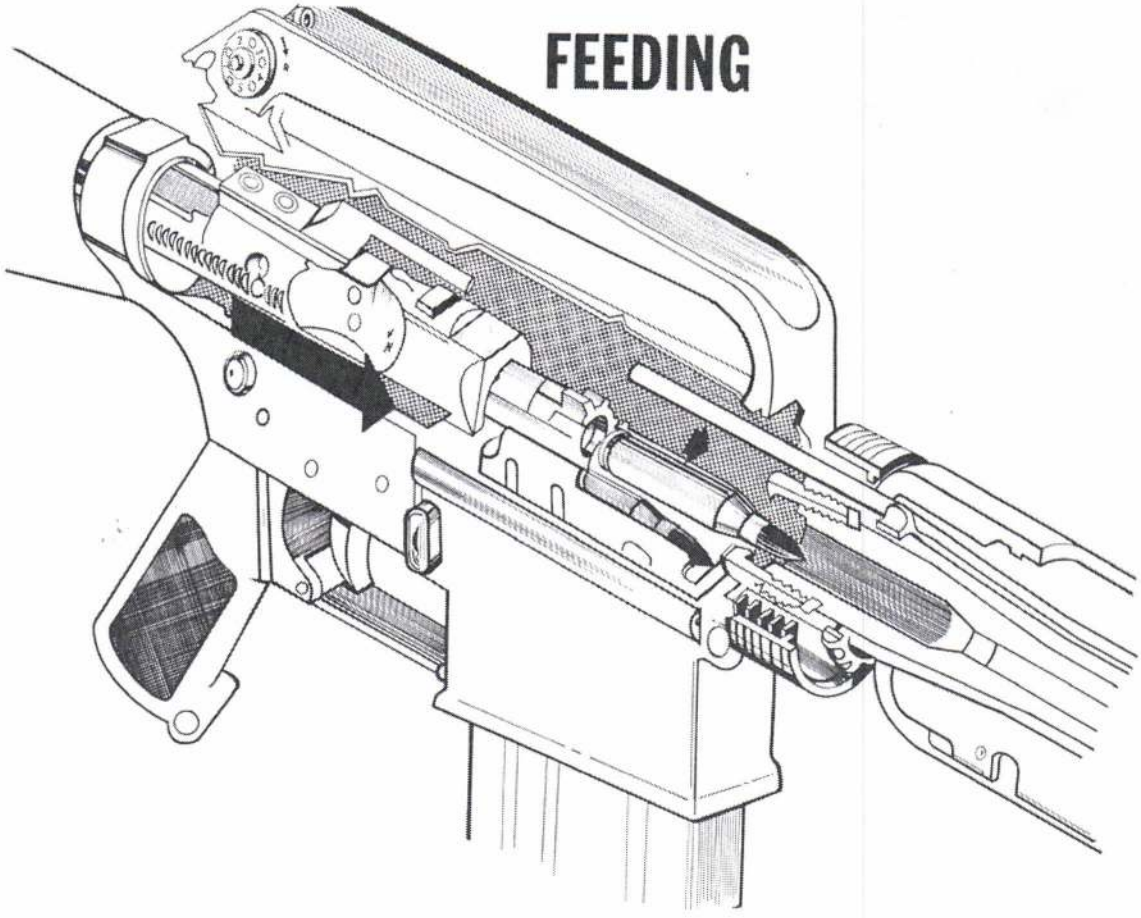
<u>Extracting:</u> As the bolt carrier continues its rearward movement, the expended cartridge is withdrawn from the chamber by the extractor claw.

<u>Ejecting:</u> The ejector is compressed into the face of the bolt. As the bolt carrier clears the ejection port, the empty cartridge is thrown out by the ejector and ejector-spring.

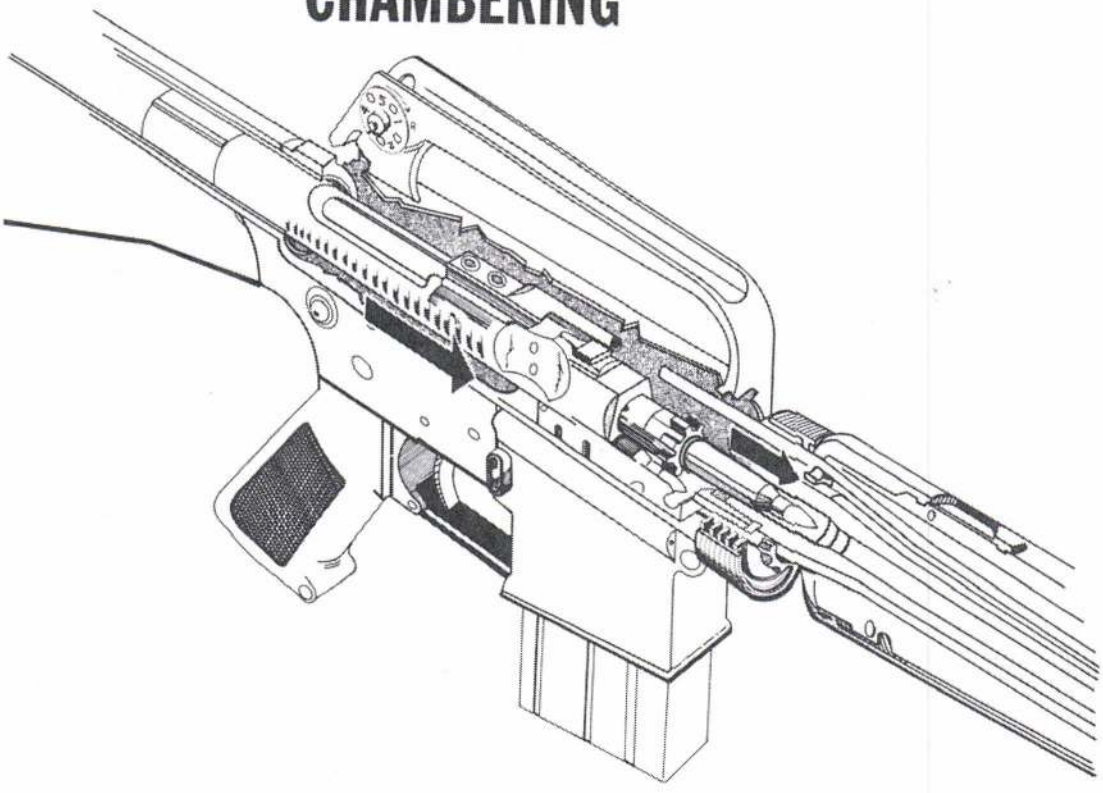
<u>Cocking:</u> As the bolt carrier moves rearward it overrides the hammer forcing it down. The lower hook of the hammer is then engaged by the disconnector. When the trigger is released the hammer slips from the disconnector and is caught by the nose of the trigger preventing the trigger from going forward. Cocking is now complete.

These eight steps in the cycle of functioning are for semiautomatic fire on with the AR-15 or M-16 weapon systems. However, there are certain reactions in the lower receiver that are different.

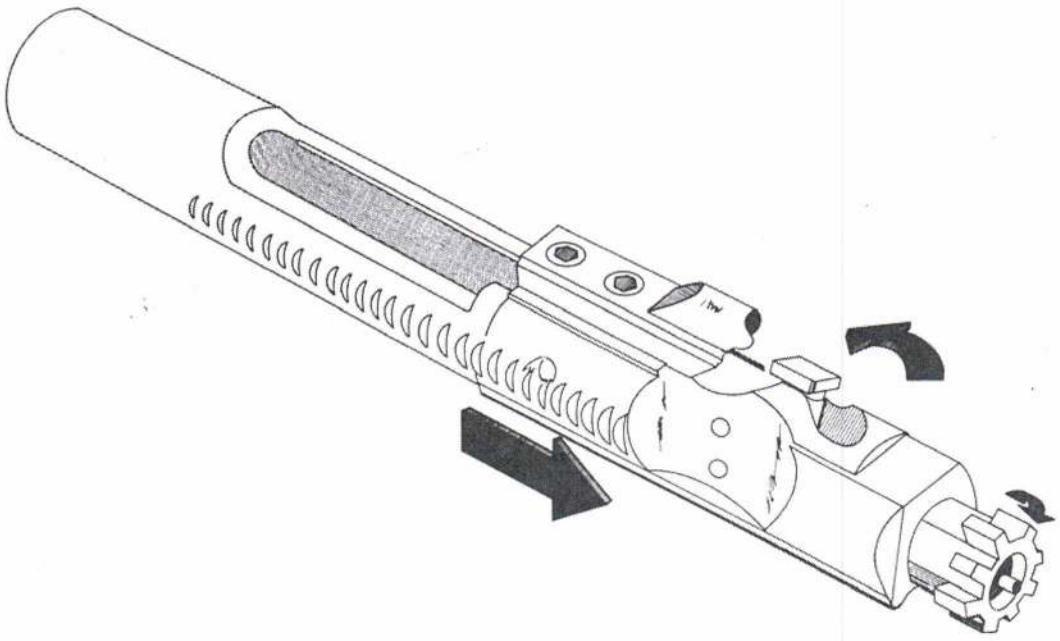
FEEDING



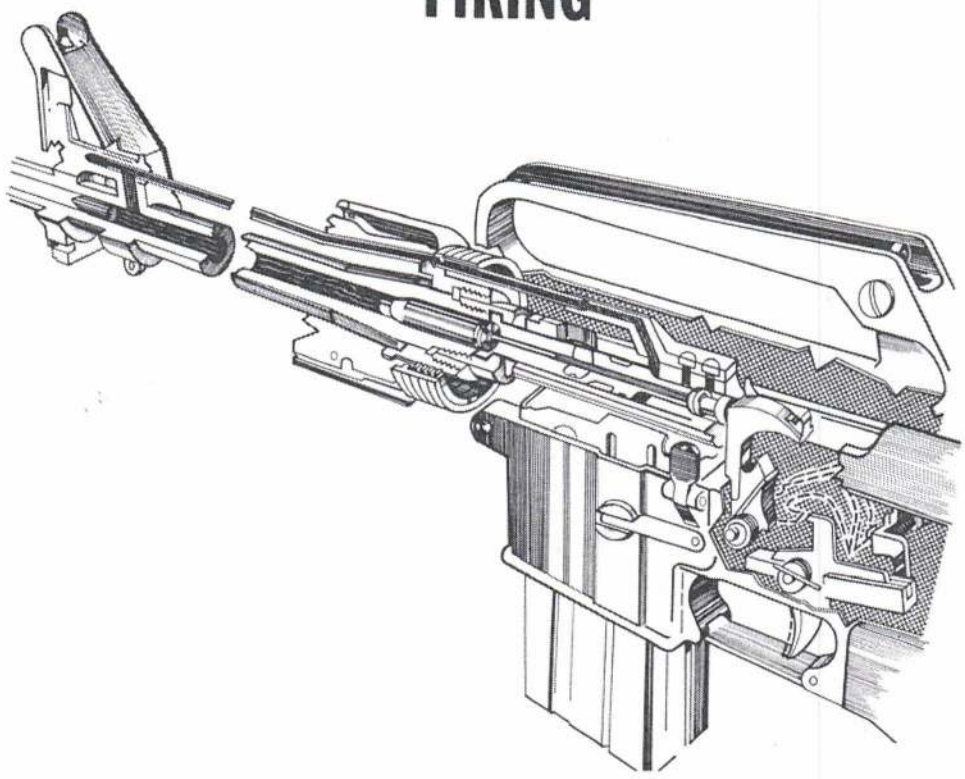
CHAMBERING



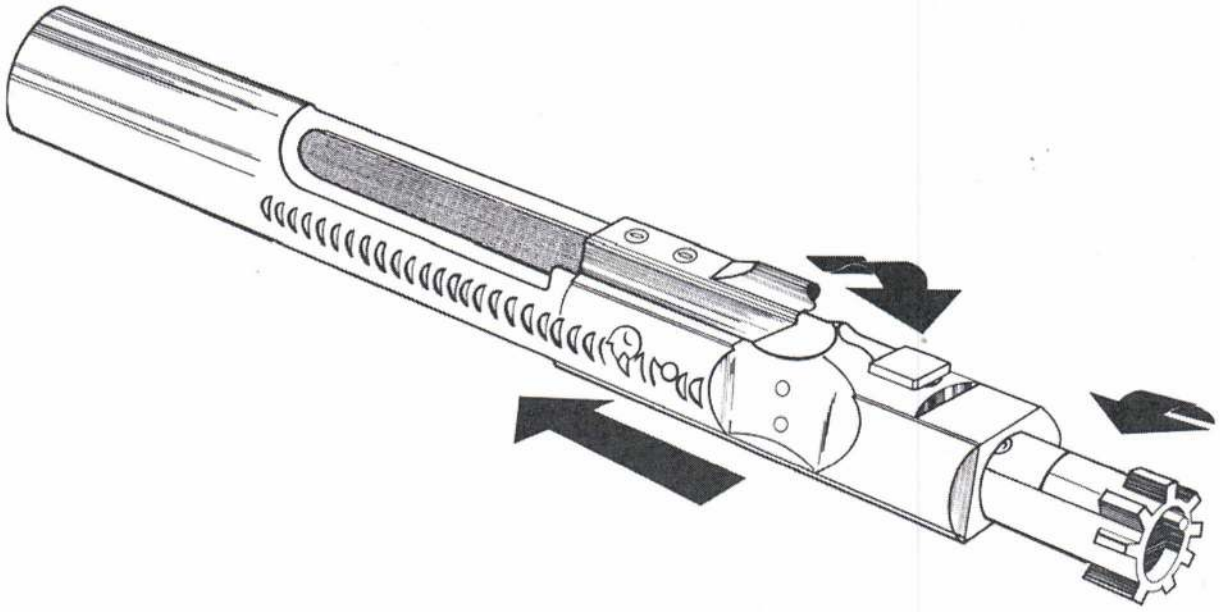
LOCKING



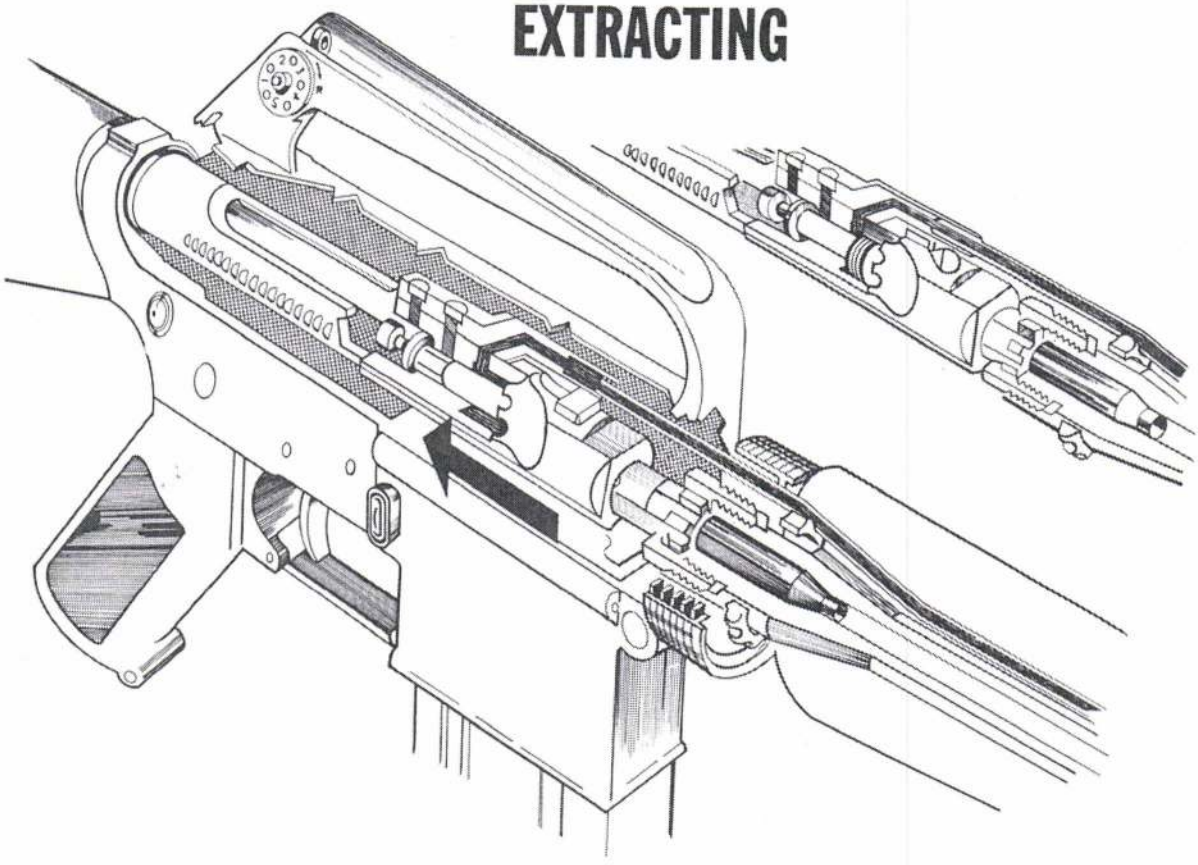
FIRING



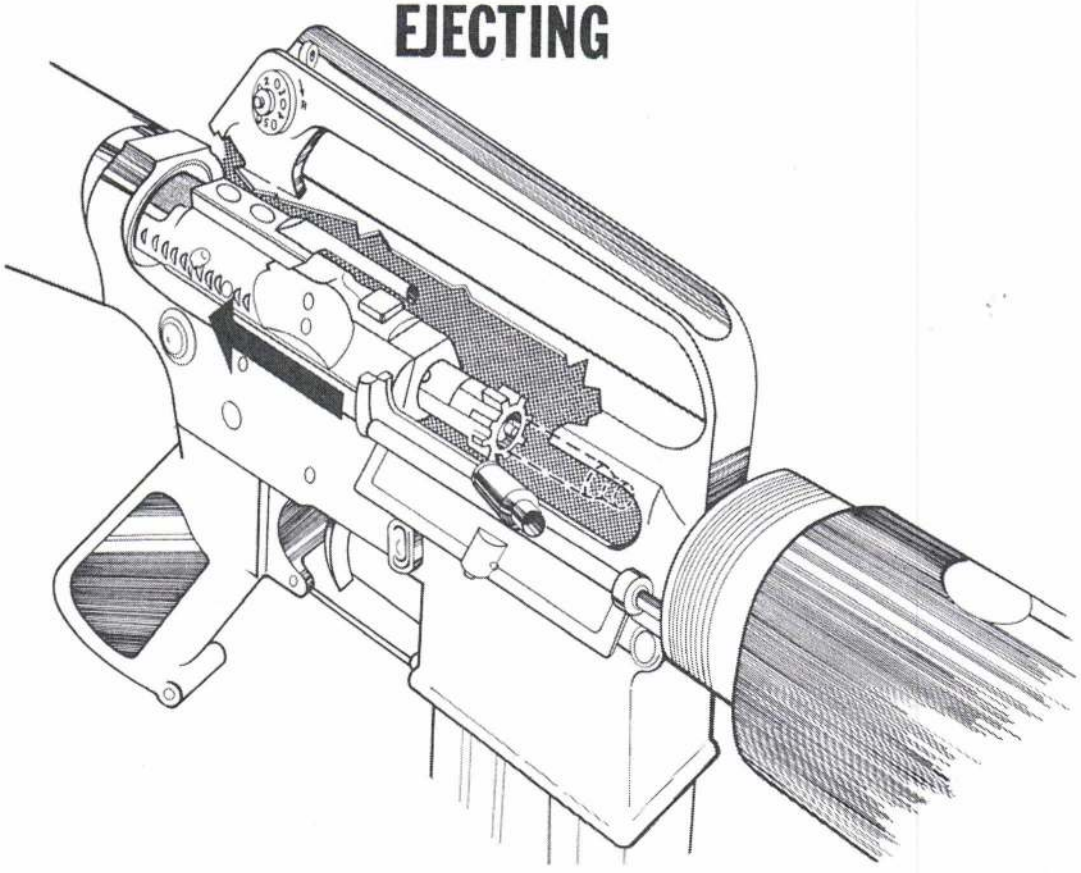
UNLOCKING



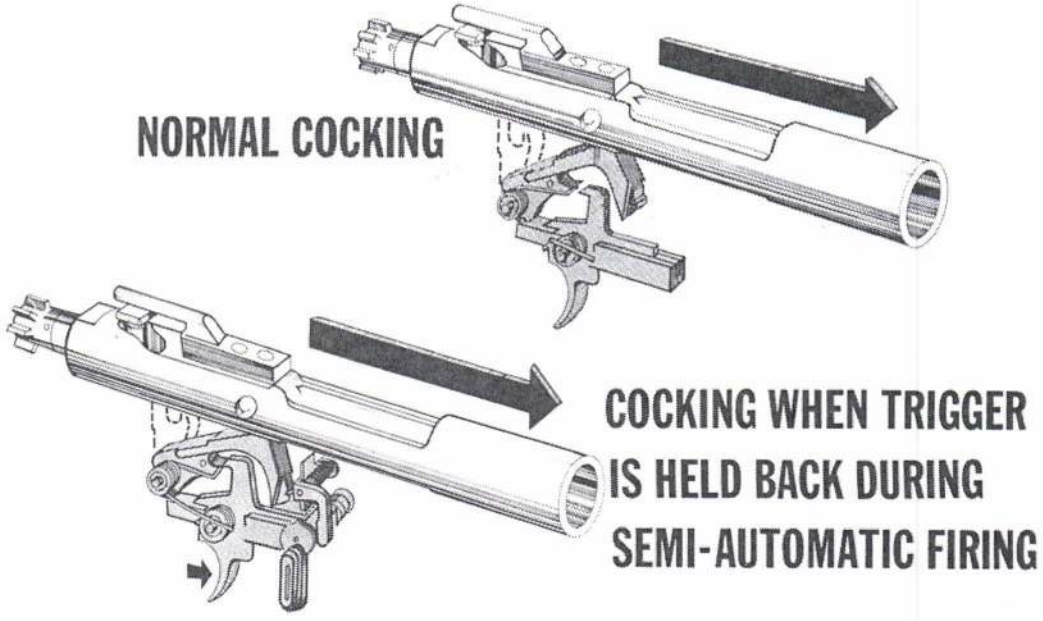
EXTRACTING



EJECTING

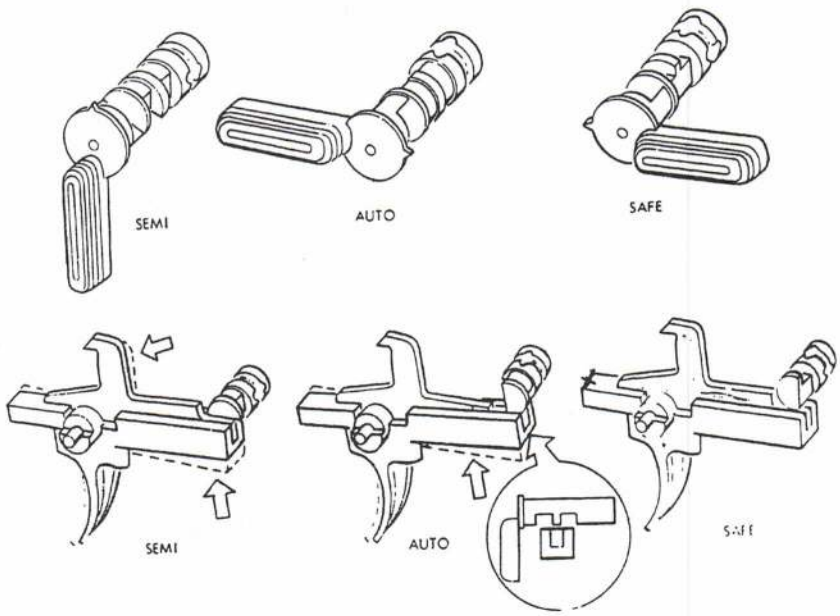


COCKING



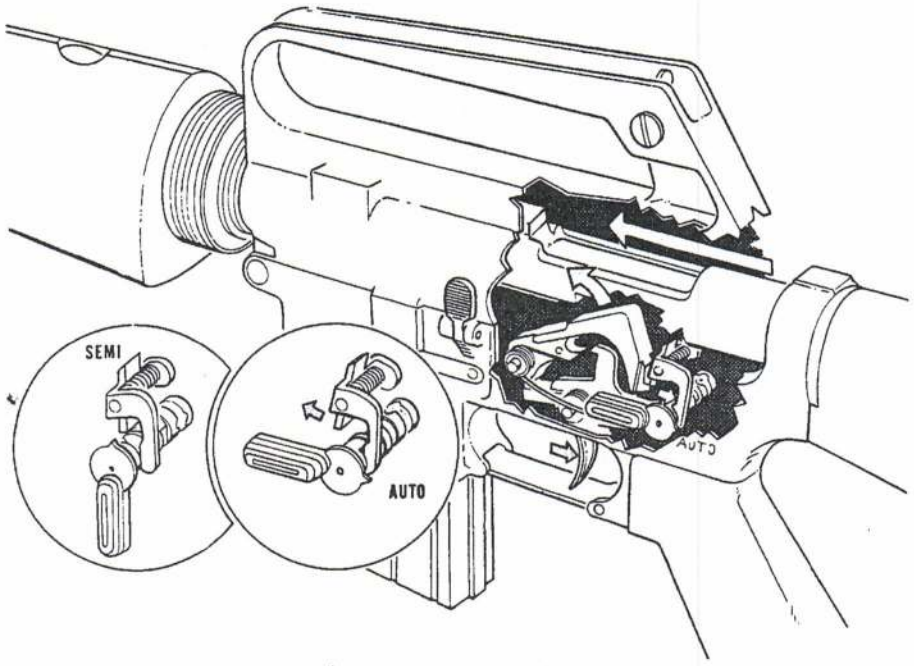
Automatic Fire

With the selector lever set in the automatic position, the rifle will continue to fire as long as the trigger is held to the rear.



As the trigger is squeezed, the cycle of function begins. The hammer is cocked as the bolt carrier recoils, but the center cam holds the disconnector down preventing it from engaging the lower hammer hook.

The automatic sear, the bottom of which is now moved forward, catches the upper hammer hook and holds it until the bolt carrier moves forward. As the bolt carrier moves forward the rear portion strikes the top of the sear, releasing the hammer and causing automatic fire.



If the trigger is released the hammer moves forward and is caught by the nose of the trigger. This will end the automatic cycle until the trigger is again squeezed.

All other portions of the cycle of functioning remain the same.

Action of the Magazine

The cycle of functioning stops when the trigger is released or when the magazine is empty.

As the last round is fired, the magazine follower pushes up on the bottom of the bolt catch forcing it into the path of the bolt. This holds the bolt carrier to the rear.

The empty magazine can now be replaced by a full one. To chamber a round, first press in on the upper portion of the bolt catch to release the bolt carrier, or pull the charging handle to its fullest rear position and release letting it go forward under its own power.

If a new magazine has been inserted and the bolt carrier goes forward the weapon is now charged and ready to fire and all cautionary and safety measured should be strictly adhered to.

2

MAINTENANCE AND INSPECTIONS

Normal care and cleaning will result in proper functioning of all parts of the weapon. Improper maintenance causes stoppages and malfunctions. Only quality cleaning materials should be used.

Barrel: Attach a bore brush to the cleaning rod, dip it in solvent and brush the bore thoroughly from the rear of the upper receiver pushing the brush forward. Never brush a barrel from the front, it could cause damage to the crown of the barrel, as well as this causes carbon and fouling into the chamber area. Continue scrubbing the bore until it comes clean of all fouling and carbon. Dry patch with a cloth patch on a jag, continue until patches come out clean. Never retreat a patch, instead push from the rear receiver until it exits the muzzle.

Chamber: Using the cleaning rod, attach a chamber brush. Dip the chamber brush in solvent and insert it into the chamber. Use five or six reciprocating plunging strokes and three or four rotations into the chamber. Then remove and dry the chamber thoroughly with dry patches.

Locking lugs: With a small bristle brush or tooth brush, scrub the locking lugs with solvent until all carbon and fouling is removed.

Exterior of Gas Tube: Clean the protruding exterior of the gas tube inside of the upper receiver with a small brush, then wipe clean. Never clean or get any type of solvent or oil inside of the gas tube.

After cleaning, lubricate the bore and locking lugs in the barrel extension by applying a light coat of oil/lube to prevent corrosion and pitting. If the handguards have been removed, rub a light coat of oil/lube onto the surface of the barrel enclosed by the handguards.

Bolt Carrier Group: Remove the bolt carrier group from the upper receiver and disassemble it. Thoroughly clean all parts with a patch and brush dipped in solvent. Clean the locking lugs of the bolt with solvent and a small brush. Insure that all carbon and metal filings are removed, then wipe clean with a dry patch. Lightly lubricate.

Scrub the extractor clean with solvent and a brush removing any carbon and metal filings. Also clean the firing pin recess and firing pin. When dry and before assembly, apply a coat of oil/lube to the bolt body, rings, and carrier key. When the bolt carrier group is reassembled apply a liberal amount of oil/lube to all exterior surfaces with particular emphasis to the friction points (ie: rails and cam area).

Upper Receiver: Clean the upper receiver free of powder fouling with solvent. After cleaning, lube with a light coat of oil/lube paying special attention to any shiny surfaces which indicate friction.

Lower Receiver Group: Wipe any particles of dirt or fouling from the trigger mechanism with a clean patch and brush. When clean, lubricate all pins. Components of the lower receiver group can be cleaned with a solvent. After clean, lightly lubricate.

Magazine: Disassemble the magazine, being careful not to scratch or bend anything. Scrub the inside with a brush and solvent only if necessary. Wipe dry and reassemble. No lubricants are needed on the magazines.

3

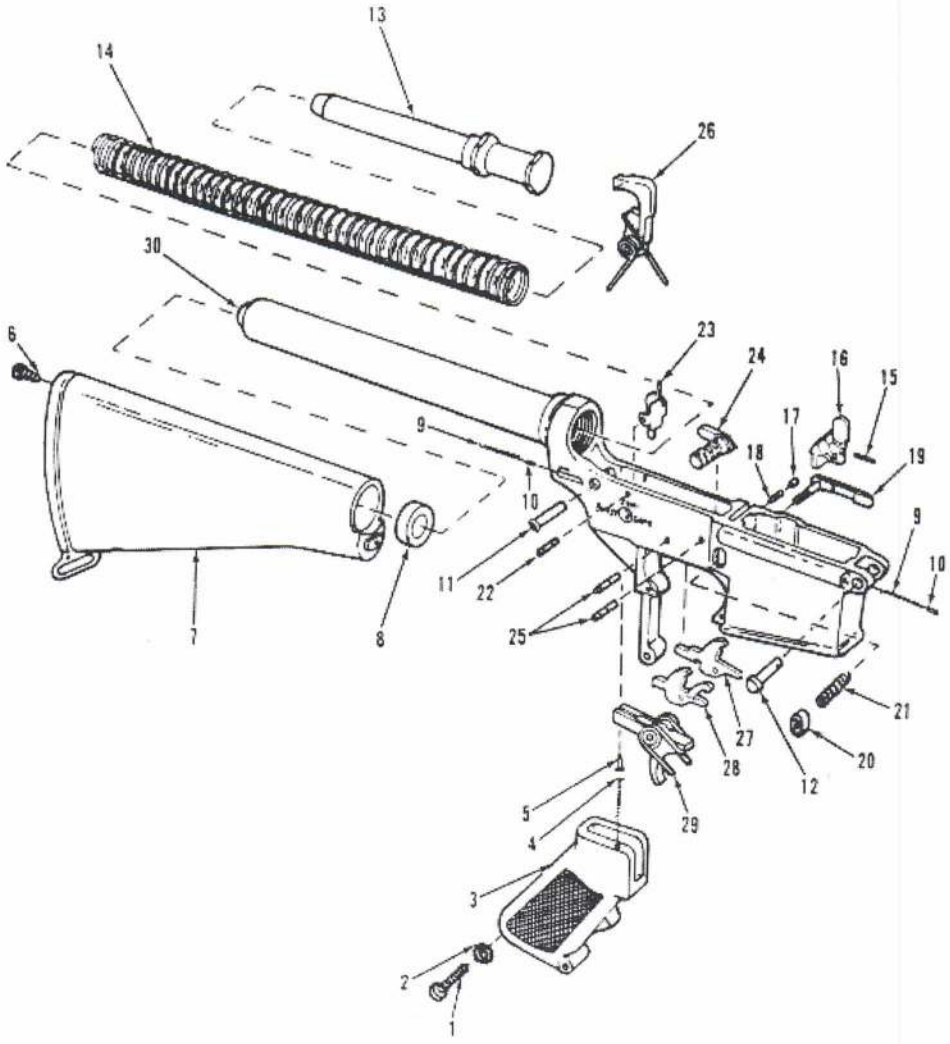
LOWER RECEIVER ASSEMBLY

The steps for assembly are presented in a sequence which has been effective. It is by no means the only correct method, as it does not make any difference on the end result if the magazine catch is installed before or after the bolt catch, for instance.

It is important to install the selector before the pistol grip, and a few other steps that must be performed before others. Unless you are experienced, follow the sequence presented and you will be successful.

Always work in a well-lit area, and it is helpful to work on a flat, hard surface. There are many small pins and springs, and they have a tendency to roll or fly away and disappear forever. In addition, look over the lower receiver before you begin the assembly. Many of the small holes can have debris in them from the forging process; a small drill bit, turned by hand, will clean these out nicely.

- Magazine Catch Assembly
- Trigger Guard Assembly
- Bolt Catch Assembly
- Pivot Pin Assembly
- Trigger Assembly
- Hammer
- Selector
- Pistol Grip Assembly
- A2 Stock or Collapsible Stock Telescoping Stock



Parts and Tools for Assembly and Disassembly

The lower receiver parts kit consists of 30 parts not counting the stock assembly, the receiver, or the pistol grip. It is a good idea to lay all your parts out on a flat, light-colored surface so that you can verify all your parts are there, and find them easily when you need them.

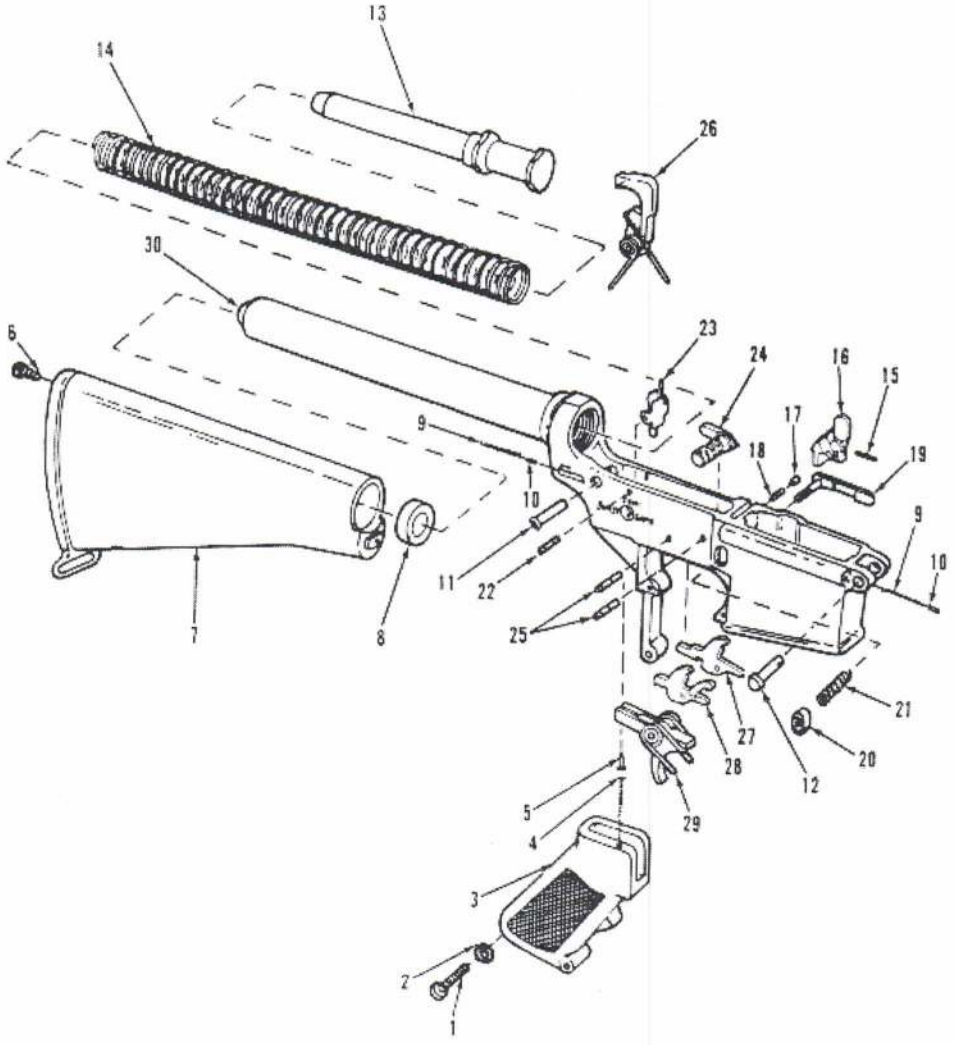
Most parts kits come covered in oil to prevent rust; wipe all the excess oil off before assembly. Because of tight tolerances, some of these parts will be a tight fit. With the exception of the roll pins, no part should need to be hammered into place.

SPRINGS

- **Bolt Catch Spring** - easily confused with the disconnector spring; disconnector spring is tapered though.
- **Buffer Retainer Spring** - second largest spring in the kit.
- **Disconnector Spring** - similar to bolt-catch spring, but identifiable because one end is wide than the other.
- **Hammer Spring** - larger of the two similar springs.
- **Magazine Catch Spring** - this is the largest spring in the kit.
- **Pivot Detent Spring** - same as the takedown detent spring, so there are two in a kit.
- **Selector Spring** - similar to the takedown and pivot detent springs, but there will only be one of these.
- **Takedown Detent Spring** - same as the pivot detent spring, so there are two in a kit.
- **Trigger Spring** - the smaller of the two similar springs.

PINS

- **Bolt Catch Buffer**
- **Bolt Catch Roll Pin** - smaller of the two roll pins.
- **Hammer Pin** - same as trigger pin; can be inserted from either side.
- **Pivot Detent** - same as takedown detent; both sides usually rounded.
- **Pivot Pin** - larger of the two large pins.
- **Selector Detent** - one end is flat, the other pointed.
- **Takedown Detent** - same as pivot detent; both sides usually rounded.
- **Takedown Pin** - smaller of the two large pins.
- **Trigger Guard Roll Pin** - larger of the two roll pins.
- **Trigger Pin** - same as hammer pin; can be inserted from either side.
- **Bolt Catch**
- **Buffer Retainer**
- **Disconnector**
- **Hammer** - will have a J-pin already installed.
- **Magazine Catch**
- **Magazine Catch Button** - some are plastic, some metal.
- **Pistol Grip Lock Washer**
- **Pistol Grip Screw** - some are Allen-head, some use a slotted pan-head screw
- **Selector**
- **Trigger**
- **Trigger Guard** - some are metal, some plastic. Will already have a detent installed on its front end.



Lower Receiver and Buttstock Assembly

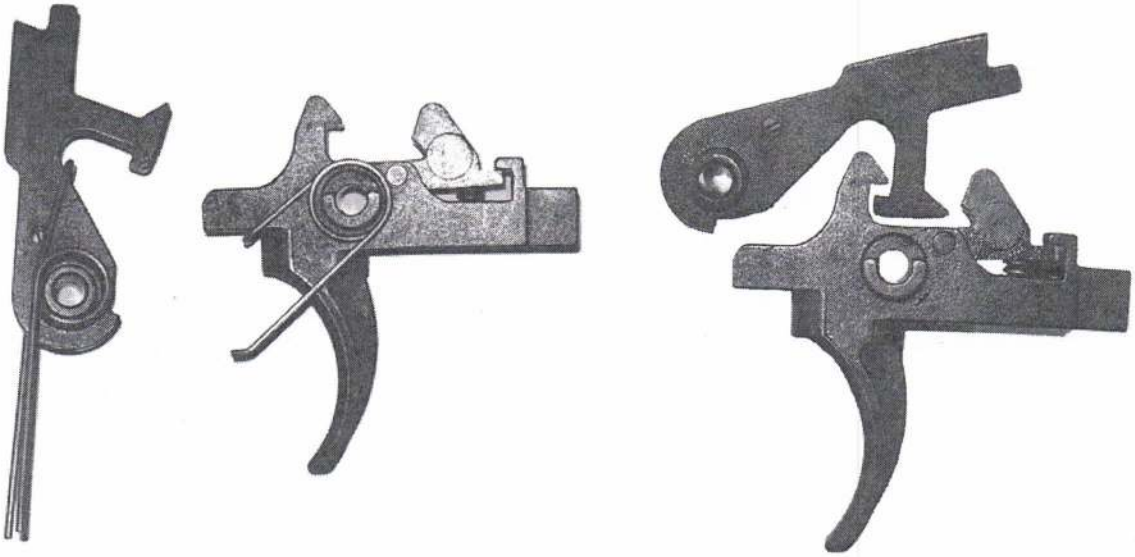
1. Grip Machine Screw	2. Grip Lock Washer	3. Grip
4. Safety Detent Helical Spring	5. Safety Detent	6. Lower Receiver Extension Self Locking Screw
7. Buttstock Assembly	8. Stepped Spacer	9. Takedown Pin Detent Helical Spring
10. Takedown Pin Detent	11. Takedown Pin	12. Pivot Pin
13. Buffer Assembly	14. Recoil Spring	15. Bolt Catch Pin
16. Bolt Catch	17. Bolt Catch Plunger	18. Bolt Catch Helical Compression Spring
19. Magazine Catch	20. Magazine Catch Button	21. Magazine Catch Helical Spring
22. Automatic Sear Pin	23. Sear	24. Selector Lever
25. Hammer And Trigger Spring	26. Hammer Assembly	27. Disconnector
28. Disconnector for Burst	29. Trigger Assembly	30. Lower Receiver and Receiver Extension Assembly

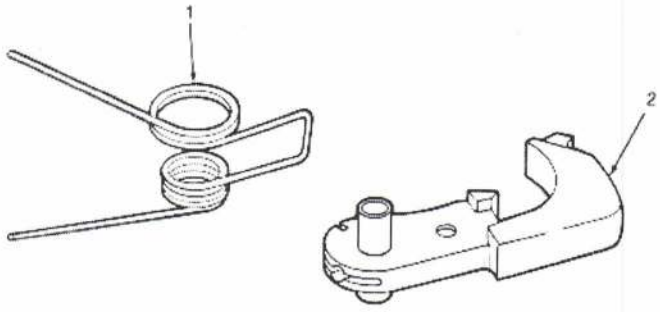
Hammer

M16 Hammer / AR15 Flat Face Hammer / AR15 Notched Hammer

Single Stage Hammer & Trigger (notice sear engagement)

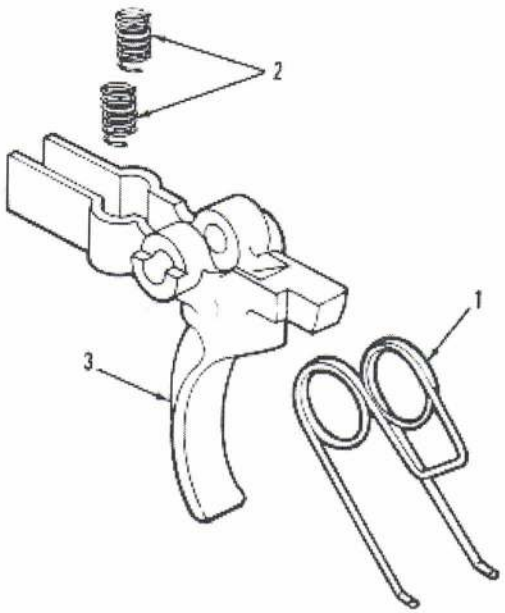
2-Stage Hammer (The right one is broken, this is a weak point)





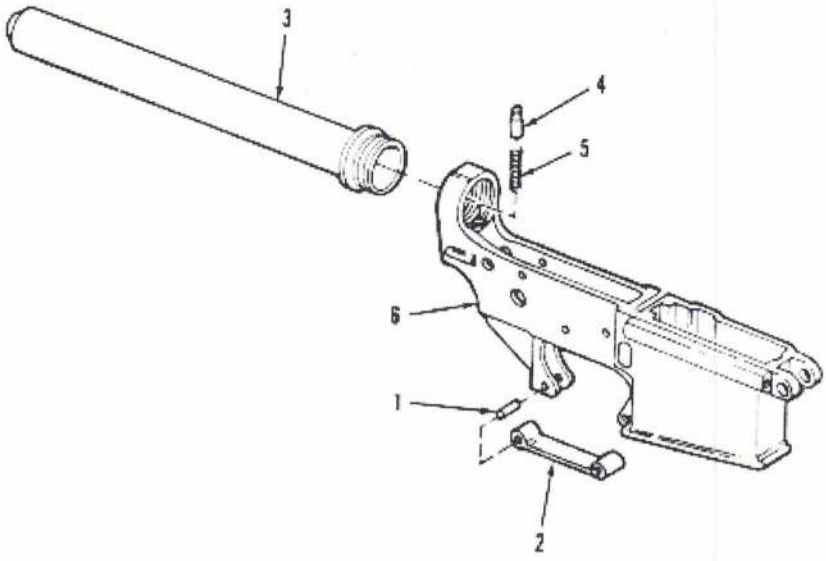
Burst Hammer Assembly

1. Hammer Helical Spring
2. Hammer and Hammer Pin Retainer Assembly



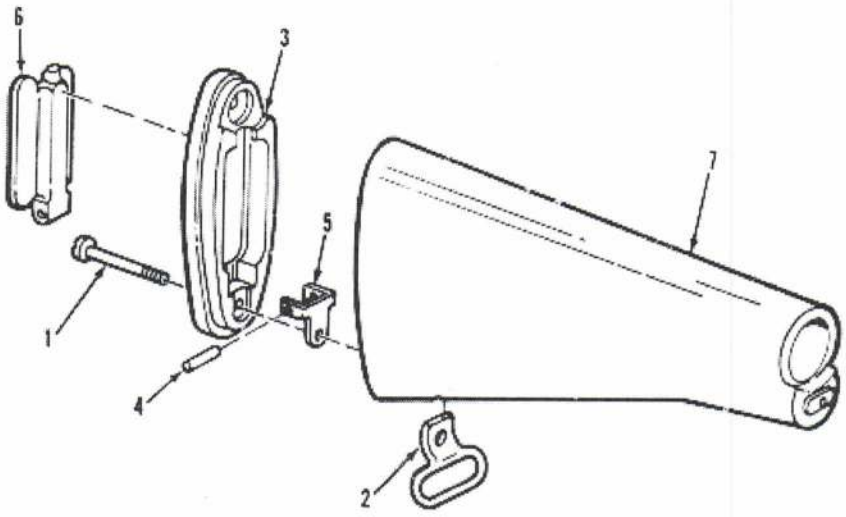
Burst Trigger Assembly

1. Trigger Helical Torsion Spring
2. Disconnector Helical Spring (two of them for double disconnectors)
3. Trigger



Lower Receiver and Receiver Extension Assembly

1. Trigger Guard Pin
2. Trigger Guard
3. Lower Receiver Extension
4. Buffer Retainer
5. Buffer Retainer Helical Spring
6. Lower Receiver



Buttstock Assembly

1. Buttplate Self Locking Screw
2. Rear Sling Swivel
3. Buttplate
4. Buttplate Storage Door Hinge Pin
5. Buttplate Storage Door Hinge
6. Storage Door Assembly
7. Buttstock

Lower Receiver Assembly

This guide is created to help put together an AR-15 lower receiver from a stripped receiver and a lower receiver parts kit.

Tools

There are a few tools that make it easier to put together these kits, but none of them are necessary. Minimum requirements include a hammer and punch to drive in a couple of roll pins, a flat-blade screwdriver for A2 stock screw, and either a screwdriver or Allen key for the pistol grip screw.

- **Roll Pin Punches** - to drive roll pins (3/32", 1/8", 5/32"); these have a small raised projection in the face of the punch to automatically center the punch and prevent the roll pin from collapsing
- **Roll Pin Holders** - used to hold and start roll pins... very convenient
- **Hammer** - used to drive the roll pins
- **#10 Flat-Blade Screwdriver** - used for A2 stock screw and some pistol grips
- **Block of wood** - base to support receiver when driving roll pins
- **Pivot Pin Installation Tool** - handy tool if you build a few lowers
- **Allen Key** - used for some pistol grips
- **Telescoping Stock Wrench** - to tighten telescoping stock lock ring

Magazine Catch Assembly

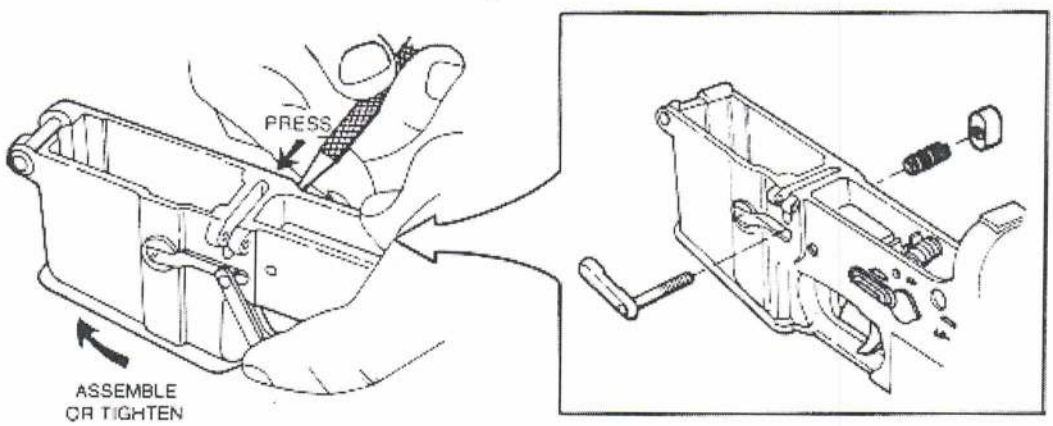
PARTS: magazine catch, magazine catch spring, magazine button
TOOLS: 5/32" roll pin punch

- Install magazine catch into recess on left of receiver.
- Install spring onto threaded portion of magazine catch from the right side of receiver.
- Screw button onto threaded portion of magazine catch 3 or 4 turns.
- Use a punch (larger than hole in magazine button) or wooden dowel to push in the magazine button so you can turn the magazine catch clockwise until the end of the catch is flush with the magazine button head. You can hold the receiver and press the punch against the table to do this, but put something between the punch and the magazine catch button to prevent marking it. Do this step first, as it will prevent the bolt catch from getting in the way as you turn the magazine catch into place.

CAUTION-
IT IS POSSIBLE TO SCRATCH THE RECEIVER ON THIS STEP!
Take special care when turning the magazine catch to avoid rubbing against the hump around the bolt catch.

FUNCTION CHECK

- Check that depressing the magazine release button will push the magazine catch out of the magazine well in the lower receiver.
- Spring will return magazine catch to engage in magazine well.



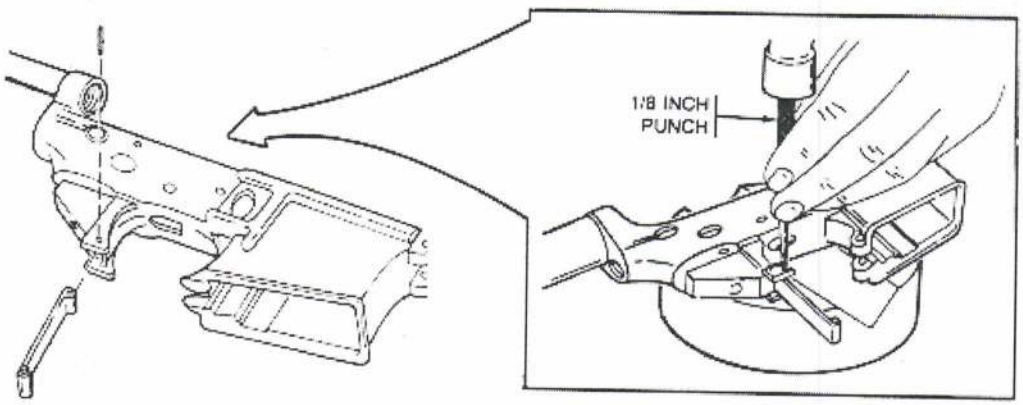
Trigger Guard Assembly

PARTS: trigger guard assembly, roll pin
TOOLS: 1/8" roll pin punch, hammer

- Attach front of trigger guard assembly to the receiver using the detent.
- Lay receiver on a block of wood, and drive roll pin into receiver and rear of trigger guard using drive pin punch.
- Make sure that the small block of wood is supporting the bottom flange and that the trigger guard is in position supporting the top flange otherwise you risk bending or breaking off one of the flanges.
- Also watch as you put in the roll pin that it is going through the hole in the trigger guard correctly.

FUNCTION CHECK

- Check that by depressing the detent on trigger guard you are able to pivot the trigger guard open.



Bolt Catch Assembly

PARTS: bolt catch, bolt catch buffer, bolt catch spring, roll pin
TOOLS: 3/32" roll pin punch, 5/32" (or larger) punch (Flat sided punch is recommended)

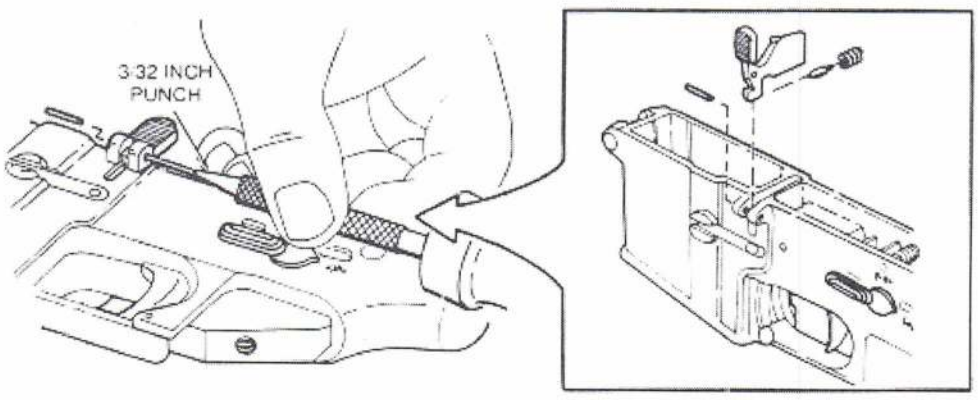
CAUTION-
IT IS VERY EASY TO SCRATCH THE RECEIVER ON THIS STEP!
Take special care to make sure pin in place before driving it, and ensure that it is held securely in place when striking the punch.

Fiberglass packing tape - 2 layers thick - taped over the receiver just between the receiver and the punch can help avoid scratching.

- When installing the bolt catch, first drive the roll pin about halfway into the rear hump from the rear of the receiver using roll pin holder. It can be very difficult to get this pin started; you might want to try squeezing the roll pin on one end with pliers or the vise before starting. If you don't have a roll pin holder, then try holding it in place with a pair of needle nose pliers while you drive using a 5/32" punch.
- Install spring in hole on left side of receiver.
- Install bolt catch plunger on top of spring with round portion on top and small end into receiver. Make sure it moves freely in its hole.
- Install bolt catch in receiver; it only fits on one way.
- Use a 3/32" punch to hold the assembly by placing it through the front hump.
- The pin can be driven the rest of the way from the rear as the punch will be pushed out and while holding the bolt catch in correct alignment. (function check as you do it to make sure it's going in correctly)
- Avoid marring/scratching lower by covering receiver with tape, cloth, or other material while you do this.

FUNCTION CHECK

- Verify that the bolt catch functions smoothly and is under tension from the spring.



Pivot Pin Assembly

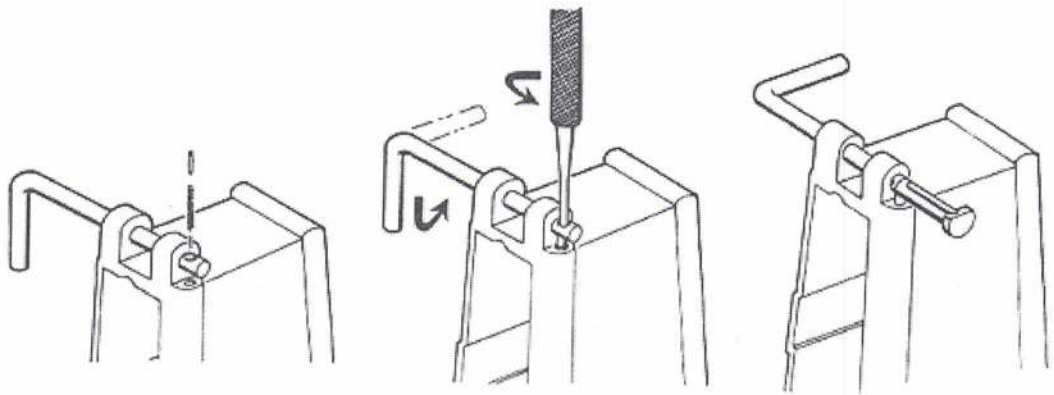
PARTS: pivot pin, pivot pin detent, pivot pin detent spring
TOOLS: pivot pin installation tool, 3/32" drive pin punch

- This is perhaps the hardest part of the lower assembly, so if available, install the installation tool.
- Insert spring and detent into receiver.
- Compress detent in recess using 3/32" punch and rotate tool.
- Push out tool with pivot pin and rotate until detent is in groove of pivot pin.

FUNCTION CHECK

- Verify that the pivot pin detent prevents the pivot pin from coming off the receiver.

Note: If you do not have an installation tool, it can be difficult to get the pivot pin inserted without losing the detent and/or detent spring; if these parts do fly out, they can be very hard to find. The idea is to insert the spring and detent, and then compress them as you insert the pivot pin. A pair of needle-nose pliers can be helpful. It is difficult to remove the pivot pin once installed, so make sure you do it right the first time and make sure you've cleaned out the detent/spring hole with a drill bit before inserting the spring.



Pivot Pin Comparison

Left to Right:
Colt Large Pin
Standard Small Pin
Colt Screw Pin
Large Hole Upper to Standard Hole Lower Conversion
Small Hole Lower to Large Hole Lower Conversion

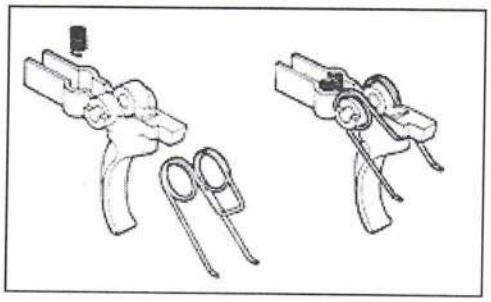
Trigger Assembly

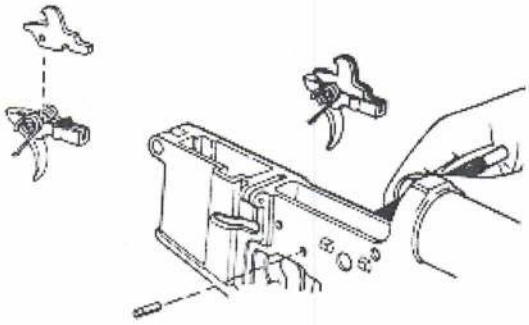
PARTS: Trigger, Trigger Pin, Trigger Spring, Disconnector, Disconnector Spring
TOOLS: 5/32" drive pin punch

- Shoulder trigger spring onto trigger with ends of spring forward and under.
- Install disconnector spring with the wider portion of spring down towards trigger and push until it locks in there.
- Position disconnector on top of trigger, where trigger pin will hold both in place.
- Insert trigger assembly into receiver.
- Insert trigger retaining pin through receiver, trigger, and disconnector. The trigger pin has 2 grooves in it; one in the middle of the pin and one off to one side. It does not matter which way it is inserted, though common practice is to insert from left to right, with the groove to the left.
- Insert hammer pin from opposite side to help align things as you push the trigger pin in and the hammer pin out. You will have to push down on trigger assembly to align the holes and get the pin in all the way.

FUNCTION CHECK

- Make sure that the trigger pivots smoothly when depressed.
- Verify that the disconnector pivots when pushed.





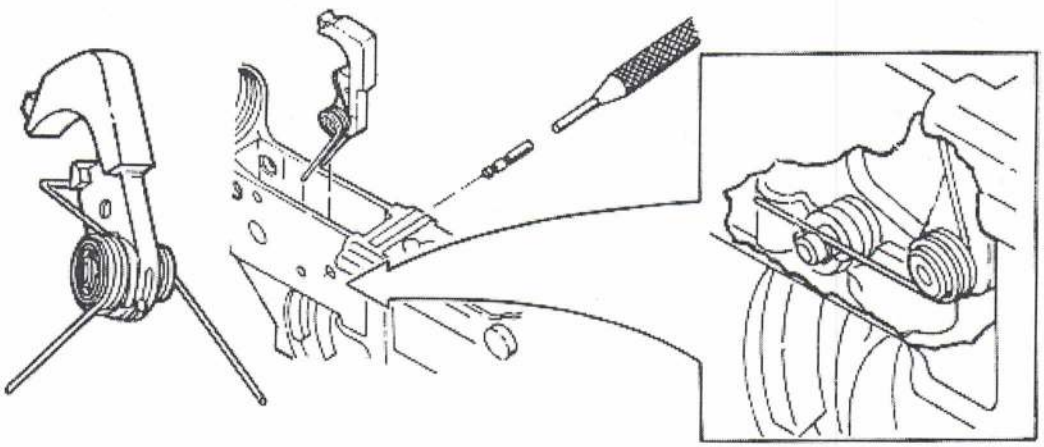
Hammer Assembly

PARTS: hammer (with J-pin installed), hammer spring, hammer retaining pin
TOOLS: 5/32" drive pin punch

- Install spring onto hammer, ends of spring to rear and shoulder on back of hammer.
- Install hammer in receiver with feet pointing rearward away from hammer
- Use 5/32" punch to retain hammer in place as you insert hammer retaining pin.
- Like the trigger pin, you may have to push down and align the holes perfectly in order to push the pin in all the way.
- Ends of the hammer spring will rest on top of the trigger pin, with one end in the groove on the trigger pin.
- Inserting the hammer pin may require some effort, as the J-pin in the hammer will catch the grooves in the pin.

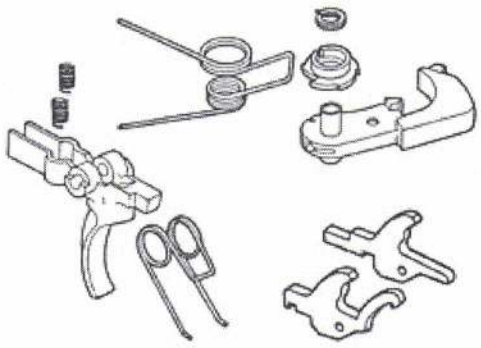
FUNCTION CHECK

- Verify that hammer locks to the rear when pushed back.
- Verify that hammer pivots forward when trigger is pressed.
- Without releasing the trigger, push the hammer back again and verify that it locks (caught by disconnector).
- Releasing the trigger should not cause the hammer to pivot fully forward (caught by trigger).
- Hammer will fall when trigger is pressed.



Burst Assembly

The burst assembly is located inside the lower receiver. The selector lever provides the options for Safe, Semiautomatic, and Burst. The burst will produce 3 rounds fired if it is held back during and allowed to complete its cycle. The burst will not reset back to 3rounds if the trigger is let off before the full cycle is reached, meaning if you are in burst mode and only fire one round and then get off the trigger and the next time the trigger is held to the rear and let cycle the weapon will only fire two rounds in the burst. Parts to the burst mechanism include a trigger, hammer and hammer spring with a burst cam assembly, a single hook semiautomatic disconnect, and a two hooked burst disconnect. The burst cam has six notches in it: two shallow, one deep, two shallow, one deep. Inside the center hub of the burst cam there is a clutch spring which allows the cam wheel to turn one direction only.



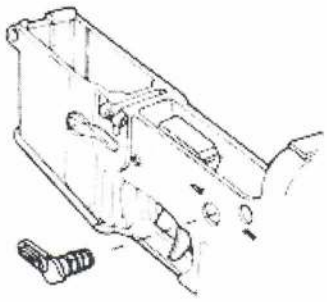
Selector Assembly

PARTS: safety selector
TOOLS:

- With hammer cocked back, insert from left side of receiver, selector pointing up in the 'fire' position.

FUNCTION CHECK

- Make sure selector rotates freely.



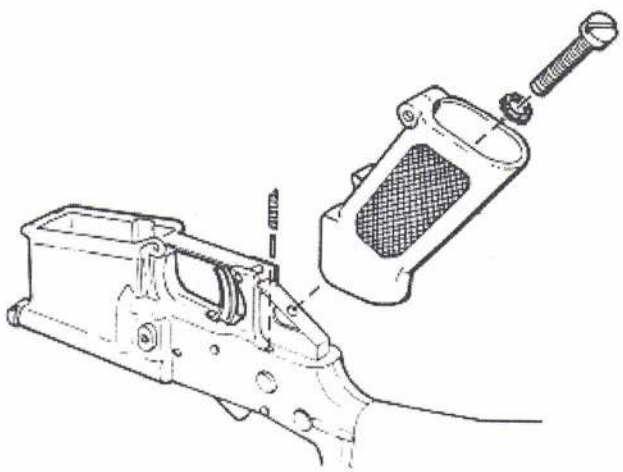
Pistol Grip Assembly

PARTS: selector detent, selector detent spring, pistol grip, pistol grip screw, lock washer
TOOLS: Allen key or flat-blade screwdriver (depends on your screw type)

- Install detent, pointed end towards the selector, and the spring into the receiver from the bottom.
- Carefully compress the spring with the grip and make sure spring fits into hole in grip.
- Check the function of the selector with the grip held in place; if too tight (unable to rotate) you may need to either cut the spring, or clean out the hole in the grip.
- Once feel is acceptable, secure the grip in place with the screw and lock washer.

FUNCTION CHECK

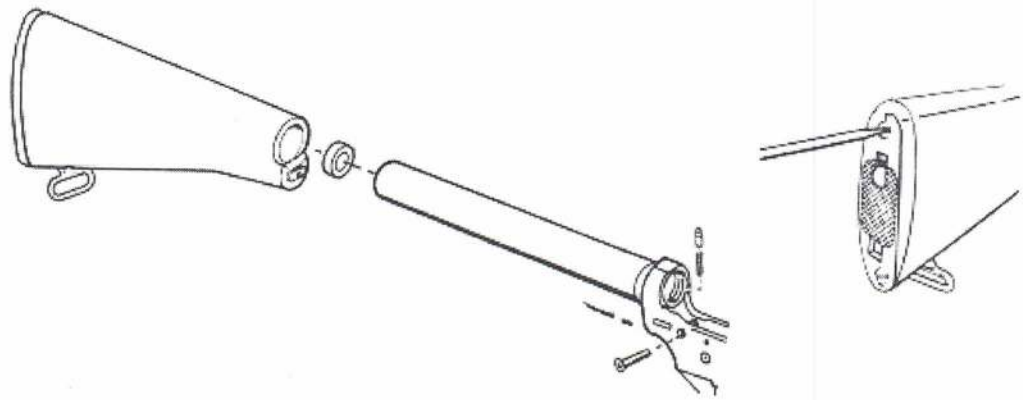
- Verify selector is able to move from safe to fire and clicks in place. It should not move past the 'safe' or 'fire' positions.
- With selector on 'safe', verify cocked hammer is not released when trigger is pressed.
- With selector on 'semi', verify hammer is released when trigger is pressed.
  NOTE: Selector cannot be rotated to 'safe' unless hammer is cocked.



A2 Stock

PARTS: takedown pin, takedown pin spring, takedown pin detent, stock, buffer extension, retainer, retainer spring, buffer, buffer spring
TOOLS: #10 (or larger) flat-blade screwdriver

- Insert retainer spring and retainer into recess in lower.
- Install buffer extension, (buffer tube); press detent when necessary; torque to 35-39 ft-lbs add spacer onto stock tube, and insert stock.
- Install takedown pin with groove to the rear and install detent and spring from the rear of the receiver.
- Carefully compress the spring with the stock and secure the stock in place with the self-locking screw.
- Insert stock screw from rear into stock.
- With hammer down, insert buffer spring and buffer into buffer tube until retainer snaps up to lock it in place.
- Function check on takedown pin and buffer retainer.



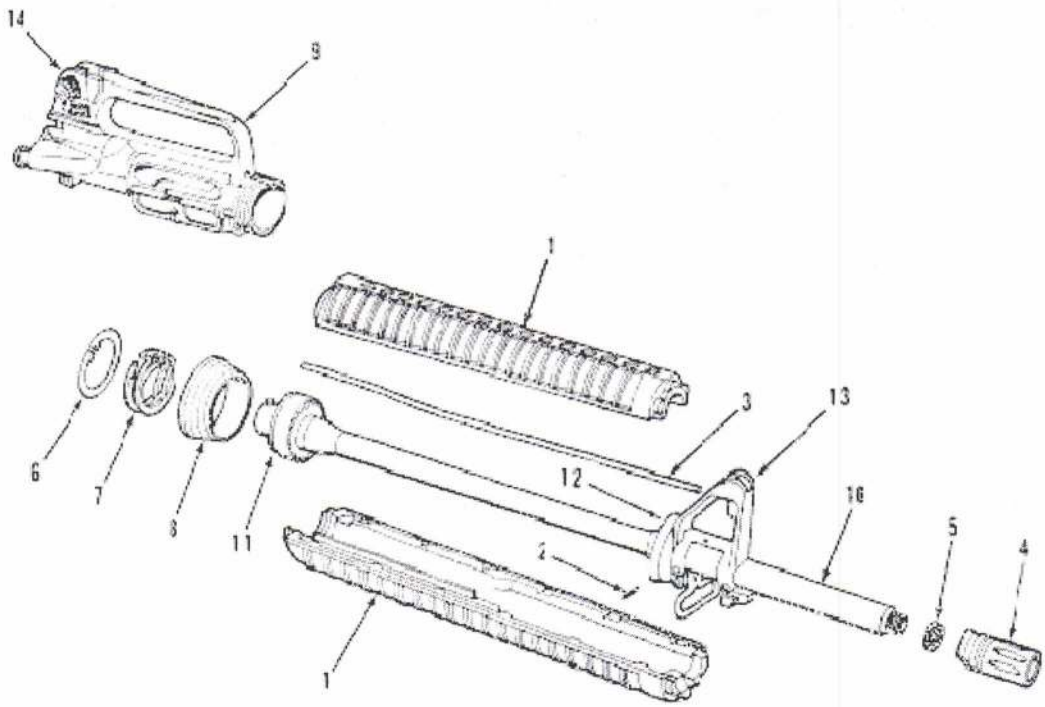
Telescoping Stock

PARTS: takedown pin, takedown pin spring, takedown pin detent, telescoping stock, buffer extension, backplate, locking ring, retainer, retainer spring, buffer spring, buffer
TOOLS: Telescoping Stock Wrench

- Insert retainer spring and retainer into recess in lower.
- Install buffer tube, backplate, and locking ring onto receiver and depress retainer when necessary to get it to rest under the extension tube. Turn tube until it is about 1/4 turn past the correct location.
- Install takedown pin with groove to the rear and install detent and spring from the rear of the receiver.
- Backplate will now hold spring in place when you turn the extension tube back 1/4 turn.
- Tighten locking ring using telestock wrench for a snug fit.
- With the hammer down, insert buffer spring and buffer into buffer tube until retainer snaps up to lock it in place.
- Function check takedown pin, stock, and buffer retainer.

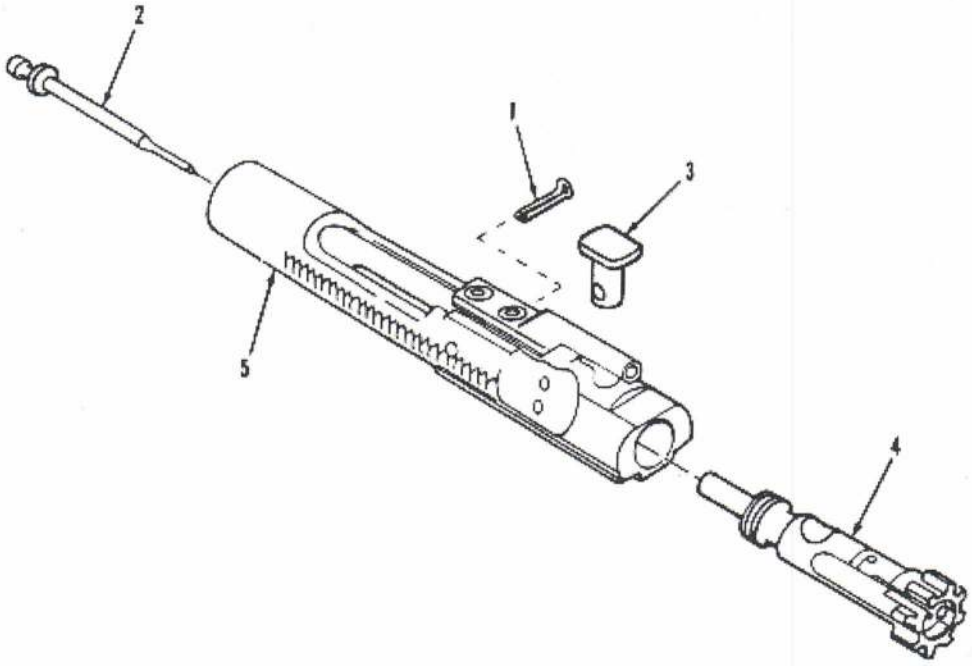
4

UPPER RECEIVER ASSEMBLY



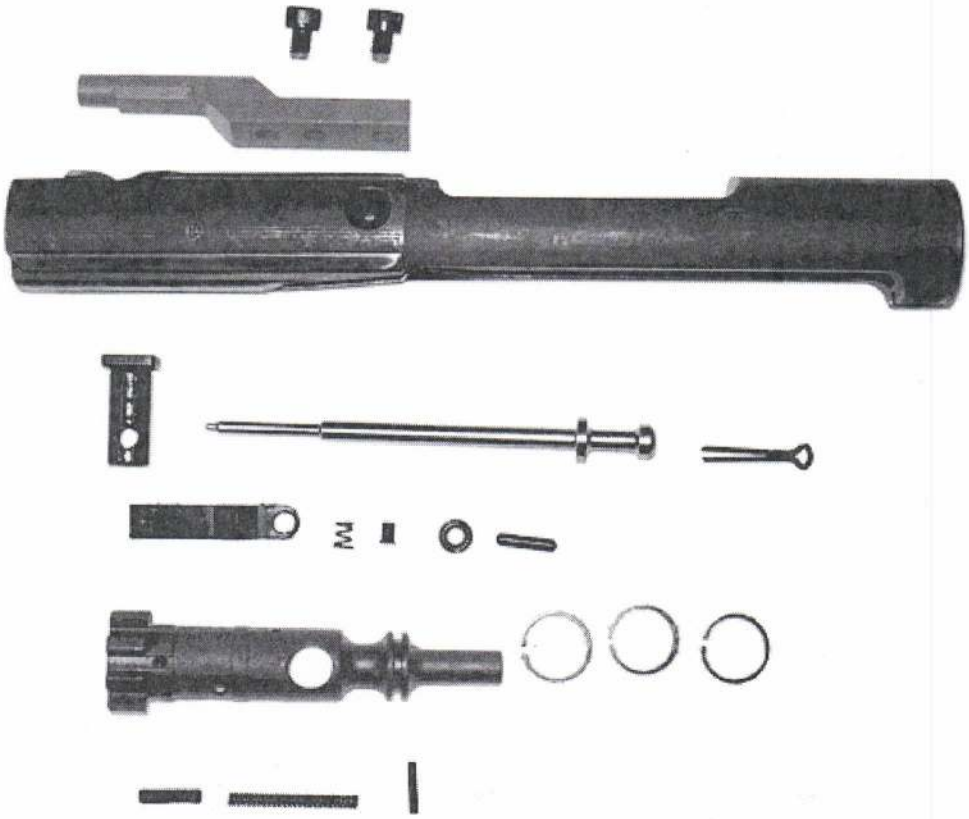
Upper Receiver And Barrel Assembly Part Description

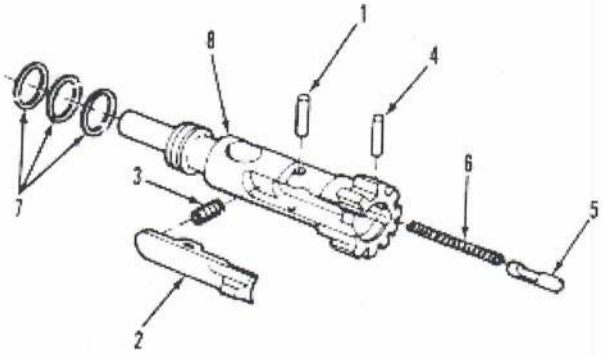
1. Handguard Assembly
2. Gas Tube Pin
3. Gas Tube
4. Flash Suppressor
5. Peel Washer
6. Handguard Slipring Retaining Ring
7. Spring Weld Assy Handguard Slip Ring
8. Handguard Slip Ring (Delta Ring)
9. Upper Receiver Assembly
10. Barrel
11. Barrel Nut
12. Handguard Cap
13. Front Sight Base Assembly
14. Rear Sight Assembly



Bolt Carrier Assembly

1. Firing Pin Retaining Pin
2. Firing Pin
3. Bolt Cam Pin

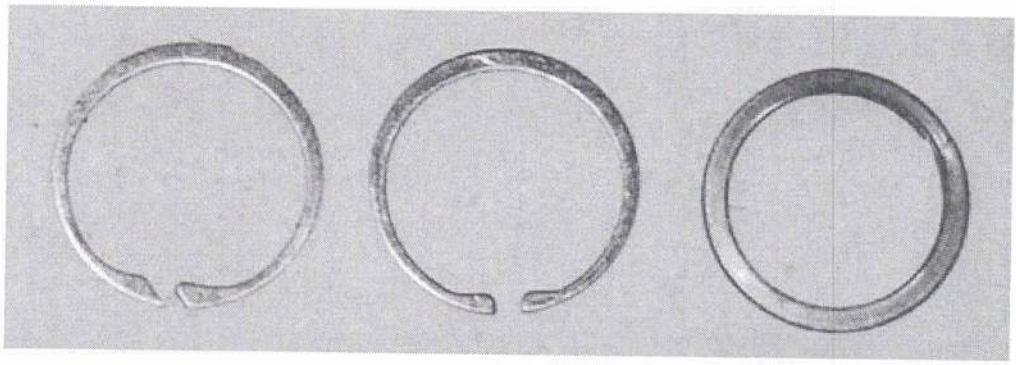


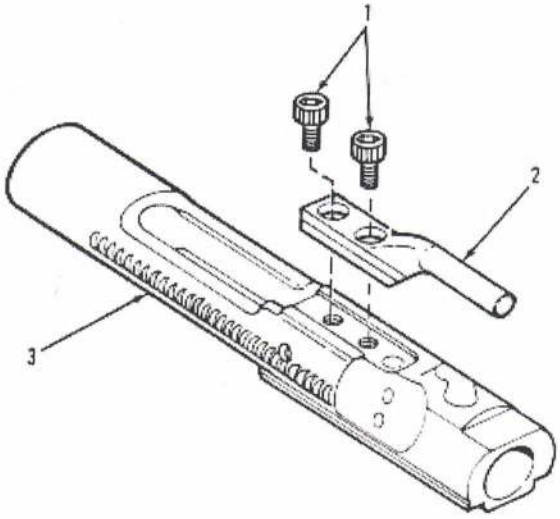


Bolt

1. Extractor Pin
2. Extractor
3. Extractor Spring Assembly
4. Ejector Pin
5. Ejector
6. Ejector Helical Spring
7. Bolt Rings
8. Bolt

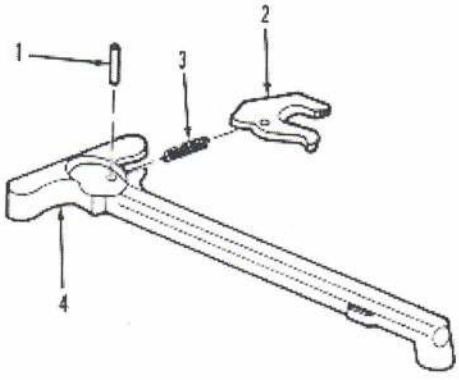
Gas Rings





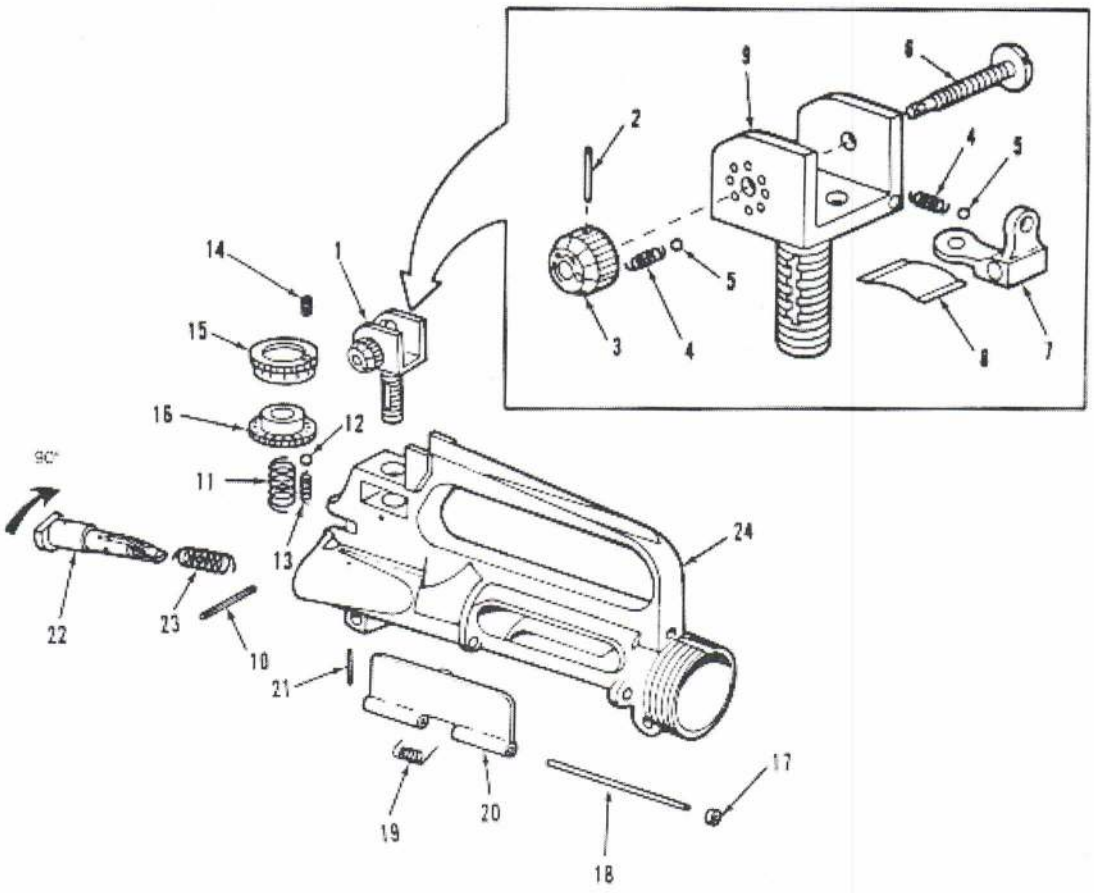
Key And Bolt Carrier Assembly

1. Carrier And Key Screw
2. Bolt Carrier Key
3. Bolt Carrier



Charging Handle

1. Charging Handle Latch Pin
2. Charging Handle Latch
3. Charging Handle Latch Helical Spring
4. Charging Handle

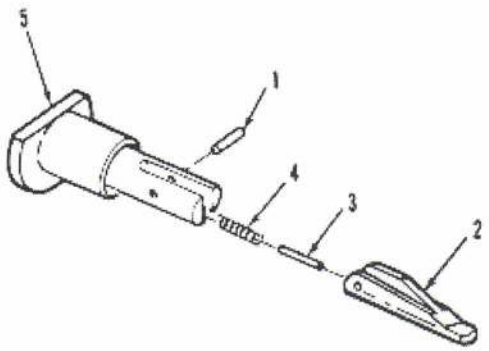


Upper Receiver And Rear Sight Assembly

1. Rear Sight Assembly	2. Rear Sight Windage Knob Retaining Pin
3. Rear Sight Windage Knob	4. Rear Sight Windage Knob Helical Spring
5. Rear Sight Windage Knob Ball Bearing	6. Rear Sight Windage Screw
7. Rear Sight Aperture	8. Rear Sight Flat Spring
9. Rear Sight Base	10. Rear Sight Retaining Pin
11. Rear Sight Elevation Helical Spring	12. Rear Sight Elevation Index Ball Bearing
13. Rear Sight Elevation Index Helical Spring	14. Rear Sight Elevation Index Screw
15. Rear Sight Elevation Index	16. Rear Sight Elevation Knob
17. Ejection Port Cover Retaining Ring	18. Ejection Port Cover Pin
19. Ejection Port Cover Helical Spring	20. Ejection Port Cover
21. Forward Assist Retaining Pin	22. Forward Assist Assembly
23. Forward Assist Helical Compression Spring	24. Upper Receiver

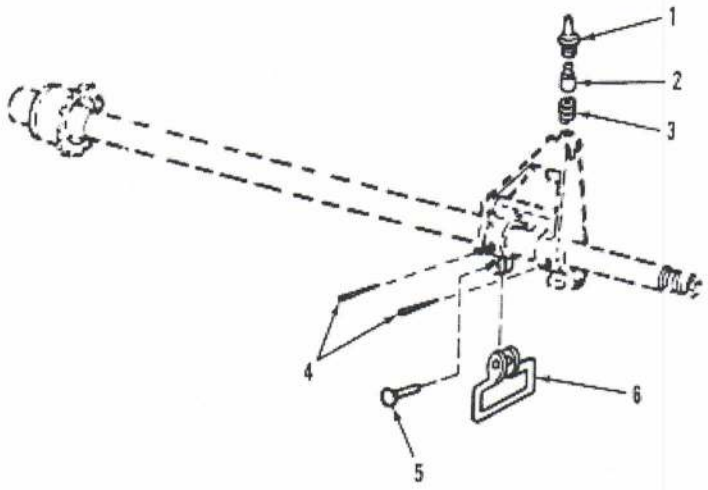
Rear Sights

The rear sight of the AR-15/M-16 A2 rifle is spring loaded in such a manner that it tends to rotate counterclockwise, as viewed from above. This biasing is caused by a ball and spring in the left wall of the sight base, which presses against a surface of the receiver and forces the rotation. This is a means of taking up accumulated slack in the parts of the sight. The spring loading insures that the sight is always in the same position. Keeping the sights consistently in the same position aids accuracy. Some manufacturers produce rear sights with springs in both sides of the sight. These parts should be avoided, since the sight will tend to lean toward the weaker spring; and as the springs will wear at differing rates, the sights will tend to change position.
Some sights are made so that the rear sight aperture has the flat side facing the shooter. Some are made so that the flat side is away from the shooter. There is no real problem here, it is a matter of taste and opinion.



Forward Assist Assembly

1. Forward Assist Pawl Retaining Pin
2. Forward Assist Pawl
3. Forward Assist Pawl Detent
4. Forward Assist Pawl Helical Compression Spring
5. Forward Assist Plunger



Barrel Assembly

1. Front Sight Post
2. Front Sight Post Detent
3. Front Sight Post Detent Helical Spring
4. Front Sight Pins
5. Sling Swivel Tubular Rivet
6. Sling Swivel

The Front Sight Base

The front sight base can be easily removed after first removing the flash suppressor, handguards, the gas tube pin and the gas tube. If you use a large lead block as a backup support, you will be less likely to marr the finish of the barrel. Notice that the taper pins holding the front sight in place are larger on one end than the other. You will want to drive the pins out from the small side. Some of them are pretty stiff, so just be careful and use just enough force. I recommend a small brass hammer. If you use a larger hammer, you can easily apply too much force and damage something.

5

HEAD SPACE

Headspace is that measurement describing the size of the chamber in a barrel. In the case of rimless rifle cartridges, it is the distance from some arbitrary point on the case neck taper back to the bolt face.

In the more general case (e.g. pistol, rimfire, rimmed cases, and belted magnums), you can imagine headspace as measured from whatever the cartridge rests against on the front of the chamber all the way back to the bolt face.

These numbers are specified for each cartridge by the Sporting Arms and Ammunition Manufacturers Institute (SAAMI) and it's important to have this measurement fall within SAAMI specified tolerances.

Too small, and you may not be able to close the bolt on some ammunition that's on the large side of its tolerance range. Worse yet, it will close and let you fire. Firing ammunition in a chamber that's too tight leads to dangerously high pressures.

Too large a chamber, and there's lots of room for the cartridge to rattle around in there -- well not really. What happens is that the brass casing can rupture and 55,000 psi hot gases start rushing out in every direction, including at your precious body parts. Think of the high pressure gases that force a bullet down the barrel finding other avenues of escape. This is what some people mean by "the gun blew up on me". One sign that this is going to happen soon is that the backs of your brass casings start looking like someone took a sledge hammer to them and flattened out the primers and lettering. This is because the casing is literally being hammered against the bolt face. This can also be caused in reloads by packing the cartridges with too hot of a load, improper powder and overload of powder.

So that's headspace, and why it's important. But what are all these gauges about? They look like little steel cartridges without the bullets. You stick them into the chamber and try to close the bolt. Whether the bolt closes or not -- and whether that's good or bad -- depends upon which gauge you're trying to use.

Using Headspace Gauges

It is important that you use the headspace gauges properly. Used improperly, the gauges will give false and possibly dangerous information. For example, if you place a NO-GO gauge in the chamber, pull the charging handle all the way back and let it fly, the bolt may well close on the gauge due to the buffer spring pressure. However, done properly, e.g. closing the bolt by hand and trying to turn the bolt, the bolt will not close without excessive hand pressure.

GO GAUGE 1.464"

This gauge is used to determine proper headspace. Insert the "GO" gauge in the chamber, then take the bolt, without the extractor or pin ejector and insert it and turn. The bolt should turn on the gauge with some force. If the bolt does not turn on this gauge, the chamber is not reamed to the correct depth or the bolt is oversized. There is inadequate headspace. Thus, if you can close the bolt, it's a "GO" on the barrel/bolt combination.

NO-GO GAUGE 1.470"

This gauge is also used to determine proper headspace. Insert the "NO-GO" gauge into the chamber, then take the bolt, without the extractor or pin ejector, insert it into the extension and turn. The bolt should not turn on this gauge. Do not force the bolt. If the bolt turns on this gauge, the chamber is too deep or the bolt is undersized. There is excessive headspace. Thus, if you can close the bolt, it's a "NO-GO" on the barrel/bolt combination.

FIELD GAUGE 1.474"

The GO and NO-GO gauges are used to check the limits of factory tolerances between the chamber and bolt to ensure that tolerance build-up is neither inadequate nor excessive. The "FIELD" gauge, checks for headspace in excess of the factory tolerances, thus the gauge is used to determine excessive headspace. Insert the "FIELD" gauge into the chamber, then take the bolt, without the extractor or pin ejector, insert it into the extension and turn. The bolt should not turn on this gauge *under any circumstances*. If the bolt turns on this gauge, there is excessive headspace and the WEAPON IS VERY DANGEROUS.

Fortunately, since the wear mechanism for a firearm chamber is to stretch, we only have to worry about the dimension beyond the NO-GO measurement; which is our "field" gauge. The field gauge is sized to be the largest acceptable headspace possible. If you can close the bolt on the field gauge, then the barrel is worn out and it's time to replace it. To continue shooting it is dangerous. In theory, the bolt of a well used rifle will close on a NO-GO gauge too. UNDER NO CIRCUMSTANCES SHOULD A BOLT CLOSE ON A "FIELD" GAUGE. That's when you rebarrel the gun.

Headspace is another matter that needs to be considered when reloading ammunition. In my opinion, it is essential to use a full length resizer die on the cases. This assures that your reloaded ammunition will work in ANY firearm, not just your rifle. The cases

stretch and conform to the chamber they were last fired in and if they conformed to a chamber different than yours (and they did) and you don't full length resize, you may be developing inordinately high chamber pressures, which may lead to a very bad day. I also recommend using a factory crimp die in lieu of a standard roll crimp die. This makes reloading life somewhat easier, since you don't have to trim all the cases to the same length, but you still have to trim cases that are over the maximum.

Since you've got a new gun (with less than 10,000 rounds through it), I would suggest you buy both a GO and a NO-GO gauge. Play it conservative, check the headspace every few thousand rounds and don't go beyond the NO-GO. As you know, most people don't even bother with that but I like to play it real safe.

Basic Rules

For a new gun:

a. Closes on the go gauge
b. doesn't close on the no-go gauge

For an old rifle that's been rode hard and put up wet:

a. closes on the go gauge
b. probably closes on the no-go gauge
c. definitely does NOT close on the field gauge

It's cheap insurance to have a set around for every rifle you have, especially if you shoot a lot. If you plan to change bolts and/or barrels around, you have to check each combination because each setup could vary a few thousandths. Fortunately you only have to do it when you first introduce them to each other, thereafter, every few thousand rounds if you wish.

Headspace

There are a few things that should be pointed out regarding headspace gages. If you look in the Forster catalog for example, you will see the following for .223 Rem:

Headspace Gage Table

GO	NO GO	FIELD	ABS MAX
1.464	1.467	1.470	1.474

If we call 1.464 "ZERO" headspace, then the others are at +3, +6, and +10 respectively. Originally M16 armorers had NO-GO and FIELD gages, but recently they went to one gage which is probably the Abs Max +10 gage. I would not be overly concerned if your rifle closes on a Forster NO-GO gage. Typically the headspace on a rifle will be around +3 to +5-6 or so and will be fine.

Another point is that the headspace gages are chamfered on the edges of the base so no contact is made with the ejector and no tension is applied when the bolt is closed. The proper way to use the gage is to load it in the chamber and let the bolt/carrier drop slowly into position under its own weight. Do not push it down using pressure; doing so will surely give an erroneous reading. If the bolt does not close all the way, then you know the headspace is below that of the gage. You can easily be fooled by several thousandths if you force the bolt closed. This is more of a problem with normal Forster type headspace gages that have flat bottoms that would put the ejector under tension.

6

SIGHTING

Zero an A1 Type Rifle

CONDITIONS

On a 25-meter firing range, given an A1 TYPE rifle, 18 rounds of 5.56-mm ammunition, a 250-meter zero target, and sandbags for support.

STANDARDS

Using 18 rounds or less, the user must battlesight zero his rifle by achieving five out of six rounds in two consecutive shot groups within the 4-centimeter circle. Bullets that break the line of the 4-centimeter circle will be used in evaluating the soldier's performance.

TRAINING AND EVALUATION

Training Information Outline

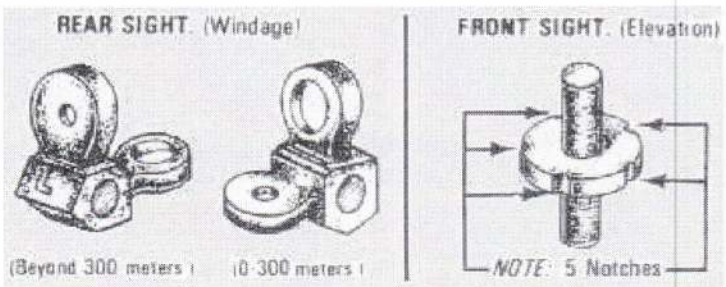
1. The A1 TYPE rifle has two adjustable sights. Elevation adjustments are made on the front sight, and windage adjustments are made on the rear sight.

2. The standard sight system.

   A. The rear sight has two parts: an aperture marked "L" for ranges beyond 300 meters and an unmarked aperture for ranges from 0 to 300 meters (when zeroing with the standard sight, use the aperture marked "L"), and a windage drum for windage adjustments.
   B. The front sight consists of a rotating sight post with a spring-loaded detent.

3. Adjust sights.

   A. Rear sight. To adjust windage, depress detent and rotate drum to desired direction. To move point of impact to right, turn drum clockwise in direction of arrow and letter R. To move left, move drum counterclockwise. Each graduation (notch) moves the point of impact of bullet as indicated below.



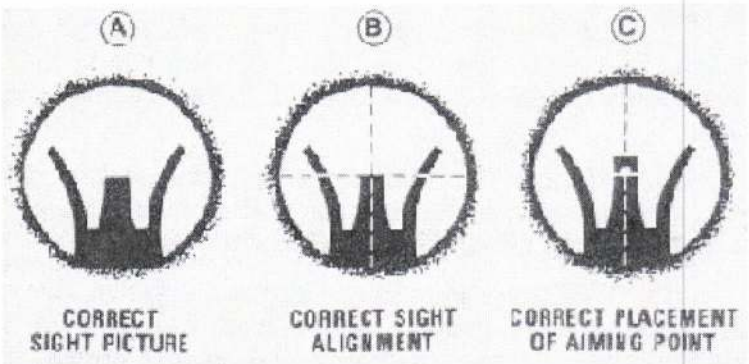
B. Front sight. To adjust elevation, depress detent and rotate post. To raise strike of bullet, rotate post in the direction of arrow marked UP. Reverse the direction of rotation to lower strike of bullet.

4. Battlesight zero the weapon.

Note: *The "L" marked aperture is used to zero theA1 TYPE rifle on the 25-meter range. Once the zeroing is complete, flipping the sight to the unmarked aperture will cause the sights to be zeroed for 250 meters. Flipping the sight back to the "L" marked aperture will automatically extend the zero to 375 meters without additional adjustments to the front sight post.*

A. Sight picture. In aiming, you are concerned with correctly pointing your rifle so the bullet will hit the target when you fire. To do this, you must have the rear sight, the front sight post, and the target or aiming point in their proper relationship. This is known as *sight picture*. A correct sight picture is obtained when the sights are aligned and the aiming point (target) is in the correct relationship to the front sight post. Sight picture includes two basic elements: sight alignment and placement of the aiming point.

B. Sight alignment. To obtain correct sight alignment, align the sights as shown in Figure. Notice that the top center of the front sight post is in the center of the rear sight aperture. If an imaginary horizontal line were drawn through the center of the rear sight aperture, the top of the front sight post would touch this line. If an imaginary vertical line were drawn through the center of the rear sight aperture, the line would bisect the front sight post. You ensure that you have sight alignment by concentrating your attention and focusing your eye on the top of the front sight post through the blurred rear sight aperture. By doing this, you can detect and correct any errors in sight alignment.

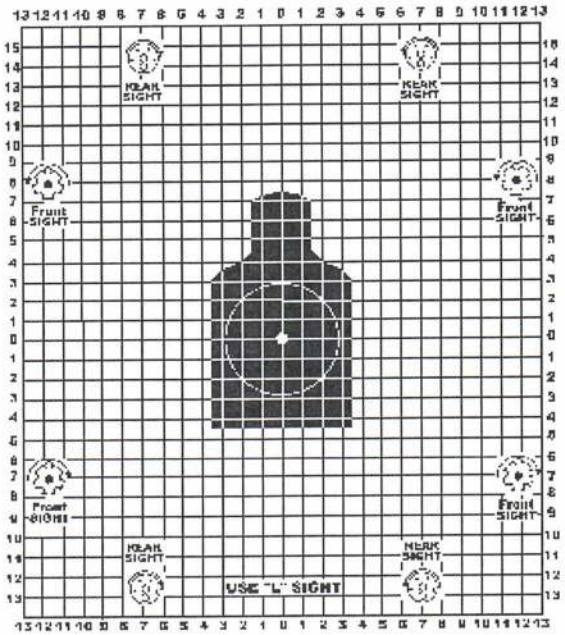


Sight pictures

C. Placement of the aiming point. The aiming point (target on which the firer has aligned his rifle sights) is correctly placed when it is on center of mass of the 250-meter scaled silhouette of the 25-meter target. If the aiming point is correctly positioned, an imaginary vertical line drawn through the center of the front sight post will appear to split the aiming point.

D. Battlesight zero target. Use the standard 25-meter target when determining the battlesight zero for the A1 TYPE rifle. Vertical and horizontal lines are printed on the target with a number value given to each. It also has pictures of front and rear sights with a direction arrow to show which direction to turn the given sight when making adjustments. When firing at this target, aim center of mass and adjust sights to bring the shot groups to the center of the silhouette and within the 4-centimeter circle.

1. Set the front sight post so that the base of the post is flush with the top of the front sight post well, then go clockwise for 11 clicks.
2. Center the rear sight aperture within the rear sight housing by moving the rear sight all the way to the left, then moving it 17 clicks to the right.
3. With the sights in the starting position, fire a three-round shot group. Once a shot group of 4 centimeters or less is achieved, adjust the sights to move the shot group to within the zero circle.



Standard zero target.

4. Find the horizontal (right-to-left) line nearest the center of the shot group. Follow the line left or right to the nearest edge of the target. Move your front sight by number of clicks marked on that target line by turning the front sight in the direction of the arrow in the front sight figure nearest the center of the shot group.
5. Find the vertical (up-and-down) line nearest the center of the shot group. Follow that line to the top or bottom of the target, whichever is nearest. Move the sight by number of clicks marked on that target line by turning the rear sight drum in the direction of the arrow in the rear sight figure nearest the center of the shot group.

5. Upon completion of zeroing, the battlesight setting should be determined and recorded. There are two methods that can be used to determine how many clicks up or down and left or right the sights were moved from the base settings.

CAUTION

AFTER THE INITIAL DETERMINATION OF SIGHT SETTING, THE FOLLOWING PROCEDURES FOR DETERMINING THE BATTLESIGHT ZERO SETTINGS FOR THE FRONT AND REAR SIGHTS OF THE A1 TYPE RIFLE WILL BE DONE ONLY WHEN DOUBT EXISTS AS TO WHETHER THE SIGHTS ARE PROPERLY SET. CONTINUAL CHANGING OF THE SIGHTS MAY CAUSE DAMAGE

A. Record as changes are made. To do this, the firer starts with both sights set at zero (base settings). A three-round shot group is fired, and the sights are changed as indicated by the numbers and pictures on the target. These changes are recorded on a piece of paper as they are made. This procedure continues until a good battlesight zero is obtained.

EXAMPLE: The firer has recorded the following corrections:

Rear Sight	*Front Sight*
L8	UP 5
R2	UP 3
L1	DOWN 2

By adding all the LEFT corrections, then subtracting the RIGHT corrections and all smaller number from the larger number will give the proper correction.

```
   L8 R2        L9
 + L1       =  - R2
-------      -------
   L9           L7
```

Where L7 is the rear sight correction.

The same procedure is repeated for the front sight by adding all the UP corrections and all the DOWN.

```
   UP 5 DOWN 1        UP 8
 + UP 3           = - DOWN 1
-------             -------
   UP 8               UP 7
```

Where UP 7 is the front sight correction.

Note: *When subtracting LEFTs and RIGHTs, and UPs and DOWNs, the remainder will carry the sign of the larger number.*

B. Determine changes after zero. The firer will complete the battlesight zero, making changes as required after each shot group is fired. Upon completion of zeroing, the firer must determine the number of clicks he moved the sight.

1. To do this, he looks at the rear sight and determines which way he must move the rear sight to place it back on center. After looking at the rear sight, the firer determines the rear sight is to the left of center. In order to bring it back to center, he must move it to the right. He carefully moves the sight to the right one click at a time, keeping track of the number of clicks to bring it to center.

   EXAMPLE: The rear sight was moved five clicks to the right to bring it back to center. The zero for the rear sight is, therefore, "left five clicks".

2. To determine the zero for the front sight, use the same procedure: determine which way the sight post must be turned to bring it back to even (base setting). Carefully turn the front sight post one click at a time until the base is even with the top of the sight post well.

   EXAMPLE: The sight post base is above the top of the sight post well. Since the sight post has a right-hand thread, the sight post must be turned to the right to lower the sight.

   The sight post was lowered four clicks; therefore, the zero is "up 4 clicks".

   The battlesight zero for this rifle is "left 5 clicks" and "up 4 clicks".

6. Upon obtaining the battlesight zero, the firer should record the data on a piece of tape and secure it to the rifle. By doing this, should the sights be changed during cleaning, the sights can be returned to the battlesight setting.

ZERO AN AR-15/M16 A2 RIFLE

(ALSO FOR THE A3 TYPE)
CONDITIONS

On a 25-meter range, given an A2/A3 TYPE rifle, 18 rounds of 5.56-mm ammunition, a 300-meter zero target, and sandbags for support.

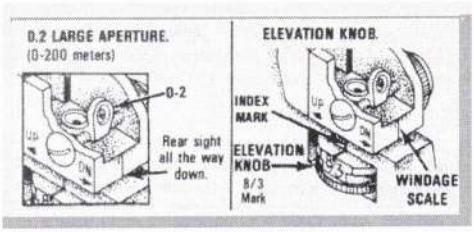
STANDARDS

Using 18 rounds or less, the user must battlesight zero his rifle by achieving five out of six rounds in two consecutive shot groups within the 4-centimeter circle. Bullets that break the line of the 4-centimeter circle will be used in evaluating the soldier's performance.

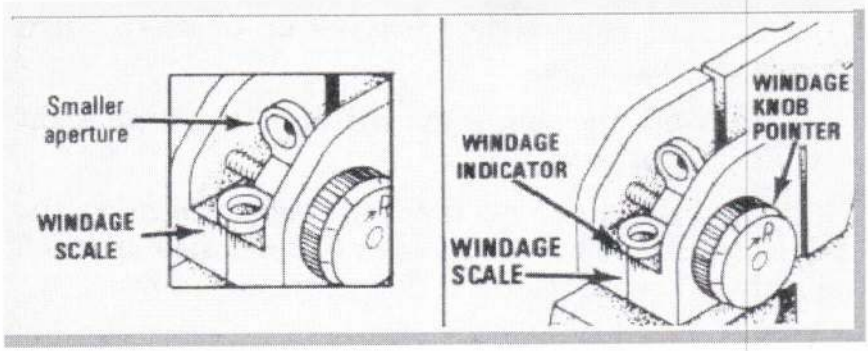
TRAINING AND EVALUATION

Training Information Outline

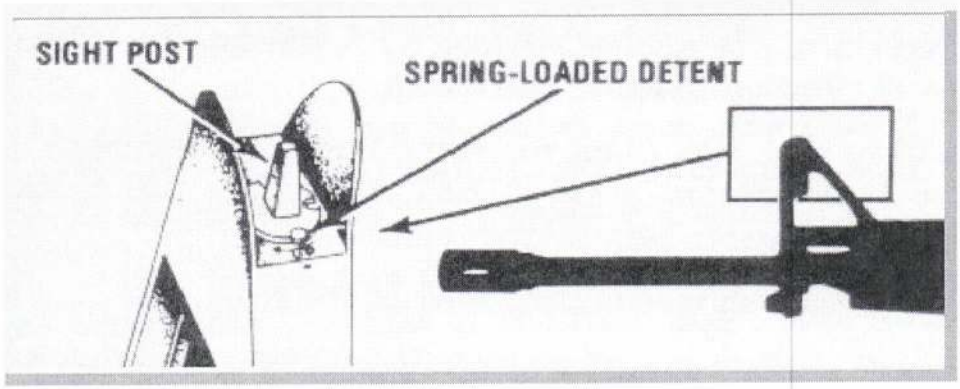
1. The A2/A3 rifle has two adjustable sights -- front and rear. Elevation adjustments are made using the front sight, and elevation changes and windage adjustments are made using the rear sight.
2. The sight systems.
   A. The rear sight has an elevation knob with range indicators from 300 to 800 meters and two apertures for range. One aperture is marked 0-2 for short range from 0-200 meters and an unmarked aperture for normal range from 300 to 800 meters.
      1. The 0-2 (large) aperture is used for short range (Figure 104). This aperture is used only when the rear sight is all the way down. The 8/3 (300-meter) mark on the elevation knob is aligned with the index mark on the left side of the receiver.
      2. The unmarked (small) aperture is used for normal range. This aperture is used for most firing situations. It is used in conjunction with the elevation knob for 300- to 800-meter targets.
   B. The rear sight also consists of a windage knob on the rear side of the sight.
      1. Each click of the windage knob will move the strike on the round from 1/8 inch (.3 centimeters) at 25 meters to 4 inches (10 centimeters) at 800 meters.
      2. A windage scale is on the rear of the sight and the windage knob pointer is on the windage knob.
         a. The front sight consists of a rotating sight post with a spring-loaded detent.



Rear sight



Unmarked aperture **Windage knob**



Front sight

1. The front sight is moved up or down when zeroing the rear sight.
2. Once the rear sight is zeroed, the front sight post should not be moved.
3. Each notch on the front sight will move the strike of the bullet from 3/8 inch (0.9 centimeters) to 2 3/4 inches (7 centimeters) at 200 meters.

3. Sight adjustments.

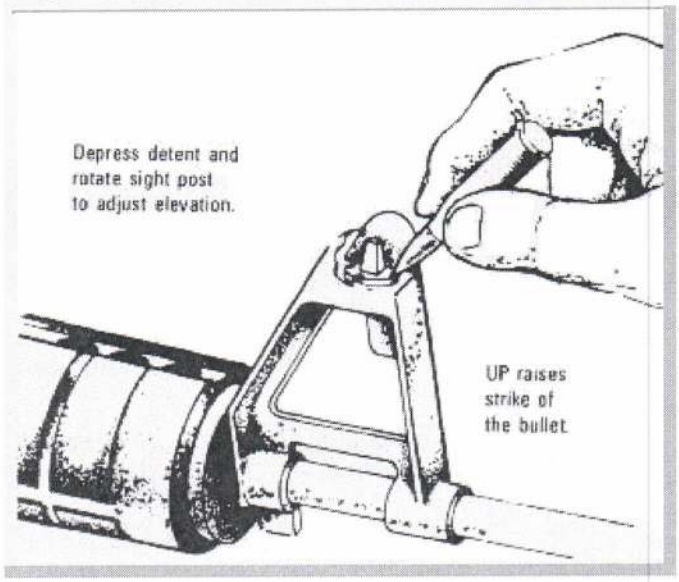
A. Rear sight.

1. To adjust windage or move the strike of the round, turn the windage knob counterclockwise to move the strike to the left and clockwise to move the strike to the right.
2. To adjust elevation, turn the elevation knob until the desired range is indexed at the index mark on the left side on the sight.

B. Front sight. To adjust elevation, depress the detent and rotate the sight post. To raise the strike of the round, rotate the sight post in the direction of the arrow marked UP. Reverse the direction of rotation to lower the strike.

4. Zero the rifle. The following steps will establish a zero at 25 meters, your A2/A3 rifle sights will be set with a 300-meter battlesight zero.

A. Establish mechanical zero on the rifle.
   1. Align the windage indicator mark on the 0-2 aperture with the center line of the windage scale (the unmarked aperture is up).



Depress detent

   2. Rotate the elevation knob down until the range scale 8/3 (300-meter) mark is aligned with the mark on the left side of the receiver.
   3. Rotate the front sight post up or down as required until the base of the front sight post is flush with the top of the sight post well.

B. Zero at 25 meters.

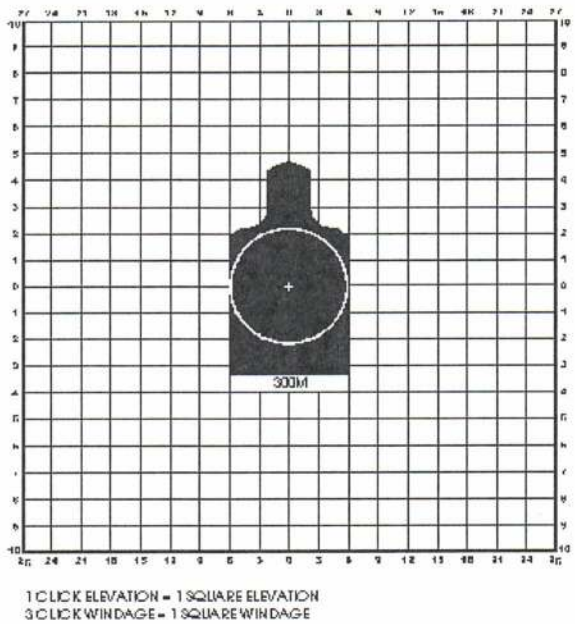
   1. After setting the front and rear sights to mechanical zero, the elevation knob is rotated up (clockwise) one click past the 8/3 (300-meter) mark. The elevation knob will remain in this position until the battlesight zeroing has been completed.

Note: ***Any changes in elevation required during the zeroing procedures will be made using the front sight post only***

2. Carefully aim and fire each shot of a three-shot group at the circle on the silhouette.
3. If your shot group is not within the circle on the silhouette, use the squares on the target to determine the required clicks to move your next shot group into the circle.

Note: ***The squares are numbered around the edges of the target to equal the number of clicks required to move the shot group to the circle.***

4. To raise your next shot group, rotate the front sight post UP (clockwise). To lower your next shot group, rotate the front sight post DOWN (clockwise). One click will move the strike of the round one square on the target.
5. To move the shot group to the left, turn the windage knob counterclockwise. To move the shot group to the right, turn the windage knob clockwise. Three clicks of the windage knob will move the strike of the round one square on the target.
6. Continue to fire three-round shot groups and make corrections until you have a tight shot group in the circle on the silhouette.



25-meter zero target

7. If your shot group is within the circle, your rifle is now "calibrated."
8. To place your 300-meter zero on the rifle, you must rotate the elevation knob one click counterclockwise. The 8/3 (300-meter) mark on the elevation knob should now be aligned with the index mark on the left side of the sight.

Notes:

1. There are clicks between the range numbers as you turn the elevation knob. Use these clicks if you need more elevation past a certain range number to hit a target.

2. The unmarked aperture is automatically zeroed to 200 meters. Use the 0-2 aperture when shooting at night or at close ranges; for example, in an urban environment or in dense jungle.

5. Sight setting. Your rifle sights should be kept set to a combat zero of 300 meters. If you are told to engage a target at a longer range; for example, 500 meters:

A. Rotate the elevation knob so that the desired range mark is aligned with the index mark on the left side of the sight.
B. Engage the target.
C. When the engagement is over, return the sight to the 300-meter setting

Note: *When the rifle has been zeroed to 300 meters, all other ranges on the elevation knob are also zeroed.*

An Improved Battlesight Zero for the M4 Carbine and M16A2 Rifle

Current Army/Marine Corps battlesight zero and its procedures are well described in TM9-1005-319-10, the M16/M4 operator's manual.

The current 300 meter battlesight zero is a function of the sights on the rifle and I personally find it shoots too high for the vast majority of combat targets, including the Army's qualification ranges. The procedure listed here takes better advantage of the flat trajectory of these rifles as well as the use of civilian ranges, which are seldom surveyed in meters.

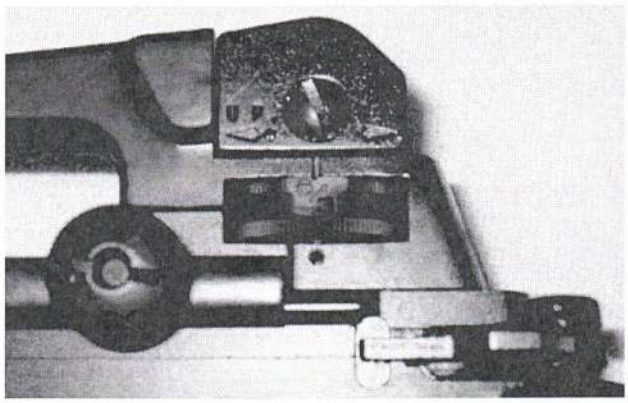
When zeroed at 200 meters, a distance twice that of normal combat engagements, these rifles have a very flat trajectory that is less then 2" from line of sight at all intermediate distances; a distance that's smaller than the normal dispersion of arsenal or factory loaded ammunition. This tiny trajectory arc allows very precise shooting out to 250 meters where the bullet is only 2" below line of sight.

A 200 meter zero has the happy coincidence of an initial trajectory cross-over at 50 yards, a distance available on almost all civilian ranges including many indoor ranges. This makes it easy to achieve a 200 meter battlesight zero without recourse to surveying your own range. If 200 meters is available you can fine-tune the zero at the real distance. And should when you get the chance.

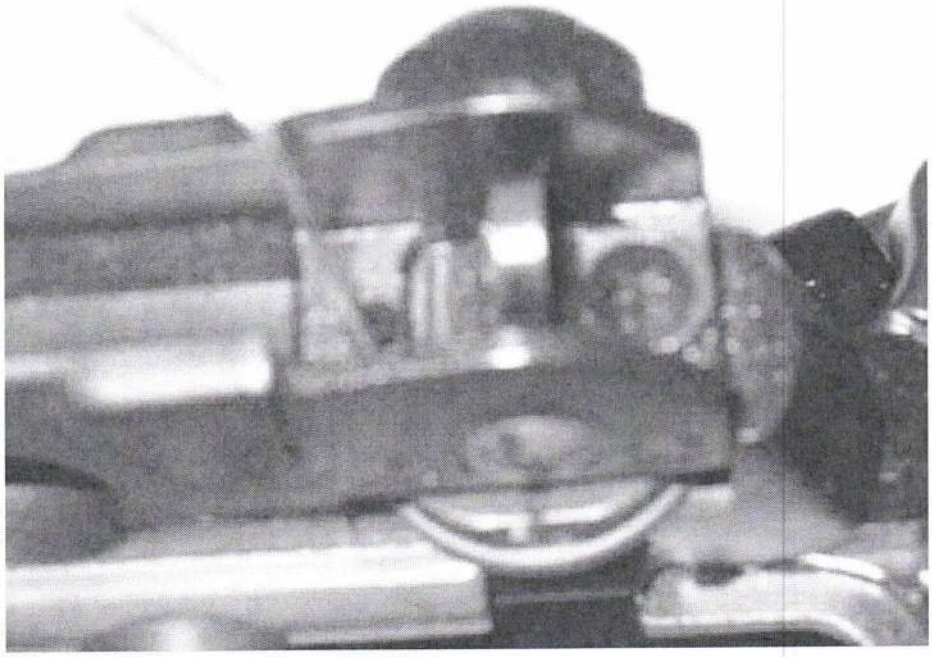
The lowest sight setting, however, on these sights is 300 meters so the sight needs to be modified to preserve the markings on the sight (despite the fact that no one ever sets a range on these in the real world other than a USMC range). The sight needs to be set to bottom out at 8/3 -2 clicks. This will be the new 200-meter setting.

1. Flip the rear sight back to the unmarked aperture. This will reveal a hole in the top of the handle.

2. Rotate the sight wheel all the way down. Will probably be exactly at 8/3 (6/3). Don't force it down.



3. Using a 1/16" Allen wrench loosen the screw (under the revealed hole) in the sight wheel 3 full turns. Leave the wrench in the screw.



4. Rotate the bottom half of the sight wheel two clicks clockwise. This will raise the sight body if you look at it while you're turning it.

5. Tighten the Allen screw, remove the wrench, and confirm the sight bottoms out at 2 clicks BELOW 8/3. If not repeat the procedure until it's right.

6. Battlesight the rifle per the -10 with the following exceptions:

a. Sight should be at 8/3 -2 clicks, that is, all the way down, not up a click. Please note removable handle sights are marked 6/3 (rather than 8/3); also some are in 'half-clicks' as well. There should be 3 clicks between 3 and 4 on the knob. If there are 6 clicks then the sight needs to be set at –4 clicks (instead of –2).

b. Small aperture, nose to firing handle weld.

c. Distance is 50 yards.

d. Point of aim should be point of impact of bullet.

e. Remember you're adjusting the FRONT SIGHT for elevation, not the rear, and that each click is about 1/2" (actually a little more) at 50 yards. You won't get it closer than that. Don't frustrate yourself trying.

7. You're done. Leave the sight in this position for 99% of your shooting.

If you have to shoot targets you KNOW are 300 meters away or more, just click to the right number on the sight.

If you're patrolling, set the sight to 8/3 and snap the aperture forward to 0-2. This will provide the same trajectory as above but with a larger, easier to see thru rear sight. Use this setting if you also have the M68 mounted as it's quicker to transition to if the sight fails.

If you have an M68 CCO (Aimpoint CompM-XD) optical sight battlesight it to 50/200 as well. You can shoot to 300 meters by merely holding "over a dot."

This battlesight zero is valid to 300 meters for both the M16A2 and M4 Carbines and their AR15 sisters. It's valid with any ammunition that approaches the specs for M193 (55gr) or M855 (62g) Ball ammunition. It works for both rifles and carbines due to the offsetting influence of higher muzzle velocity in the rifle being offset by the longer sight radius that moves bullet strike less per click. This is battlesight, not X-ring shooting!

This battlesight zero does not reflect the doctrine of the US Armed Forces, however, it reflects the personal use of these weapons in combat and in training for over 34 years.

Comments to: Lt. Colonel Chuck Santose (santose@compuserve.com).

Original document: 990104

Note To Users of Carbines with the A1 style rear sight or users of Flip-Up Sights: This 50 yard zero works really well. If you have the original sight aperture use the unmarked (short range) hole to zero the rifle. If you have upgraded, and use the A2 style aperture (or the A.O. Same Plane sight), then use the small (long range) hole for zeroing.

American Eagle 55gr FMJ 50 Yd Zero on AR15/M15

Range (yards)	Velocity (ft/sec)	Energy (ft-lbs)	Momentum (lbs-sec)	Drop (inches)	Windage (inches)	Lead (inches)	Time (sec)
0	2875.4	1009.7	0.70	-2.5	0.0	0.0	0.000
25	2827.4	976.3	0.69	-1.1	0.0	0.0	0.026
50	2780.0	943.8	0.68	-0.0	0.2	0.0	0.053
75	2733.0	912.2	0.67	0.8	0.4	0.0	0.080
100	2686.6	881.4	0.66	1.4	0.6	0.0	0.108
125	2640.7	851.5	0.64	1.6	1.0	0.0	0.136
150	2595.2	822.5	0.63	1.5	1.5	0.0	0.165
175	2550.3	794.3	0.62	1.1	2.0	0.0	0.194
200	2505.9	766.8	0.61	0.4	2.6	0.0	0.224
225	2461.9	740.2	0.60	-0.7	3.4	0.0	0.254
250	2418.5	714.3	0.59	-2.1	4.2	0.0	0.285
275	2375.5	689.1	0.58	-3.9	5.1	0.0	0.316
300	2333.0	664.7	0.57	-6.1	6.1	0.0	0.348
325	2291.0	640.9	0.56	-8.7	7.2	0.0	0.380
350	2249.4	617.9	0.55	-11.7	8.5	0.0	0.413
375	2208.2	595.5	0.54	-15.1	9.8	0.0	0.447
400	2167.2	573.6	0.53	-19.0	11.2	0.0	0.481
425	2126.7	552.3	0.52	-23.3	12.8	0.0	0.516
450	2086.6	531.7	0.51	-28.1	14.5	0.0	0.552
475	2046.9	511.6	0.50	-33.4	16.3	0.0	0.588
500	2007.6	492.2	0.49	-39.3	18.2	0.0	0.625
525	1968.8	473.4	0.48	-45.7	20.3	0.0	0.663
550	1930.5	455.1	0.47	-52.6	22.4	0.0	0.701
575	1892.7	437.5	0.46	-60.1	24.8	0.0	0.740
600	1855.4	420.4	0.45	-68.2	27.2	0.0	0.780
625	1818.6	403.9	0.44	-77.0	29.8	0.0	0.821
650	1782.3	387.9	0.44	-86.4	32.5	0.0	0.863
675	1746.6	372.5	0.43	-96.5	35.4	0.0	0.905
700	1711.4	357.7	0.42	-107.3	38.5	0.0	0.949
725	1676.7	343.3	0.41	-118.9	41.7	0.0	0.993
750	1642.5	329.5	0.40	-131.2	45.1	0.0	1.038
775	1609.0	316.1	0.39	-144.3	48.6	0.0	1.084
800	1575.9	303.3	0.38	-158.3	52.3	0.0	1.131

American Eagle 55gr FMJ (25yd Zero on AR15/M16)

Range (yards)	Velocity (ft/sec)	Energy (ft-lbs)	Momentum (lbs-sec)	Drop (inches)	Windage (inches)	Lead (inches)	Time (sec)
0	2875.4	1009.7	0.70	-2.5	0.0	0.0	0.000
25	2827.4	976.3	0.69	-0.0	0.0	0.0	0.026
50	2780.0	943.8	0.68	2.2	0.2	0.0	0.053
75	2733.0	912.2	0.67	4.2	0.4	0.0	0.080
100	2686.6	881.4	0.66	5.8	0.6	0.0	0.108
125	2640.7	851.5	0.64	7.2	1.0	0.0	0.136
150	2595.2	822.5	0.63	8.2	1.5	0.0	0.165
175	2550.3	794.3	0.62	8.9	2.0	0.0	0.194
200	2505.9	766.8	0.61	9.3	2.6	0.0	0.224
225	2461.9	740.2	0.60	9.4	3.4	0.0	0.254
250	2418.4	714.3	0.59	9.1	4.2	0.0	0.285
275	2375.5	689.1	0.58	8.4	5.1	0.0	0.316
300	2333.0	664.7	0.57	7.3	6.1	0.0	0.348
325	2290.9	640.9	0.56	5.8	7.2	0.0	0.380
350	2249.4	617.9	0.55	3.9	8.5	0.0	0.413
375	2208.2	595.5	0.54	1.6	9.8	0.0	0.447
400	2167.2	573.6	0.53	-1.2	11.2	0.0	0.481
425	2126.7	552.3	0.52	-4.4	12.8	0.0	0.516
450	2086.5	531.7	0.51	-8.1	14.5	0.0	0.552
475	2046.8	511.6	0.50	-12.3	16.3	0.0	0.588
500	2007.6	492.2	0.49	-17.0	18.2	0.0	0.625
525	1968.8	473.4	0.48	-22.3	20.3	0.0	0.663
550	1930.5	455.1	0.47	-28.1	22.4	0.0	0.701
575	1892.7	437.5	0.46	-34.5	24.8	0.0	0.740
600	1855.4	420.4	0.45	-41.5	27.2	0.0	0.780
625	1818.6	403.9	0.44	-49.2	29.8	0.0	0.821
650	1782.3	387.9	0.44	-57.5	32.5	0.0	0.863
675	1746.5	372.5	0.43	-66.4	35.4	0.0	0.905
700	1711.3	357.6	0.42	-76.1	38.5	0.0	0.949
725	1676.6	343.3	0.41	-86.6	41.7	0.0	0.993
750	1642.5	329.5	0.40	-97.8	45.1	0.0	1.038
775	1608.9	316.1	0.39	-109.8	48.6	0.0	1.084
800	1575.9	303.3	0.38	-122.7	52.3	0.0	1.131

Federal 62gr Bonded Tactical (50yd Zero on AR15/M16)

Range (yards)	Velocity (ft/sec)	Energy (ft-lbs)	Momentum (lbs-sec)	Drop (inches)	Windage (inches)	Lead (inches)	Time (sec)
0	2722.2	1020.1	0.75	-2.5	0.0	0.0	0.000
25	2675.9	985.7	0.74	-1.1	0.0	0.0	0.028
50	2630.1	952.2	0.72	-0.0	0.2	0.0	0.056
75	2584.8	919.7	0.71	0.8	0.4	0.0	0.085
100	2539.9	888.1	0.70	1.2	0.7	0.0	0.114
125	2495.6	857.4	0.69	1.4	1.1	0.0	0.144
150	2451.8	827.5	0.68	1.1	1.6	0.0	0.174
175	2408.4	798.5	0.66	0.5	2.2	0.0	0.205
200	2365.6	770.3	0.65	-0.4	2.8	0.0	0.236
225	2323.2	743.0	0.64	-1.8	3.6	0.0	0.268
250	2281.3	716.4	0.63	-3.5	4.5	0.0	0.301
275	2239.8	690.6	0.62	-5.7	5.5	0.0	0.334
300	2198.6	665.5	0.61	-8.3	6.6	0.0	0.368
325	2157.8	641.0	0.59	-11.3	7.8	0.0	0.402
350	2117.3	617.2	0.58	-14.9	9.1	0.0	0.438
375	2077.3	594.0	0.57	-18.9	10.6	0.0	0.473
400	2037.7	571.6	0.56	-23.4	12.2	0.0	0.510
425	1998.6	549.9	0.55	-28.4	13.9	0.0	0.547
450	1959.9	528.8	0.54	-34.0	15.7	0.0	0.585
475	1921.7	508.4	0.53	-40.1	17.6	0.0	0.623
500	1884.0	488.6	0.52	-46.9	19.7	0.0	0.663
525	1846.8	469.5	0.51	-54.2	22.0	0.0	0.703
550	1810.1	451.0	0.50	-62.2	24.3	0.0	0.744
575	1774.0	433.2	0.49	-70.8	26.8	0.0	0.786
600	1738.3	416.0	0.48	-80.2	29.5	0.0	0.829
625	1703.2	399.4	0.47	-90.2	32.3	0.0	0.872
650	1668.7	383.3	0.46	-101.0	35.3	0.0	0.917
675	1634.7	367.9	0.45	-112.6	38.5	0.0	0.962
700	1601.2	353.0	0.44	-125.0	41.8	0.0	1.009
725	1568.3	338.6	0.43	-138.2	45.3	0.0	1.056
750	1536.2	324.9	0.42	-152.4	48.9	0.0	1.104
775	1504.7	311.7	0.41	-167.4	52.8	0.0	1.154
800	1473.9	299.0	0.41	-183.4	56.8	0.0	1.204

Federal 62gr Bonded Tactical (25yd Zero on AR15/M16)

Range (yards)	Velocity (ft/sec)	Energy (ft-lbs)	Momentum (lbs-sec)	Drop (inches)	Windage (inches)	Lead (inches)	Time (sec)
0	2722.2	1020.1	0.75	-2.5	0.0	0.0	0.000
25	2675.9	985.7	0.74	-0.0	0.0	0.0	0.028
50	2630.1	952.2	0.72	2.2	0.2	0.0	0.056
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175	2408.4	798.5	0.66	8.2	2.2	0.0	0.205
200	2365.6	770.3	0.65	8.4	2.8	0.0	0.236
225	2323.2	743.0	0.64	8.1	3.6	0.0	0.268
250	2281.3	716.4	0.63	7.5	4.5	0.0	0.301
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300	2198.6	665.4	0.61	4.9	6.6	0.0	0.368
325	2157.8	640.9	0.59	2.9	7.8	0.0	0.402
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800	1473.8	299.0	0.41	-148.3	56.8	0.0	1.204

7

TROUBLESHOOTING

Jamming Problems

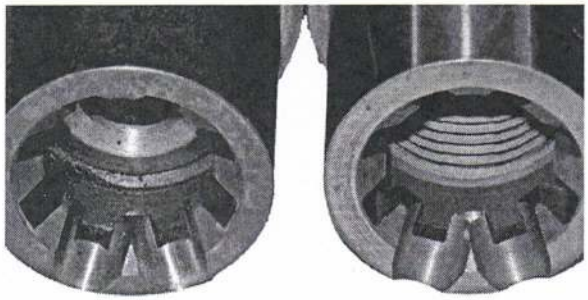
There are certain things to look out for here. If you carefully inspect some critical parts you can build a parts gun that is as reliable as any. Jamming can occur from short cycling, poor extraction or ejection. If you are firing in full auto mode, make sure that the extractor spring insert (the small piece of plastic) is inserted in the extractor spring. If it is not, the rhythm of the action may set up harmonic vibrations in the extractor spring, causing extraction problems.

Binding Bolt Carrier

First check for binding in the bolt carrier. With the charging handle in place and the upper detached, slide the bolt carrier in and out without chambering any rounds. The carrier should slide in and out very freely without requiring much force. Bad carrier keys are common and have been known to cause binding that will cause a lot of wear on the upper and lead to jams. Make sure the buffer, spring and tube are properly lubed. The buffer tube should be smooth with no lathe turning ridges. With the weapon assembled, pull the charging handle back and note some force is required to cock the hammer. Then let the handle fall back and repeat. There will be some dragging of the carrier on the hammer, but it should not require much force. Try again, keeping the trigger pulled. This time the disconnector will keep the hammer pulled back even farther, so the dragging will be very light but still there. There may be a problem with the lower/hammer if too much drag exists.

Failure to Feed

Feeding problems can be attributed to several causes. The buffer spring may be worn, as these have about a 12K round life. The other most likely cause is your ammunition. Ammunition may be under powered, which can also cause problems like not recocking the weapon, or fail to ejects as the bolt carrier may not come back enough. The other likely cause may be that the bullet shape is too fat to feed up the feed ramps, meaning that the feed ramp may not be wide enough. The feed ramps on the right are opened up (called M4 feed ramps), where the feed ramps on the right are normal sized.



Ejector Tension

Bad ejector tension is a major stumbling block that can be very frustrating and has lead people to sell their guns or pay gunsmiths a lot of money. Aftermarket bolts are frequently assembled using the same springs for the ejector as is used as a detent spring elsewhere on the gun. The problem is that the ejectors themselves vary in length and possibly the holes in the bolts do too, so when these springs are used, they usually create excessive force on the ejector. The gun may appear to function properly but after a rapid fire string in the summer, cases will start jamming up into the gas tube groove in the upper receiver. At a DCM match this then leads to a number of helpful people poking at your gun with screwdrivers trying to get the case out.

What has been observed is that a strong ejector tension will kick the brass out at about 5 o'clock 10-12 feet back. The gun will mostly function OK until the spring heats up and loses tension. The brass will not kick out as far and then jams occur. Proper ejector tension can be achieved by cutting or grinding the spring so there is practically no tension when the ejector pin is installed. The brass will then typically kick out about 2-3 ft at 2-3 o'clock, and there will be no more jam problem. Apparently when the ejector tension is very high the gun will operate, or low it will operate properly, but in between it will jam.

Short Cycling

If rounds are sometimes not chambered it is due to the bolt not coming back all the way. This also causes jams since the case may not be ejected. The problem is either something is binding, a bad part, the gas system or the ammo.

Binding

Here you might look at the lands of the bolt carrier and the mating races on the upper receiver. Make sure there are no nicks, gouges or otherwise rough surfaces. If you find any, they may be removed with some very fine grit sandpaper or a fine file.

Bad Ammo

The AR-15/M16 is a very ammunition sensitive rifle system. When the original contracts were let, the ammunition specification was relaxed to allow using up some existing powder reserves. This powder was originally used in the M1 Garand rifle. This powder was too dirty and did not develop the chamber pressures necessary to operate the action of the rifle. This was one of the major things that caused the rifle to get a bad reputation in early Viet Nam. The bottom line, use good ammo! I have seen some plastic bullets for use in rifles at indoor ranges. It is my experience that these rounds do not develop enough chamber pressure to operate the action. I even tried trimming down the buffer spring to find one that would work with the plastic ammo... didn't work after removing as much as 4" from the spring.

When firing .22LR in an adapter, NEVER use lead bullets, ALWAYS use jacketed bullets. Lead bullets will foul up the chamber in no time. Then you will have to scrape the leading out or if you fire any .223 without clearing the lead, you may damage the chamber.

Gas System

The gas tubes are supposed to be self cleaning and seldom plug up unless perhaps you are using weak loads that produce a lot of carbon. Using a .22 LR adapter and firing a lot of rounds can cause the gas system to become clogged. You should run some regular .223 ammo through every hundred rounds or so to keep the gas system clean. You may also find serious carbon build up in and around the carrier key.

It is important to know your gas system and where the possible leakage points are: near the front sight, at the carrier key, at the gas rings, and where the bolt extends through the carrier by the firing pin. There will typically be some leakage at the front sight as seen by some black deposits, but if the tube fits tight it is probably OK. The bolt post to carrier hole clearance is typically very tight - less than .005". I have seen a number of "loose" fitting bolts, but the guns ran fine. If the bolt does not fall out of the carrier when you invert it, the gas rings are probably OK. Gas rings will rotate when you fire the gun and are not like car rings that seal into position. I have heard of problems where the ring gaps lined up, but have not seen any. It is a good idea to separate the gaps each time you install the bolt anyway. The biggest source of gas leak trouble is the carrier key to gas tube contact. With the bolt removed from the carrier and the charging handle removed, slide the carrier into the weapon and "feel" for any drag where the carrier key comes into contact with the end of the gas tube. You may have to gently bend the end of the gas tube to the point you feel very little drag when the key engages the tube.

Bad Part

I have seen some upper buttstock bolts made that did not have holes drilled through them. These will definitely cause a short cycling problem since the air in the buffer tube will not have a place to escape. It will act like an air cushion and prevent the bolt from cycling fully to the rear.

Carrier Key

There are a lot of bad carrier keys out there. This is the one item that should be looked at very carefully. Not only are they a source of potential bolt/carrier binding, but they can cause excessive gas leakage if the fit to the gas tube is bad. Gas tubes have a little ridge on them where they fit into the carrier key that determines the degree of gas leak sealing. All the new gas tubes I have seen have a quite uniform diameter ridge and have not been a problem except when they get worn down. The ridge can wear down a couple thousandths which then can cause excessive leakage. This can happen after 1000 rounds or so, but the quality of your carrier key can definitely affect this. A ridge on the inside of the key can cause the gas tube to wear prematurely and lead to an excessive gas leak problem. Even supposedly GI issue carrier keys have sometimes been known to have fairly rough inside surfaces, so pick them carefully.

8

AR-15 vs M16 PARTS

This section is intended to help you to understand the difference between semiautomatic AR15 rifle parts and those designed for fully automatic M16 rifle parts. The BATFE has interpreted the law such that parts which would convert a firearm into an NFA firearm are subject to registration including:

- Any combination of parts designed and intended for use in converting weapons into machineguns;
- Any part designed and intended solely and exclusively for converting a weapon into a machinegun;
- Any combination of parts from which machineguns can be assembled if the parts are in the possession or under the control of a person;

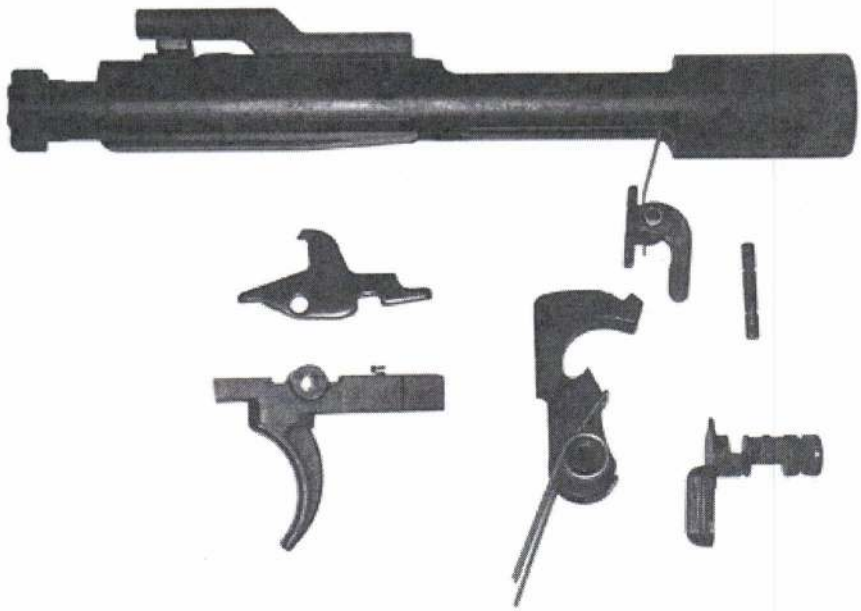
(see ATF FAQ for more details)

Due mostly to ignorance on the part of dealers and the general public, there are many rifles out there that are violating the law unknowingly. Most will have a couple of parts, and though the rifle will not be capable of full automatic fire, will still be in violation of the law. It is important to check your rifles and those you consider purchasing, since the penalties can be harsh:

> From: [49 U.S.C. 781-788, 26 U.S.C. 5861, 26 U.S.C. 5872]
> Violators may be fined not more than $250,000, and imprisoned not more than 10 years, or both. In addition, any vessel, vehicle or aircraft used to transport, conceal or possess an unregistered NFA firearm is subject to seizure and forfeiture, as is the weapon itself.

Needless to say, the risks are not worth it so it is important to be able to identify the AR15 –vs- M16 parts; included here are the trigger, disconnector, hammer, selector, bolt carrier, and auto sear. While it is unlikely that you will ever find the auto sear in a non NFA weapon, any combination of the others is possible.

M16 Full Automatic Parts



1. Full Tail Bolt Carrier
2. 3 or 4 position Selector Switch
3. Auto Sear
4. Hammer with a Tail
5. Long Tailed Disconnect
6. Trigger with Open End to accept the Long Tailed Disconnect.

(Needed is a receiver that accepts the Auto Sear)

Trigger

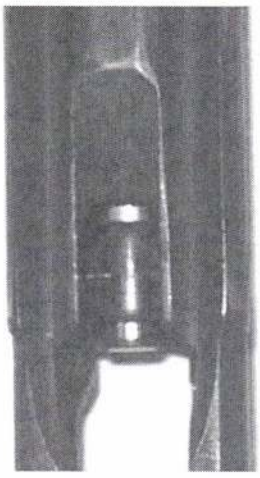
Triggers are very similar; only difference is that the M16 trigger has an open channel at the rear and the semiautomatic trigger is filled in. This is ended trigger is to accommodate the M16 disconnector which has a long tail. (AR15 left, M16 right)

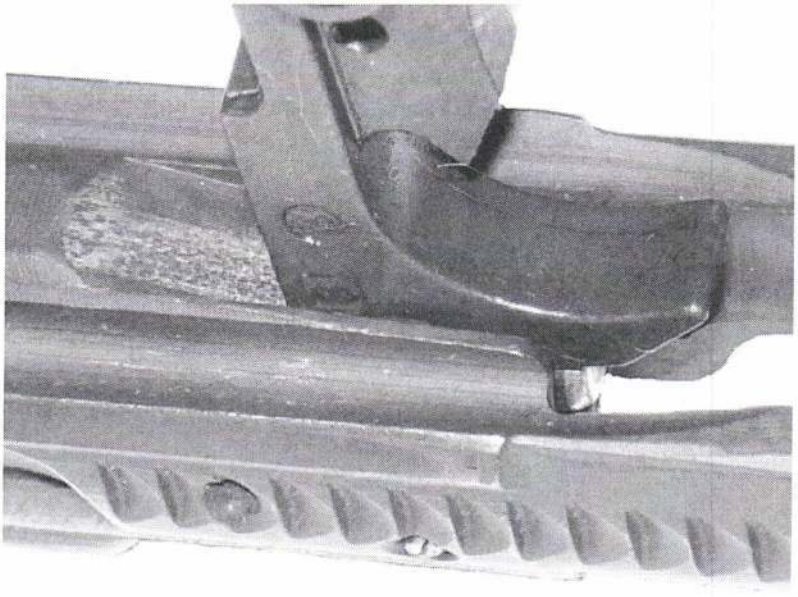
Disconnector

There are several versions of disconnectors for the AR-15. The AR15 disconnector has not tail, where the M16 disconnector has a tail that works in conjunction with the auto sear and safety selector.

Hammer

The M16 hammer has a "tail" (pictured on the left). The tail catches on the auto sear and is hung up there until the tail of the bolt carrier trips the auto sear which releases the hammer to go forward. AR15 hammers do not have a tail and are smooth on the backside. The middle hammer (AR15) has a flat face, and the right hammer (AR15) has a notch at the top of the face. The notched AR15 hammer is designed to catch on the unshrouded bolt carrier if the hammer tries to follow or ride the firing pin forward, which will cause the action to lock up before firing can occur.





Selector

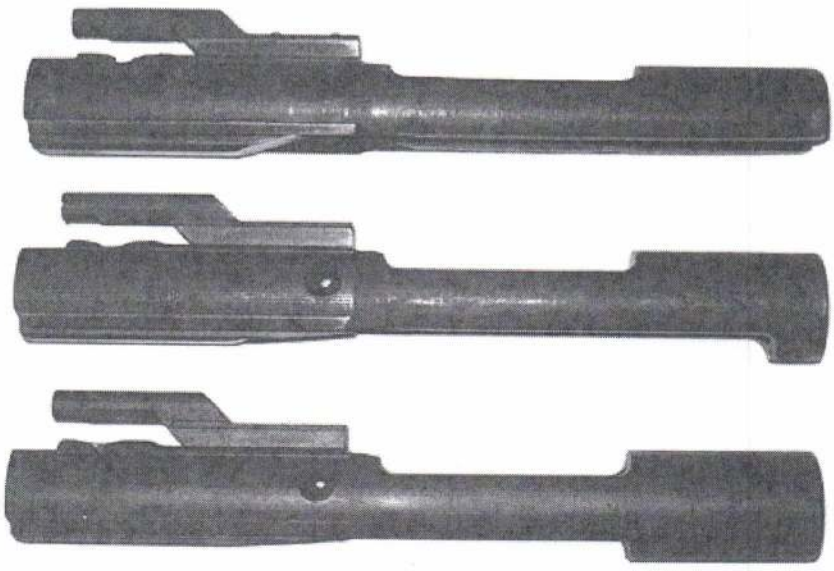
The M16 selector has a several additional cuts and can be easily distinguished from the AR15 version. In addition, the M16 selector will be capable of being rotated to the three or four positions. Pictured: AR15 selector on the right, note only one flat cut out which only allows a safe/semiautomatic modes. M16 3-position selector on the right which has two flat cut outs which allows safe/semiautomatic/automatic or burst modes.

Bolt Carrier

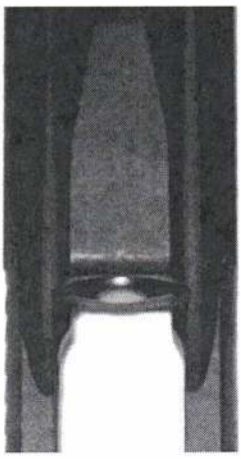
All bolt carriers essentially start out the same and are then machined out from there. The M16 bolt carrier has a large mass of metal on the underside at the back, approximately 2" in length of which we call a tail. The tail of the M16 bolt carrier makes contact with the auto sear, which trips the auto sear into releasing the hammer, which occurs just about the point of bolt lock up.

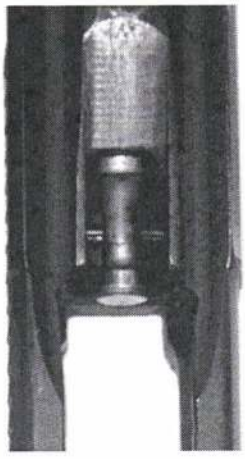
Pictured from top to bottom are:

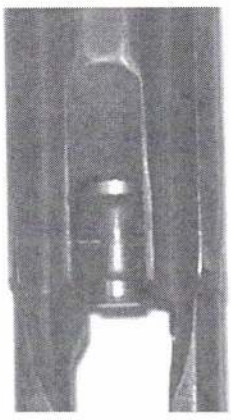
- Colt Sporter Block Carrier (No Tail)
- AR15 Bolt Carrier (Short Tail)
- M16 Bolt Carrier (Long Tail)



Some bolt carriers will have additional metal on the underside to expose the collar of the firing pin. The exposed firing pin, when combined with the shelf cut faced hammer will prevent firing if the hammer tries to ride against the firing pin on bolt carrier assemblys' travel forward.







There are some "hybrid" carriers that do not have this area open and yet only have the 1/2" closed bottom section in the back. There are others that appear to be M16 carriers, but apparently have had 1/4" of the rear "sear trip" section milled, and so do not qualify as M16 carriers because they cannot trip a sear.

Conclusion

Having M16 parts in your AR15 does not mean that it will be capable of automatic fire but it does mean that you are probably in violation of the law. Do not put M16 parts into your AR15 as it is against the law. Check your rifles and replace any parts that do not belong. Obey the law!!!

9

BARREL TWIST / BALLISTIC ISSUES

What determines the rate of twist:

Bullet weight

Bullet shape

Bullet bearing surface on the lands and grooves in the barrel

Twist Rate:

1:14 40-45gr. Short Projectile

1:12 50-60gr. Standard Rate

1:9 55-68gr.

1:7 62-80gr.+ Long Projectile

Military uses 1:7 because of the long length of the tracer round.

Heavy Barrel:

Stiffness makes for less vibration and heat and gives better accuracy.

Barrel Length:

Delivers good high velocity, 2800-3000fps. Velocity gives good wound severity. Temporary wound cavity of rifle round creates greater tissue damage. The penetration of the rifle round through hard mediums is better.

Soft nose and hollow points in .223 will not penetrate two common walls found in homes. Handgun rounds from submachine guns will. The .223 in softnose and hollowpoint tent to fragment and yaw which decreases penetration. The projectile is light with a fast velocity.

When the velocity is decreased because of short barrels, the projectile does not fragment as much and seems to penetrate more. On average it takes 14" of barrel to get a full powder burn for maximum velocity.

Bullets 55-64gr work well.

10

ASSEMBLY WORKSHEETS

Disassembly Procedure For Upper Receiver

Bolt Carrier Group

1. Remove the bolt carrier from the weapon by pulling rearward on the charging handle. The bolt carrier will be pulled to the rear with the charging handle. Set the charging handle aside.

2. Remove the firing pin retaining key from the bolt carrier.

3. Remove the firing pin from the rear of the bolt carrier.

4. Push the bolt back into its locked position.

5. Turn the cam pin 90 degrees and remove it from the carrier.

6. Remove the bolt from the carrier by pulling forward with a "twisting motion".

7. Remove the extractor from the bolt by pushing the retaining pin out and lifting out the extractor spring.

8. Remove the ejector by driving out the retaining pin and removing the ejector and spring from the front of the bolt.

9. Remove the bolt carrier key (only if necessary).

Barrel Group

1. Remove the front sight post by depressing the sight dent and unscrewing the sight post. Remove the spring and detent.

2. Remove the compensator/flash suppressor and spacer/washer.

3. Remove the front sight assembly (gas block) by driving out the two tapered retaining pins from **LEFT to Right.**

4. Slide the front sight assembly and handguard cap off the end of the barrel.

5. Remove the gas tube by driving out the retaining roll pin using a roll pin punch (Left to Right).

6. Remove front swivel rivet if necessary.

7. Place the upper receiver in the vise assembly and remove the barrel retaining unit.

8. Remove the split ring from the barrel nut assembly. Separate the split ring, hand guard ring and the barrel nut (only if necessary).

9. Remove the barrel with a pull and twist motion.

10. Remove the ejection port cover pin by either pulling forward past the end of the receiver or if the barrel is in place, remove the "C" clip and pull it to the rear.

11. Remove the ejection port cover and spring.

Rear Sight (Adjustable)

1. Remove windage knob by driving out the retaining pin.

2. Remove windage knob, detent spring and ball bearing.

3. Unscrew the rear sight screw and lift out the sight and the sight leaf spring.

4. Remove the elevation knob pin by driving it out with a punch (**Left** to **Right**).

5. Remove the sight base and spring by turning the elevation knob up until the sight base is released. A ball bearing and spring will fall out of the corner of the sight base.

6. Cover the sight with a cloth and remove the elevation knob by pushing it to the left. A ball bearing and spring will pop out of the sight.

Rear Sight (Standard)

1. Remove the windage drum roll pin with a punch.

2. Remove the windage drum, spring and detent.

3. Unthread the windage screw.

4. Remove the sight and leaf spring.

Forward Assist

1. Remove forward assist assembly roll pin with a punch.

2. Remove forward assist and spring.

3. Further disassembly of the forward assist is not needed unless it is damaged.

Reassembly of Upper Receiver

1. Insert the forward assist assembly and spring into the receiver.

2. Drive forward assist pin into place.

Rear Sight (Adjustable)

1. Insert spring and detent (ball bearing) for rear elevation knob.

2. Remove the index screw from the elevation know with a 1/16 inch hex wrench.

3. Using a punch, hold down the spring and detent and insert the elevation knob into the receiver.

4. Insert the spring and detent (ball bearing) into the corner of the rear sight housing and engage the threads into the elevation knob.

5. Turn elevation knob until the sight base is fully seated.

6. Start the elevation spring retaining pin into the receiver.

7. Insert the elevation spring under the receiver. Hold it in place with a punch (or special tool) then drive the retaining pin completely into the receiver.

8. Confirm elevation knob has been bottomed on site base.

9. Turn the index wheel until the "8/3" is lined up with the mark on the receiver.

10. Insert the index screw through the elevation knob and tighten.

11. Insert the leaf spring.

12. Thread the rear sight screw into the housing.

13. Hold the spring and detent into the windage knob and press it onto the rear sight screw.

14. Drive the retaining pin through the windage knob.

Rear Sight (Standard)

1. Replace leaf spring and rear sight.

2. Thread in windage screw.

3. Install windage drum and roll pin.

4. Replace the ejection port cover and spring.

5. Install ejection port cover pin and "C" clip.

6. Insert the barrel into the receiver, aligning the index pin of the barrel with the slot in the upper receiver.

7. Reassemble the barrel nut assembly. Coat it with high-temp grease and tighten it on the receiver.

8. Torque the barrel nut using the combination tool and a torque wrench. Apply additional torque to the barrel nut to provide adequate clearance for the gas tube to move through the barrel and nut receiver.

9. Install front swivel.

10. Insert the gas tube into the front sight assembly and pin it in place with the gas tube roll pin (**Right** to **Left**).

11. Slide the front sight assembly over the barrel and align the gas tube with the front of the receiver.

12. Pin the front sight in place with the two tapered pins (**Right** to **Left**).

13. Replace the compensator spacer and the compensator.

14. Align the compensator slots.

15. Install the front sight spring and detent.

16. Screw in the front sight blade.

Bolt Carrier

1. Replace the bolt carrier key and torque hex screws to spec.

2. Install the gas rings onto the bolt (rotate slit in rings).

3. Install ejector spring and ejector and pin in place (if removed).

4. Install extractor with spring.

5. Replace the bolt using a twisting motion. Align the cam pin hole in the bolt with the hole in the carrier.

6. Install the cam pin and rotate it 90 degrees.

7. Pull the bolt forward to its unlocked position.

8. Install the firing pin and the firing pin retaining key.

9. Check firing pin protrusion.

    a. With a go/no-go gauge check, check for proper protrusion by pushing the firing pin forward in the bolt. Place the gauge end marked "Max" (**Go=.036 inch**) over the firing pin, **it should pass over** the pin. Turn the gauge and pass the "Min" (**No-Go=.028 inch**) over the pin and it should hit the pin and **not pass over.**

Complete Assembly of Rifle

1. Install charging handle and bolt carrier into the upper receiver.

2. Assemble the upper and lower receivers.

3. Install Handguards.

Disassembly of the Lower Receiver

1. Remove the butt cap screw on the standard rifle. Check the breather hole for obstructions.

2. Remove the butt stock, the take down spring and detent, and the receiver extension spacer.

3. Remove the swivel screw, rear swivel and the butt plate.

4. Separate the butt stock door and hinge.

5. Remove receiver extension tube with combination wrench.

6. Remove buffer retainer and spring.

7. Remove pistol grip screw, pistol grip, selector spring and detent.

8. Release tension on the hammer pin by pressing the trigger and lowering the hammer.

9. Remove the hammer pin with a 1/8 inch punch.

10. Remove the hammer.

11. If the rifle is a full-auto remove the auto sear pin and a 3/32 inch punch. Then remove the auto sear.

12. Remove the selector lever.

13. Remove the trigger pin with a 1/8 inch punch.

14. Remove the disconnect and trigger.

15. Remove the bolt catch pin.

16. Remove the bolt catch, spring and plunger.

17. Remove the magazine release by depressing the mag catch button with a punch and turning the catch counter clockwise until it is un-screwed.

18. Remove the trigger guard roll pin and trigger guard.

19. Remove front take down pin, spring and detent.

Reassembly of Lower Receiver

1. Install front take down spring, detent, and take down pin.

2. Install trigger guard and roll pin.

3. Install magazine release spring, mag catch and button.

4. Install bolt catch spring, plunger, bolt catch and roll pin.

5. Install trigger and disconnect.

6. Install selector.

7. If full-auto, install auto sear.

8. Install hammer.

9. Check hammer, trigger, disconnector operation.

10. Install selector detent, spring and pistol grip.

11. Thread the receiver extension tube into the receiver & Install the buffer retaining spring and retainer into the receiver.

12. Finish threading the receiver extension tube into the receiver and torque to spec.

13. Install action spring and buffer.

14. Assemble butt stock door and hinge.

15. Install take down pin, take down pin detent and spring.

16. Install extension spacer onto extension.

17. Slide butt stock onto receiver extension.

18. Install butt cap screw.

Torque Specs:

Barrel Nut

30 lb-ft / 40.67 N.m

Compensator/Flash Suppressor

25-30 lb-ft / 33.90-40.67 N.m

Carrier Key Screw

35-40 lb-in / 4.52 N.m

Receiver Extension – Rifles

35-39 lb-ft / 47.45-52.88 N.m

Receiver Extension – Carbine

38-42 lb-ft / 51.52-56.94 N.m

Pre-Ban vs. Post-Ban: What's the Difference?

When the Crime Bill was enacted in September, 1994, there was significant confusion about what would still be permissible. Years later, some of this confusion remains.

One of the provisions of the Crime Bill is that "it shall be unlawful for any person to manufacture, transfer, or possess a semiautomatic assault weapon." 18 U.S.C. sec. 922 (v) (1). However, the code exempts previously-owned "assault weapons" from this prohibition. 18 U.S.C. sec. 922 (v) (2). In the case of a rifle, a "semiautomatic assault weapon" is

A semiautomatic rifle that has an ability to accept a detachable magazine and has at least 2 of--

- a folding or telescoping stock;
- a pistol grip that protrudes conspicuously beneath the action of the weapon;
- a bayonet mount;
- a flash suppressor or threaded barrel designed to accommodate a flash suppressor; and
- a grenade launcher . . .

18 U.S.C. sec. 921 (a) (30) (B). Traditionally, the frame or receiver of a firearm has been legally equivalent to the firearm itself. 18 U.S.C. sec. 921 (a) (3). This has led some people to believe that a pre-ban receiver, that is, one manufactured before 9/13/94, is the same as a pre-ban "assault weapon." Unfortunately, this is not correct.

Since a lower receiver, by itself, does not have any of the five listed features, BATF doesn't consider it an "assault weapon." This is a good thing, since it means that manufacturers may still make the receivers. However, this also means that a pre-ban lower receiver is not an "assault weapon otherwise lawfully possessed under Federal law on [9/13/94]," and therefore not exempted from the ban. 18 U.S.C. 922 (v) (2).

In essence, there are three categories of A15 lower receivers: those manufactured before 9/13/94, which were assembled into "assault weapons" on that date; pre-ban lower receivers which were not assembled into "assault weapons" on 9/13/94; and post-ban manufactured lower receivers. The first class can be re-assembled into an "assault weapon," and can be changed (say, from a fixed-stock model to a collapsing stock). The latter two classes may not be assembled into an "assault weapon."

Armorer Tools List

Snap Ring Pliers

Pivot Pin Detent Installation Tool

A1 and A2 Sight Tools

Roll Pin Punch Set

Standard Pin Punch Set

Firing Pin Protrusion Gauge

Head Space Gauges

Torque Wrench

Receiver Action Block

Armorers Combination Wrench

Carbine Spanner Wrench

Bench Block

Arkansas Stone Set (for polishing only)

Assorted Small Files

Trigger Pull Gauge

Plastic Hammer

Ballpeen Hammer

Assorted Screwdrivers

Carbon Scraper

SLR15 Armorer Tool Kit - $875 plus shipping

- Armorer's Block
- Hammer
- Armoring Wrench
- Upper Receiver/Lower Receiver Block Set
- Carbon Scraper
- Gas Tube Wrench
- Ejector Tool
- Front Pivot Pin Installation Tool
- Broken Shell Extractor
- Firing Pin Protrusion Gage
- Chamber Inspection Mirror
- Kroil
- Scotch-bright
- Bolt Catch Shaved Punch
- 1/16 Flat Pin Punch
- 5/64 Gas Tube Pin Punch
- 3/32 Flat Pin Punch
- 1/8 Flat Pin Punch
- Roll Pin Punch Set 1/16, 3/32, 1/8, 5/32
- Roll Pin Holder Set
- A1 & A2 Sight Tools
- MOACKS Gas Key Staking Tool
- Armorer Tool Kit Box
- Needle Oiler
- Slip2000 Extreme Weapons Lubricant "EWL"
- Slip2000 Carbon Killer/Cutter
- Slip2000 #725 Cleaner Degreaser
- Sweets 7.62 Solvent

Order form

1 SLR15 Rifles Armorer Tool Kit - $875 plus shipping cost $30 Total: $905

Name: _____

Agency: _____

Address, City, State & Zip Code: _____

Phone: _____ Email: _____

Payment is due before shipping unless using a purchase order.

Send completed form via email to sully@slr15.com or fax to 763-712-1434.

08/2013

Parts & Accessory Suppliers

Armalite.com

BravoCompanyUSA.com

Brownells.com

Bushmaster.com

Colt.com

DanielDefense.com

DPMSInc.com

DSArms.com

ElementArms.com

FultonArmory.com

GunPartsCorp.com - Numrix - odd parts

JTDistributing.com - Small parts

LarueTactical.com

MidwayUSA.com (Midway Reloading)

Olyarms.com (Olympic Arms)

RockRiverArms.com

SpecializedArmament.com

StagArms.com

Web Forums

AR15.com

10-8Forums.com

LightFighter.net

M4Carbine.net

NTOA.org (National Tactical Officers Association)

AR15/M16 Rifle Inspection Form

WARNING: NO LIVE AMMUNITION IN INSPECTION AREA; CHECK THAT RIFLE AND MAGAZINES ARE UNLOADED AND CLEAR.

lame: _____ Model: _____ Serial Number: _____ Date: _____

INSPECTION OF ASSEMBLED RIFLE

(Mark pass/fail)

1. External visual inspection _____
2. Trigger safety check _____
3. Trigger pull _____
4. "Locking up" and "unlocking" _____
5. Trigger reset check _____
6. Does empty magazine lock bolt _____
7. Are component parts correct _____
8. Engagement _____

INSPECTION OF FIELD STRIPPED AND DETAILED STRIPPED RIFLE

Component	Pass	Fail	Component	Pass	Fail
I. FIELD STRIPPED EXAM			5. Gas Rings		
A. Barrel			6. Bolt Lugs (7)		
1. Barrel bulged or bent			7. Cam & Cam Bolt Hole		
2. Cracks at muzzle or chamber			8. Carbon Build Up?		
3. Longitudinal cracks			**B. Extractor**		
4. Condition of front sight base			1. Extractor Spring		
B. Upper Receiver			2. Extractor Spring Insert		
1. Sights/Night Sights (inspection)			3. Extractor Lip		
2. Front Sight Base pins/screws present			1. Upgrade present (O-Ring)		
3. Flash Suppressor (condition)			2. Condition of extractor		
4. Handguards (condition)			**C. Firing Controls**		
. Ejection Port Dust Cover (condition)			1. Hammer/Trigger Sere Engagement		
6. Forward Assist			2. Manual Safety Selector		
7. Rear Sight Base (condition)			3. Disconnect		
8. Carry Handle/Optics (condition)			4. Function Test		
C. Lower Receiver			5. Full-Auto/ Burst Function Test		
1. Magazine catch & Button			6. Auto Sere		
2. Receiver cracks			**D. Trigger Guard**		
3. Bolt Catch lever			1. Pins Present and does it work		
4. Safety Selector			**E. Stock**		
5. Pivot/Take-down Pins			1. Securely Fastened		
6. Trigger/Hammer Pins			2. Buffer Tube / Stock Tube (condition)		
D. Buffer & Spring assembly			3. Sling Mount		
II. DETAIL STRIPPED EXAM			4. Collapsible Stock (does it lock into positions)		
A. Bolt Carrier Assembly			5. Stock Condition (Cracked?)		
1. Gas Key & Screws (staked?)			**F. Magazine**		
1. Ejector			1. Tube-lips damaged		
2. Extractor			2. Spring-correct, undamaged		
3. Firing Pin Retaining Pin			3. Follower, cracked, broken		
4. Firing pin			4. Welds secure or cracked?		

Remarks: _____

Reassembly—After the component parts of the "detailed stripped" rifle have been found to be acceptable (or have been corrected), and they have been cleaned, the rifle will be reassembled. The reassembled rifle will then be reinspected to ensure functionability and zero.

Inspected By: _____

Defensive Edge SLR15 Rifles Maintenance Kit Order Form

AR15 / M16 Maintenance Kit (Suggested for 5-15 Rifles)

- 5 - Firing Pin Retaining Pins
- 2 - Sets Gas Rings
- 1 - Firing Pin
- 1 - Bolt (Complete with Extractor & Ejector)
- 1 - Cam Pin
- 1 - Bolt Carrier Key (Gas Key)
- 1 - Set of Gas Key Screws
- 1 - Trigger Group (Hammer, Trigger, Disconnector, Springs and Pins
- 1 - Buffer Spring
- 1 - Gas Tube with Roll Pin

AR15 / M16 Parts Kit (Suggested for 25 Rifles or more)

- 5 - Firing Pin Retaining Pins
- 3 - Sets Gas Rings
- 1 - Firing Pin
- 1 - Bolt (Complete with Extractor & Ejector)
- 1 - Cam Pin
- 1 - Bolt Carrier Key (Gas Key)
- 1 - Set of Gas Key Screws
- 2 - Ejectors
- 2 - Ejector Springs
- 5 - Ejector Roll Pins
- 1 - Extractor
- 2 - Extractor Springs with Inserts
- 2 - Extractor Retaining Pins
- 2 – Extractor O-Rings
- 2 - Hammer Trigger Pins
- 1 - Trigger Group (Hammer, Trigger, Disconnector
- 1 - Trigger Spring
- 1 - Hammer Spring
- 1 - Disconnector Spring
- 1 - Buffer Spring

Order Form

__ SLR15 AR15/M16 Maintenance Kit Tool Kit for 5-15 Rifles - $245 plus $20 shipping cost. Total $265

__ SLR15 AR15/M16 Maintenance Kit Tool Kit for 25 Rifles or more - $345 plus $20 shipping cost. Total $365

Name: _____

Agency: _____

Address, City, State & Zip Code: _____

Phone: _____ Email: _____

Payment is due before shipping unless using a purchase order.

Send completed form to sully@slr15.com or fax to 763-712-1434. Order online at SLR15.com