

Armorer's Course – AR15 RIFLE



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I. Introduction

A. General

The Armalite division of Fairchild Engine and Airplane Corporation was established in October 1954, for the express purpose of developing new military firearms using the latest advancements in plastics and nonferrous metals. Under the guidance of chief designer, Eugene M. Stoner, many firearms were developed in calibers ranging from 22 long rifle, 22 Hornet, 7.62 NATO, and 12 gauge shotgun. Most of these designs never got further than proto type production; however, one design the M-16/AR-15 was adopted by the United States Army in 1967. Mr. Stoner incorporated many features from previous rifle designs into his rifle. A multi lug rotating bolt similar to the Johnson semiautomatic rifle, a hinged upper and lower receiver mechanism similar to the FN FAL, direct gas impingement developed in the Swedish Ljungman rifle, a top receiver rear sight carrying handle the British used on their EM2 and an ejection port cover patterned from the German MP44. Other features of the AR-15 was an inline stock to aid in controlling the gun during full auto fire, a bolt locking device that held the bolt to the rear after the last round is fired, and the successful marriage of plastic, aluminum, and steel. All these features are combined into an attractive rifle that weighs 6.7 pounds. Today there are over thirty variations of the basic AR-15 design.

Colt Firearms acquired the manufacturing and marketing rights in 1959 from Armalite. Colt licensed General Motors and Harrington & Richardson during the 60's and 70's to help meet the Army's demand. Colt also licensed production of the AR-15 in Singapore, the Philippines, and South Korea for issue to their respective armies and police forces. There are at least five different commercial U.S. companies that produce a form of the AR-15. For the most part these commercially produced versions are identical to Eugene Stoner's original design, with evolutionary improvements, such as chrome lined chambers, a different buffer, match grade barrels, and a myriad of sighting options.

The incorporation of lightweight materials, ergonomic features together with the many variations available ensure the AR-15 rifle will remain very popular for usage by the military, police, and civilians for years to come.

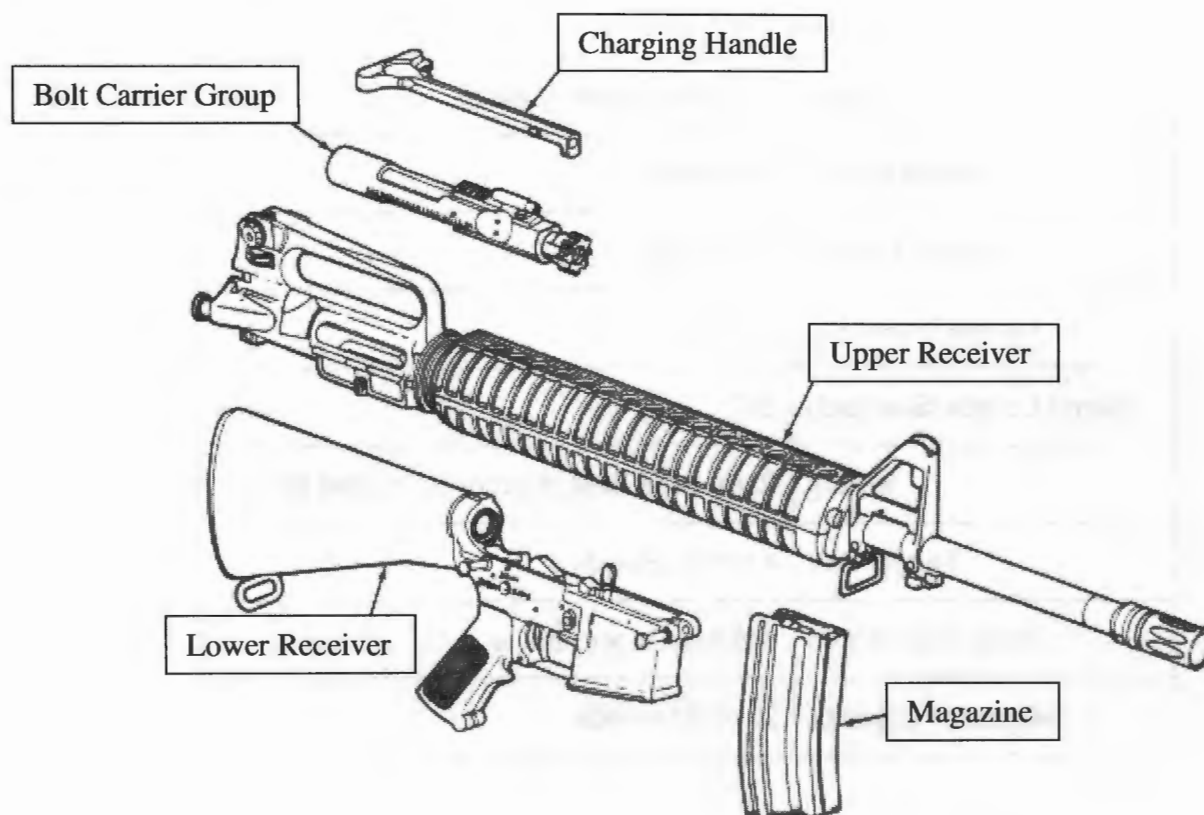
This manual contains maintenance and technical information for AR-15 armorers. The knowledgeable use of the material within this manual provides the armorer with the necessary information to maintain AR-15 rifles in a condition that exceeds the requirements concerning reliability and ease of maintenance by today's law enforcement agencies or military.

B. Technical Specifications

Action	Rotating bold, gas operated
Trigger	Single stage
Caliber	.223 Remington/5.56mm
Weight Empty	7.5 pounds
Weight Loaded	8.75 pounds
Length (Standard)	39 5/8"
Barrel Length (Standard)	20"
Rifling	Right hand twist, 6 grooves – 1 turn in 7"
Trigger Pull	4 to 8 ½ pounds
Cyclic Rate of Fire	800 rounds per minute
Magazine Capacity	20 or 30 rounds

II. Components

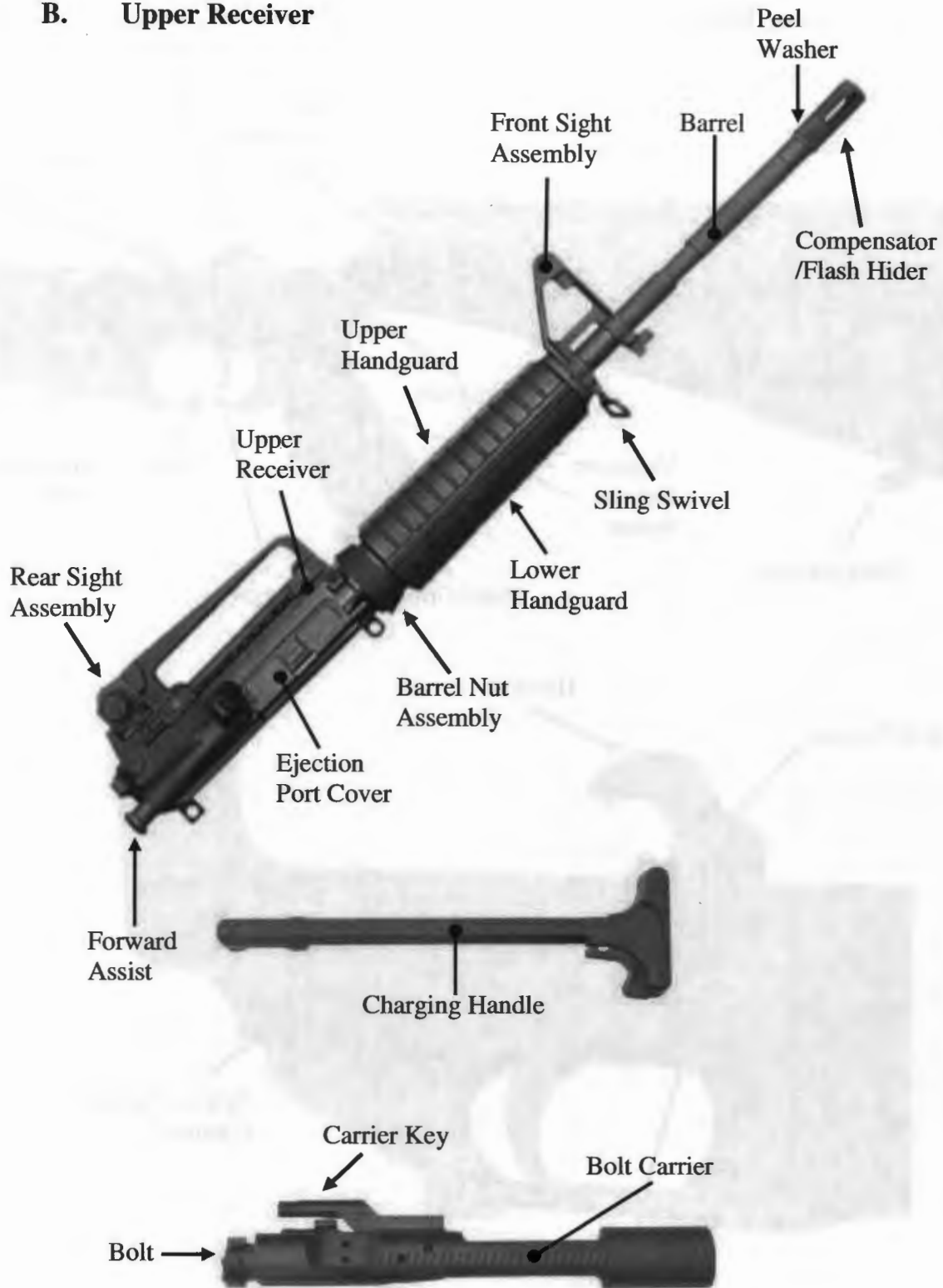
A. General



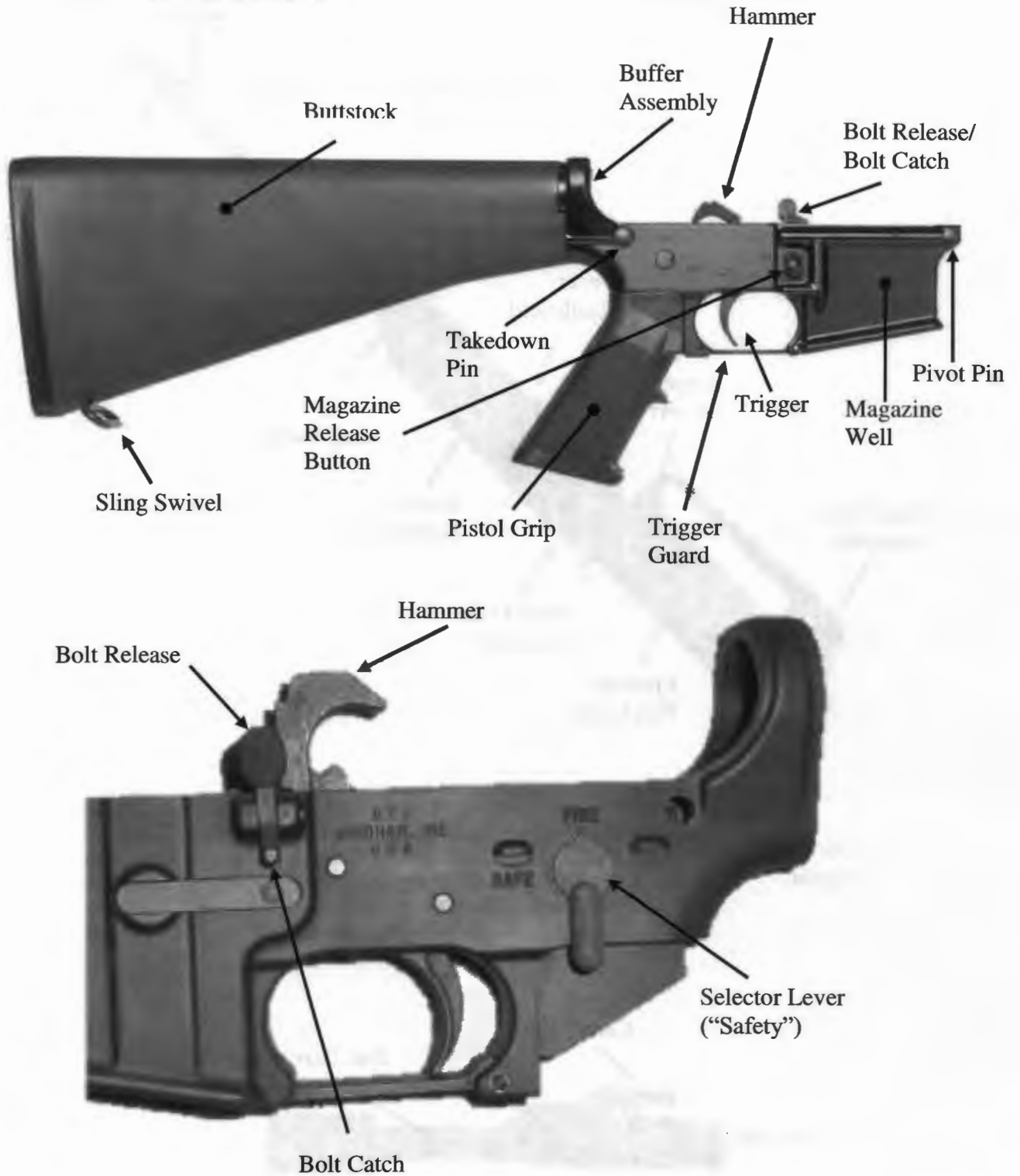
Three main components of the AR-15 rifle:

1. Upper Receiver
2. Lower Receiver
3. Magazine

B. Upper Receiver



C. Lower Receiver



D. Magazine

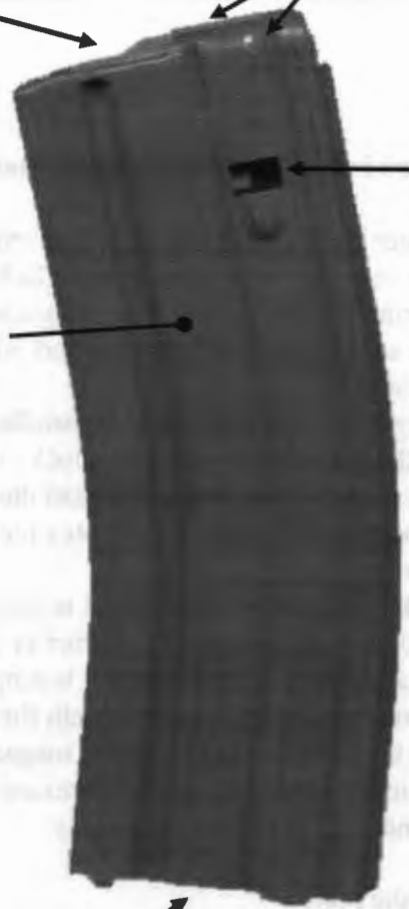
Magazine
Follower

Magazine
Feed Lips

Magazine
Catch
Notch

Magazine
Body

Magazine
Floorplate



III. Handling

WARNING: BEFORE WORKING ON OR CLEANING YOUR WEAPON, ENSURE IT IS UNLOADED!

A. Unloading

If bolt carrier is forward:

1. Point the weapon in a safe direction (which should be at something that will stop a round)
2. Keep your trigger finger straight and off the trigger
3. Check to make sure the selector lever is on Safe
4. Remove magazine if there is one in the magazine well
5. Rotate the rifle so the ejection port is up and your support side thumb presses in on the bolt catch
6. With your firing hand, pull the charging handle all the way back until the bolt catch engages the bolt carrier group and locks the bolt to the rear
7. Release pressure on the bolt catch and push the charging handle all the way forward – the bolt carrier group should stay locked to the rear if it was engaged properly
8. Carefully check the chamber to ensure it is empty
9. Push the bolt release to release the bolt carrier group
10. Check the magazine well to make sure it is empty
 - a. Place your support hand underneath the magazine well and use the tip of your trigger finger to press the magazine release button
 - b. If nothing is ejected from the magazine well, run a finger up into the magazine well to ensure it is empty

If bolt carrier is locked to the rear:

1. Point the weapon in a safe direction (which should be at something that will stop a round)
2. Keep your trigger finger straight and off the trigger
3. Check to make sure the selector lever is on Safe
4. Remove magazine if there is one in the magazine well
5. Rotate the rifle so the ejection port is up and you can see the chamber
6. Carefully check the chamber to ensure it is empty
7. Push the bolt release to release the bolt carrier group
8. Check the magazine well to make sure it is empty
 - a. Place your support hand underneath the magazine well and use the tip of your trigger finger to press the magazine release button
 - b. If nothing is ejected from the magazine well, run a finger up into the magazine well to ensure it is empty

IV. Cycle of Operation

In order to understand the sequence of events that occur when firing, you must be familiar with the cycle of operation.

- Feeding: Placing the round in the path of the slide
- Chambering: Moving the round from the magazine to the chamber
- Locking: The precise mating between the barrel lug and the slide lug
- Firing: Firing pin strikes the primer which ignites the propellant
- Unlocking: Unlocking the slide lug from the barrel lug
- Disconnecting: Disengaging sear from pressed trigger
- Extracting: Pulling either a spent case or live round from the chamber
- Ejecting: Pushing a case or a live round around the extractor and out of the ejection port
- Cocking: Returning firing mechanism to the cocked position
- Reconnecting: Reestablish the trigger to sear relationship

V. General Disassembly and Assembly

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A. Disassembly Procedure

1. Ensure bolt/bolt carrier assembly are in their fully forward positions and dust cover is closed
2. Push takedown pin from left to right and pivot the upper receiver away from lower receiver
3. Depending on pivot pin type, either push pivot pin left to right or unscrew pivot pin and remove separating upper and lower receivers
4. Pull back on charging handle approximately two inches which will start the bolt carrier group from the upper receiver
5. Remove the bolt carrier group rearward from upper receiver
6. Pull back and down and remove charging handle assembly from upper receiver
7. Grasp the bolt carrier and push bolt into the carrier so bolt is in the locked position



Bolt Unlocked



Bolt Locked

8. Push out the firing pin retaining pin from right to left

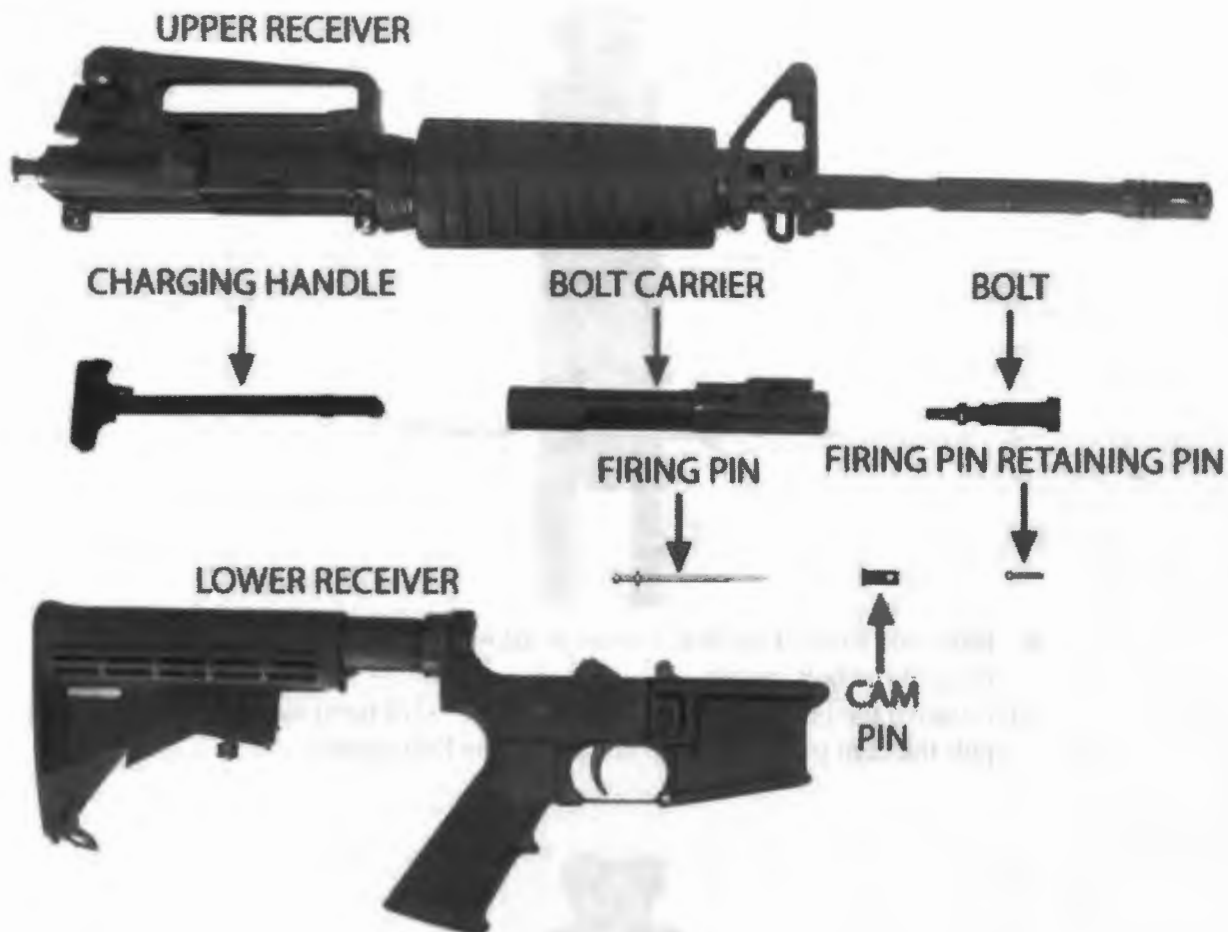


9. Raise the front of the bolt carrier to allow the firing pin to fall free out the back of the bolt carrier
10. Remove the bolt cam pin by rotating it 90° (1/4 turn) in either direction and pull the cam pin straight up and out of the bolt carrier

Rotate cam
pin 90°

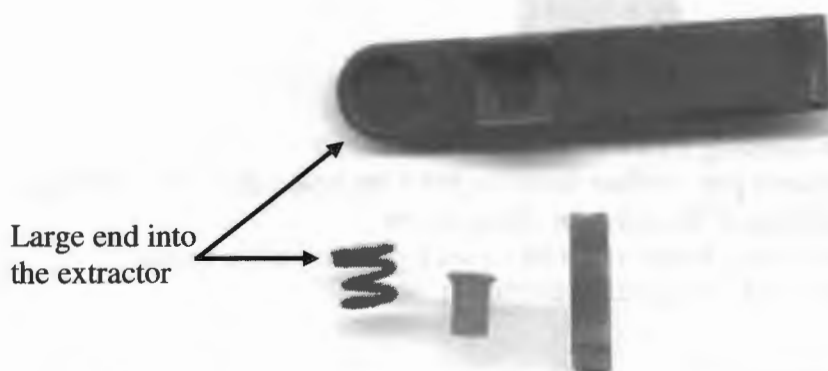


11. Pull the bolt assembly forward out of the bolt carrier
12. Push the extractor pin in either direction from the bolt and remove extractor, extractor spring, and the extractor spring insert
13. Push in buffer using finger and with a punch depress buffer retainer
14. Pull the buffer and spring out of the buffer tube



B. Assembly Procedure

1. Insert buffer spring and buffer into receiver extension until buffer retainer again retains buffer in receiver extension
2. Insert extractor, extractor spring, and extractor spring insert into bolt, align holes and push in the extractor pin



Note: The extractor spring has a large end and a small end; the large end should be seated into the extractor

3. Stagger the three gas rings so the ring gaps do not align



Right

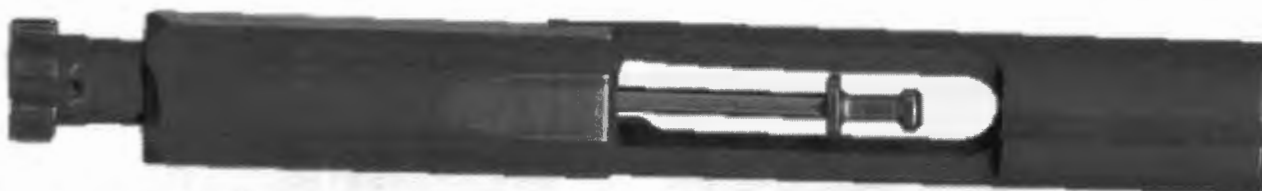


Wrong

4. Slide the bolt into the carrier, twisting gently to seat the bolt all the way in the carrier
5. Orient the bolt with the extractor to the right and align the cam pin hole in the bolt with the cam pin hole in the bolt carrier



6. Insert cam pin from the top
7. Rotate cam pin 90°
8. From the rear of the carrier, insert the firing pin into the back of the bolt



9. Insert the firing pin retaining pin into the left side of the bolt carrier

Note: Do not damage the firing pin retaining pin during installation. A gentle twisting motion will aid in the installation of the retaining pin

10. Pull bolt forward to the unlocked position



11. Align wings on charging handle with recesses in upper receiver and install charging handle
12. With bolt in unlocked position slide the bolt carrier group into upper receiver
13. Push the bolt carrier group and charging handle assembly fully into upper receiver
14. Close the dust cover
15. Align upper and lower receiver halves and install receiver pivot pin or screw type pivot
16. Ensure hammer is in its cocked position
17. Swing receiver halves together and push in takedown pin right to left
18. Perform a mechanical function check – See Section VIII-B, Function Check

VI. Functions

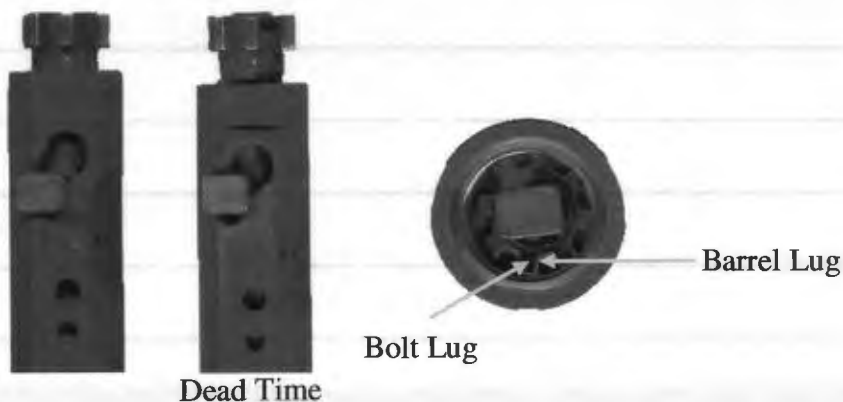
A. Locking

1. Lock up is achieved by the decompression of recoil spring which pushes buffer into the rear of bolt carrier
2. The bolt carrier has a camming surface that acts on a bolt cam which passes through the bolt
3. This bolt cam rotates the bolt to align bolt lugs with the barrel extension lugs
4. The gun is ready to fire.



B. Unlocking

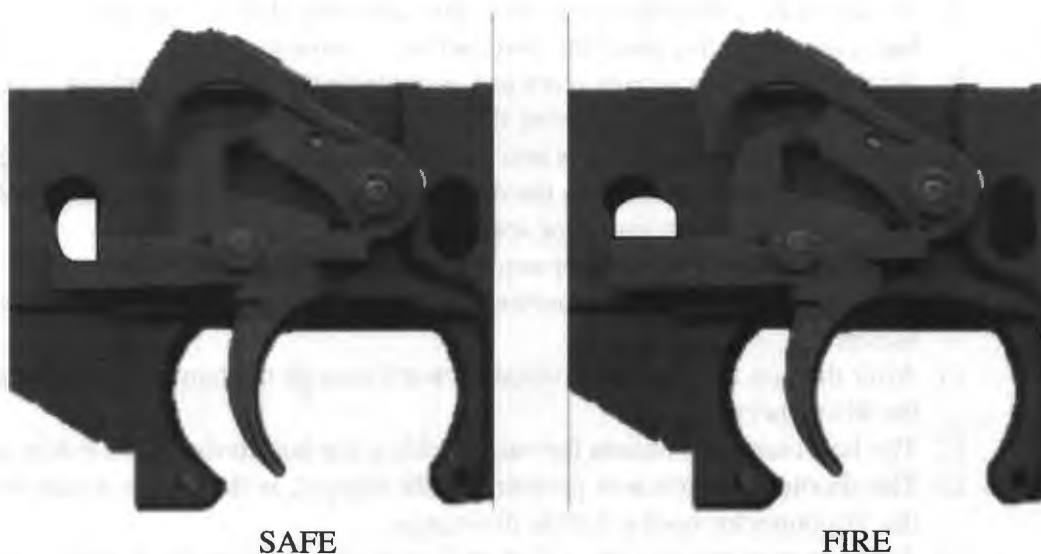
1. Unlocking is achieved by a precise amount of gas directly vented into the bolt carrier
2. As the cavity between bolt and bolt carrier fills with gas, the carrier is pushed rearward
3. The initial rearward movement of the bolt carrier does not act upon bolt cam pin
4. This "dead time" is necessary for the bullet to clear the muzzle and pressures to drop to zero
5. The bolt carrier has been accelerated rearward enough to cause the bolt cam pin to rotate the bolt and disengage the bolt lugs from the barrel extension lugs
6. The rifle is now out of battery.



C. Safeties

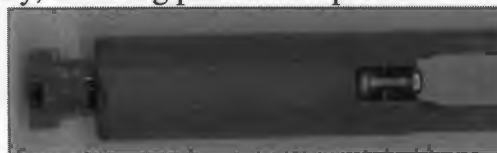
1. Selector Lever

- a. The selector lever has an eccentric lobe on its shaft that when the lever is placed on SAFE the lobe on the lever prohibits the trigger from pivoting far enough to disengage the hammer
 - b. In order to fire the rifle, the shooter must rotate the selector lever to the FIRE position
 - c. The trigger can now be pressed so it pivots far enough to allow the trigger to release the hammer
2. The selector lever is an 'active safety' because the shooter must manipulate the lever



3. Firing Pin

- a. By design, the rifle has a minimum firing pin protrusion. The interaction between the cam pin and camming surface of the bolt carrier ensures that there will be no driven firing pin protrusion as long as the bolt has not fully locked up.
- b. This is a 'passive safety' in that the shooter does not need to do anything to activate or deactivate this safety
- c. The rifle going into full battery enables the gun to fire; if not in full battery, the firing pin will not protrude enough to ignite the primer



On



Off

D. Trigger

1. Starting with the gun cocked and ready to fire the shooter starts to press the trigger rearward
2. As trigger pivots rearward the front of trigger pivots downward and out of hammer notch
3. As the trigger is pivoting rearward the disconnecter is pivoted forward
4. At hammer release the trigger is fully back and the disconnecter is fully forward
5. The compressed hammer spring drives the hammer forcefully forward striking the firing pin and igniting the primer on the round
6. Upon ignition of the round, the gun's internal workings remain still
7. As the bullet clears the gas orifice, hot gases are bled off and directed to the bolt carrier which causes the bolt carrier to move rearward
8. As the bolt carrier moves rearward, it contacts the hammer and starts to cam the hammer back, compressing the hammer spring
9. As the bolt carrier continues rearward, it pushes the hammer further rearward so that the hammer contacts the disconnecter hook and cams it rearward, compressing the disconnecter spring
10. As the hammer disconnecter notch clears the disconnecter hook the disconnecter spring decompresses, which allows the disconnecter to pivot forward
11. After the bolt carrier has traveled forward enough the hammer is captured by the disconnecter
12. The bolt carrier continues forward, locking the bolt to the barrel extension
13. The shooter now releases pressure on the trigger; as the trigger pivots forward the disconnecter hooks start to disengage
14. As the trigger reaches the end of its forward movement, the disconnecter releases the hammer forward until it is resting on the trigger reset, ready for the next shot



Cocked



Fired



Disconnected

Notes: _____

VII. Care and Cleaning

WARNING: BEFORE WORKING ON OR CLEANING YOUR WEAPON, ENSURE IT IS UNLOADED!

A. General

1. Normal cleaning can be performed when the rifle is field stripped into its major components



2. Use a high quality solvent and follow manufacturer's directions
3. Wipe all surfaces dry and apply a light coat of high quality lubricant such as Break-Free to all steel parts
4. The use of a bronze bore brush of the correct caliber is recommended
5. Never use a stainless steel bore brush on any barrel, especially one that is chrome lined
6. The use of stainless steel brushes of any kind is not recommended
7. Use a solid bronze jag of correct caliber and clean barrel until a dry patch comes out clean
8. Clean barrel from breech to muzzle
9. The use of a BoreSnake is recommended

10. If the rifle is to be stored for long periods of time or if the rifle is used in a highly corrosive environment, the armorer needs to determine if lubricant inside the magazine tube or gas system will pose a problem
11. The armorer then needs to be aware of the rifle's use to determine how often to perform maintenance
12. If corrosion is to be avoided, it may be necessary to inspect and clean these pistols more frequently
13. It is mandatory that a mechanical function check be performed after cleaning; see Section VIII-B

B. Procedure

WARNING: BEFORE WORKING ON OR CLEANING YOUR WEAPON, ENSURE IT IS UNLOADED!

1. Check again to ensure the chamber and magazine well are empty and the weapon is *UNLOADED*
2. Field strip the rifle and disassemble the magazine
3. Clean all areas with a lightly treated cloth of high quality solvent

Caution: Do not lubricate the bolt gas rings or inside of the bolt carrier, bolt carrier key or gas tube. No lubrication inside the body of the magazine.

4. Cleaning the barrel
 - a. Scrub the barrel using a saturated nylon or bronze bore brush inserted from the breech end
 - b. Repeat at least 10 times, re-soaking the bore brush once or twice
 - c. Use a jag and patches until a dry patch comes out clean
5. Wipe away any traces of solvent with a soft clean cloth
6. Apply a light coat of lubricant to the following areas:
 - a. Bolt
 - b. Bolt carrier
 - c. Barrel
 - d. A light coat of lubricant is such that after lubrication you can rub your finger over the part and your finger might be damp with oil, but not dripping
7. Reassemble the rifle
8. Perform a mechanical function check; see Section VIII-B

C. Detailed Clean and Oil

Completely disassemble the entire weapon and follow the above procedures. Refer to Section IX, Section X, and Section XI.

Notes: _____

VIII. Inspections

A. General

A function check is to be carried out after any work is done to the rifle. A parts inspection is to be carried out whenever the rifle is disassembled. A static inspection of subassemblies is to be performed to aid in malfunction diagnosis and to ensure the gun is within specifications.

B. Function Check (Mechanical)

The rifle is fully assembled

WARNING: BEFORE WORKING ON OR CLEANING YOUR WEAPON, ENSURE IT IS UNLOADED!

1. Insert an **EMPTY** magazine into the magazine well and ensure the magazine catch has engaged with the magazine
2. Pull charging handle fully to the rear and ensure magazine follower has engaged bolt catch and that bolt catch has captured the bolt
3. Push charging handle fully forward locking handle to upper receiver
4. **Remove magazine**
5. Push in bolt catch releasing bolt to its fully closed position
6. Rotate selector lever to the **SAFE** position if not already there
7. Press the trigger; the hammer must not fall and the trigger should not move
8. Rotate selector lever to the **FIRE** position
9. Press the trigger and hammer should fall
10. Hold trigger to the rear and rack the charging handle
11. Slowly release trigger and you must hear or feel the trigger reset as the disconnecter releases the hammer onto the trigger
12. Press the trigger and the hammer should fall
13. Put some **DUMMY** (inert) ammunition into a magazine
14. Insert magazine with **DUMMY** rounds into magazine well and ensure the magazine catch has engaged the magazine catch notch
15. Verify magazine drops free when magazine release button is pushed
16. Reinsert magazine
17. Retract charging handle fully to the rear and release – do not ride it forward
18. Verify bolt carrier group has fully closed
19. Press check by pulling the charging handle slightly to the rear until you can see part of the chambered **DUMMY** round, release the charging handle and tap the forward assist to fully seat the bolt
20. Pull the charging handle fully to the rear and release – do not ride it forward
21. A **DUMMY** round should be ejected, and the next one in the magazine should chamber
22. Repeat until the magazine is empty and the bolt carrier group locks back on an empty magazine
23. Inspect each magazine
24. Test fire

C. Parts Inspection

This inspection is to be performed with the gun completely disassembled and cleaned.

WARNING: BEFORE WORKING ON OR CLEANING YOUR WEAPON, ENSURE IT IS UNLOADED!

Very carefully examine all parts for cracks, deformities, or any unusual wear. All parts need to be inspected for proper function and condition.

Areas of Inspection:

1. Upper Receiver
 - a. Barrel:
 - i. Bore and chamber
 - ii. Barrel extension
 - iii. Front sight assembly
 - iv. Compensator/Flash Hider
 - v. Gas orifice
 - vi. Gas tube and pin
 - vii. Handguards
 - viii. Barrel nut
 - ix. Slip ring spring retaining ring
 - b. Receiver:
 - i. Ejection port cover, pin, spring, and retaining ring
 - ii. Forward assist assembly
 - iii. Rear sight assembly
 - iv. Charging handle
 - v. Bolt carrier group – bolt carrier, including the gas key, bolt, firing pin, extractor, ejector, springs and extractor insert
2. Lower Receiver
 - a. Receiver:
 - i. Pistol grip, screw and lock washer
 - ii. Selector lever, spring, and detent
 - iii. Trigger guard, spring, and plunger
 - iv. Trigger and trigger spring
 - v. Hammer and hammer spring
 - vi. Disconnecter and spring
 - vii. Magazine catch, spring, and release button
 - viii. Bolt release/bolt catch, spring and plunger
 - ix. Receiver pivot pin, detent, and spring
 - x. Receiver takedown pin, detent, and spring
 - xi. Buttstock, door assembly, butt plate, plunger, spring, sling swivel, self-locking screw, spacer, and receiver extension (buffer tube)
 - xii. Buffer retainer and spring
 - xiii. Buffer and recoil spring

3. Magazine

- a. Magazine body, feed lips, follower, spring and floorplate

D. Static Inspection

To aid in malfunction diagnosis and to ensure the gun is within specifications, a static inspection should be carried out. The gun needs to be field stripped for this inspection

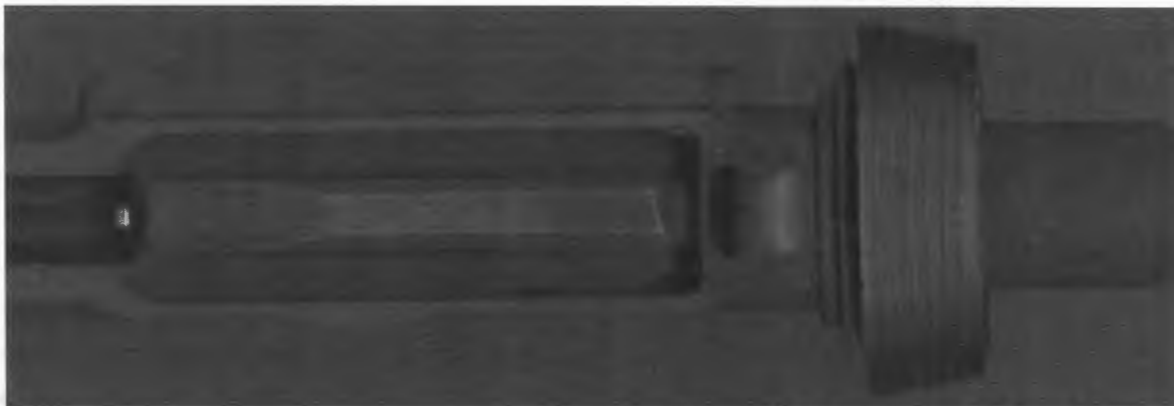
Areas of Inspection:

1. Bolt and Bolt Carrier

- a. Ejector must not extend forward beyond the front edge of the bolt
- b. The ejector must move freely in and out and when pushed fully to the rear will be slightly below flush with bolt face
- c. The extractor must have .010" to .020" cam out and the rubber insert must be in place, and not deformed, with positive engagement
- d. With the firing pin inserted into bolt, measure firing pin protrusion; must be a minimum of .028" and a maximum of .036"
- e. Firing pin hole must not be deformed – should be round
- f. Insert bolt into the bolt carrier:
 - i. The three gas rings with staggered gaps must hold the bolt in the carrier assembly without using the cam pin when the carrier is held bolt down
 - ii. Also verify that when the bolt is pulled forward enough so as to position the bolt in its unlocked position, the gas rings supply enough resistance to hold bolt carriers weight up when the bolt is placed face down on the bench
- g. Remove the extractor pin and spring, along with the ejector pin and spring only and reassemble bolt and bolt carrier assembly
- h. Place the Go gauge into the chamber and push the bolt carrier forward as if to close the action – the action must close fully



- i. Remove the Go gauge and insert the No-Go gauge and attempt to close the action using hand pressure – the bolt carrier should not go closed



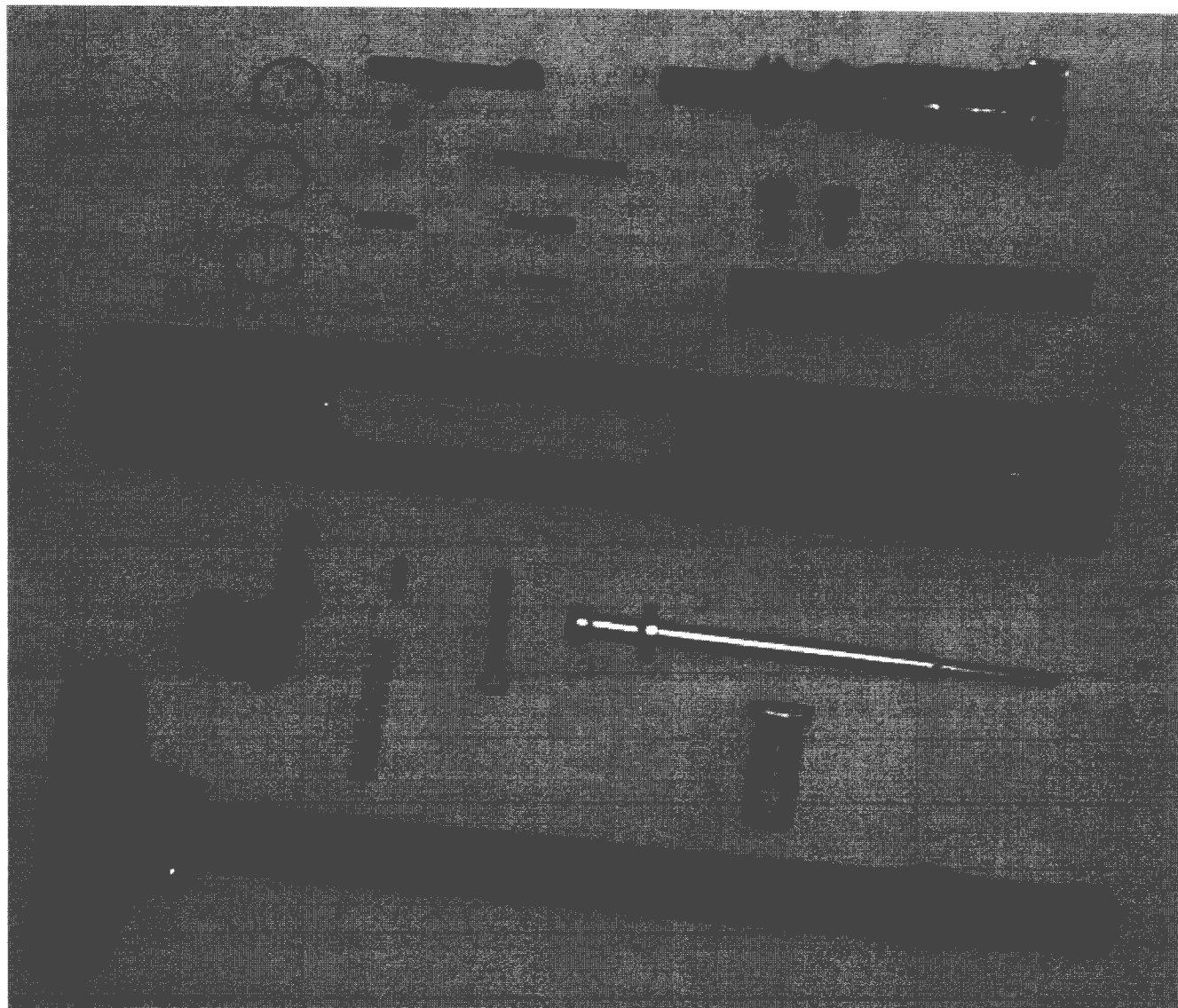
Note: If the No-Go allows the bolt to seat all the way, test again using the Field Gauge. The bolt and carrier must NOT close on the Field Gauge.

- j. Remove the bolt from the bolt carrier
- k. Insert the bolt carrier only into the upper receiver and verify the carrier key and gas tube mate correctly and does not bind
- l. Ensure carrier key screws are torqued and staked into place
 - i. Investigate any signs of gas leakage around carrier key and carrier
2. Buffer and Spring
 - a. Free spring length must be between 11 ¾” to 13 ½”
 - b. The buffer should rattle when shaken
3. Fire Control

Caution: A free-falling hammer may damage the receiver or the bolt catch/bolt release assembly; as you are performing this inspection, keep your free hand or thumb over the hammer to keep it from snapping forward into the receiver.

- a. Verify primary sear engagement is positive by hammer coming back slightly prior to being released by the trigger
- b. Verify the disconnecter holds onto the hammer long enough for the trigger to go fully forward
- c. Using finger pressure, ensure the trigger and hammer pins cannot be pushed out

IX. Disassembly and Assembly of the Bolt, Bolt Carrier, and Charging Handle



1. Gas Rings	8. Ejector Pin	15. Charging Handle Latch Spring
2. Extractor	9. Bolt	16. Firing Pin Retaining Pin
3. Extractor Spring Insert	10. Carrier Key Screws	17. Firing Pin
4. Extractor Spring	11. Carrier Key	18. Cam Pin
5. Extractor Pin	12. Bolt Carrier	19. Charging Handle
6. Ejector Spring	13. Charging Handle Latch	
7. Ejector	14. Charging Handle Latch Pin	

A. Disassembly of the Bolt

WARNING: BEFORE WORKING ON OR CLEANING YOUR WEAPON, ENSURE IT IS UNLOADED!

1. Push the extractor pin in either direction from the bolt and remove extractor, extractor spring, and the extractor spring insert
 - a. The large end of the extractor spring should be seated into the extractor
 - b. Within the extractor spring is a rubber insert; neither spring or insert need to be removed unless replacing

Note: The extractor spring has a large end and a small end; the large end should be seated into the extractor

2. Drive out the ejector pin in either direction

Note: The ejector is under spring pressure – when removing the punch, cup your hand over the bolt face to catch and trap the ejector and the ejector spring

3. Use a small pointed tool to gently nudge one end of a gas ring out of its cutout in the bolt and continue to use the tool to work the ring out and off the bolt
4. Repeat until all three rings are removed



B. Assembly of the Bolt

1. Install one end of the gas ring into the bolt ring cut out and use a tool to gently walk the ring around until it snaps into the bolt cutout

Note: The gas rings have a sharp edge and a rounded edge. When reinstalling the rings, the sharp edge needs to be towards the back of the bolt.

2. Install the second and third rings
3. Drop the ejector spring into ejector hole in bolt face
4. Orient ejector so cutout will align with the pin hole in bolt
5. Compress ejector until a punch can be inserted through the bolt to capture the ejector



Note: The ejector retaining pin is a spring pin. The slot in the ejector retaining pin needs to be oriented so that the slot in the pin is at right angles to the ejector's back-and-forth movement.

6. With the ejector retaining pin correctly oriented, drive the spring pin into the bolt partway
7. Lightly compress the ejector and drive the pin in so it pushes the punch out
8. Use the punch to drive the ejector retaining pin in until equal gaps appear on either side of the pin
9. Install the extractor, spring and insert

C. Disassembly of the Bolt Carrier

1. Using a Dremel tool or other similar tool, carefully remove the staked steel over the carrier key screws



2. Use a correct fitting Allen wrench and unscrew both carrier key screws
3. Remove the carrier key

D. Assembly of the Bolt Carrier

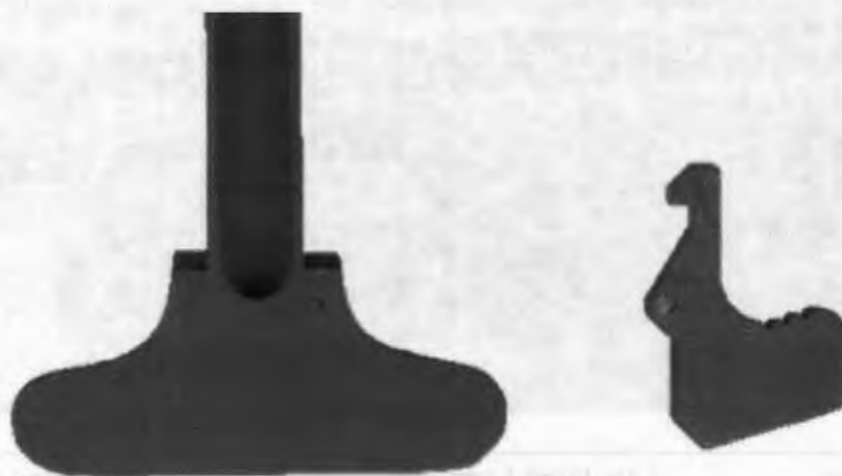
1. Use new carrier key screws
2. Place the carrier key on the bolt carrier and align the screw holes
3. Torque the carrier key screws to 35~40 in. /lbs.
4. Re-stake the key screws in at least two places for each screw

E. Disassembly of the Charging Handle

1. In either direction, drive out the charging handle latch retaining pin
2. Remove the charging handle latch and latch spring

F. Assembly of the Charging Handle

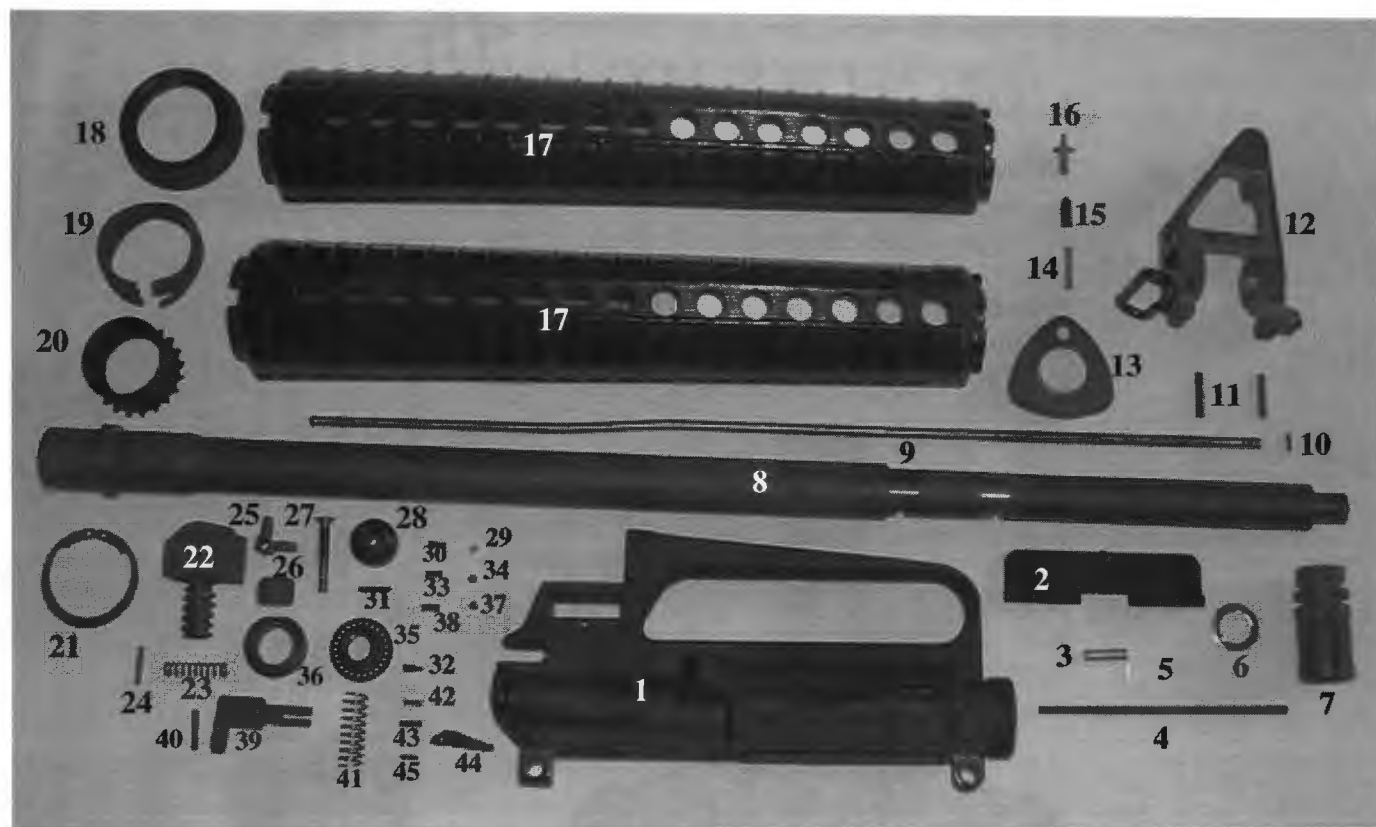
1. Install the charging handle latch spring
2. Correctly orient the charging handle latch



3. Using the latch to compress the spring until the hole in the latch aligns with the hole in the handle
4. Drive in the latch retaining pin flush or slightly below flush

Note: Align the slot in the spring pin 90° to the spring's motion

X. Disassembly and Assembly of the Barrel and the Upper Receiver



1. Upper Receiver	16. Front Sight Post	31. Windage Knob Retaining Pin
2. Dust Cover	17. Handguards (2)	32. Index Screw
3. Dust Cover Spring	18. Slip Ring	33. Rear Sight Base Spring
4. Dust Cover Pin	19. Slip Ring Spring	34. Rear Sight Base Ball
5. Dust Cover Retaining Ring	20. Barrel Nut	35. Elevation Index
6. Peel Washer	21. Slip Ring Retaining Ring	36. Elevation Knob
7. Compensator/Flash Hider	22. Rear Sight Base	37. Elevation Index Ball
8. Barrel	23. Elevation Knob Spring	38. Elevation Index Ball Spring
9. Gas Tube	24. Rear Sight Base Pin	39. Forward Assist
10. Gas Tube Pin	25. Rear Sight Aperture	40. Forward Assist Retaining Pin
11. Front Sight Pins (2)	26. Flat Spring	41. Forward Assist Spring
12. Front Sight	27. Windage Screw	42. Forward Assist Detent Pawl
13. Handguard Hanger	28. Windage Knob	43. Forward Assist Detent Pawl Spring
14. Front Sight Detent Spring	29. Windage Knob Index Ball	44. Forward Assist Pawl
15. Front Sight Detent	30. Windage Knob Index Ball Spring	45. Forward Assist Pawl Pin

A. Disassembly of the Barrel Assembly

1. Remove handguards one at a time by depressing hand guard slip ring towards the receiver and pulling handguard up and clear of barrel nut notches
2. Use a spring pin punch or 5/64" pin punch and remove the gas tube retaining pin located under front sight just above the barrel



3. Slide the gas tube into receiver until tube clears the front sight assembly
4. Gently lift and roll the gas tube forward as you pull it out of the receiver
5. Place upper receiver into an action block
6. Place the action block with the upper receiver in a vise
7. Use a barrel nut wrench to engage the teeth on the barrel nut

Caution: *Take care to engage all the barrel nut teeth equally and fully*

8. Unscrew the barrel nut from the receiver, (right hand threads)
9. Pull barrel assembly forward from receiver
10. Secure barrel in barrel vise jaw blocks in a vise and remove compensator and peel washer
11. Remove both tapered pins that secure the barrel to the front sight assembly
12. Slide the front sight assembly forward off of the barrel
13. Slide the handguard support forward off of the barrel
14. Use a small punch to depress the front sight post detent and unscrew the front sight post

Note: The rifle will need to be sighted in (zeroed) once it is reassembled. If it was previously zeroed, you can make a note of the front sight post's position in relation to the lip of the post housing or you can re-install the front sight post with the base flush with the housing lip as a starting point (mechanical zero).

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15. Allow the front sight detent to slowly decompress and remove the front sight detent and spring
16. Using retaining ring pliers remove barrel nut retaining ring rearward from barrel nut
17. Slide the slip ring spring and slip ring off of barrel nut
18. Slide barrel nut forward off the barrel

B. Assembly of the Barrel Assembly

1. Slide the barrel nut over muzzle of the barrel to the rear



2. From the rear of the barrel, slide the slip ring, then the slip ring spring over the barrel nut



3. Using retaining ring pliers, install the retaining ring into the groove in the rear of the barrel nut

Note: The sharp edge is AWAY from the slip ring spring



4. Drop the front sight post detent spring into the forward hole in the front sight assembly
5. Place the front sight detent over the detent spring
6. Depress the front sight detent and install the front sight post

Note: Screw in the front sight post until it is close to being in the same position as it was when removed, or set it at mechanical zero. (Flared base of the front sight post is flush with the lip of the housing.)

7. Slide the front handguard support over the muzzle and onto the barrel
8. Slide the front sight assembly over the muzzle and onto the barrel
9. Align tapered pin holes and install both tapered pins
10. Secure the barrel in barrel vise jaw blocks and secure the blocks into a vice
11. Install the peel washer and compensator/flash hider
12. Torque the compensator/flash hider to 15~20 ft./lbs.
13. Correctly orient the barrel by locating the stud on the barrel extension so that the stud will align with the notch in the receiver threads



14. Slide the barrel assembly fully into the receiver
15. Apply a small amount of No Seize lube to the threads of the upper receiver
16. Using the barrel wrench torque the barrel nut to 31~35 ft./lbs.

Note: It is permissible to torque the barrel nut up to 80 ft./lbs. in order to line up the teeth in the barrel nut to clear the gas tube. **Do not exceed 80 ft./lbs.!** **Never loosen the barrel nut to align with the gas tube – always tighten to align.**

17. If you removed the front sight assembly, then at this time slide the handguard support over the muzzle, then the front sight assembly onto the barrel and secure with the tapered pins between barrel and sight assembly
18. Use a small tool to align notches in the slip ring, slip ring spring and retainer with the gas tube hole in the upper receiver
19. Slide the gas tube through the barrel nut into the upper receiver until the front of the gas tube clears the front sight assembly
20. With the gas hole of the tube facing the barrel, slide the gas tube forward into the front sight assembly until pin hole in the tube aligns with the pin hole in the front sight assembly



21. Install the gas tube spring pin with the slot of the pin up or down
22. Install the handguards, aligning the extensions on the forward end of the handguards with the handguard support
23. Remove the upper receiver from the receiver action block

C. **Disassembly of the Upper Receiver**

1. Remove the barrel assembly as described above
2. Remove the upper receiver from the receiver action block
3. Grasp the ejection port cover pin and retaining ring and pull slowly forward as the ejection port cover spring is under some tension
4. Remove the ejection port cover and spring



5. Remove the forward assist spring pin
6. Pull the forward assist assembly and spring rearward
7. Remove the forward assist pawl spring pin



8. Pull forward assist pawl, detent and spring forward off of the forward assist plunger
9. Drive out the rear sight windage knob spring pin



Note: There is a small spring and detent ball embedded in the windage knob – ensure you don't lose them

10. Remove the windage knob, detent and ball to the right
11. Use a screwdriver and remove the windage screw to the left
12. Remove the rear sight aperture and flat spring
13. Remove the spring pin located under the elevation knob from the receiver



Note: The elevation knob spring is held in the rear sight base by this spring pin. As you remove the pin, don't lose the spring

14. Remove the elevation knob spring from inside the upper receiver
15. Rotate the elevation index knob until the rear sight base clears the upper receiver
 - a. There is a small spring and detent embedded in the rear sight base on the front-left side – **do not lose them**
16. Push out the elevation index knob using a slight rotation to the left
 - a. There is a small spring and detent embedded in the receiver under the elevation index knob – **do not lose them**
17. Remove the elevation index knob's detent ball and spring

D. Assembly of the Upper Receiver

1. Install the elevation index knob's spring and detent in the hole in the receiver and depress using a punch

Note: The three little springs in the rear sight assembly are identical. If they are of differing length after removal, use the shortest spring as the elevation index knob spring, the next longest spring as the spring in front of the rear sight base and then use the longest spring as the windage knob index spring.

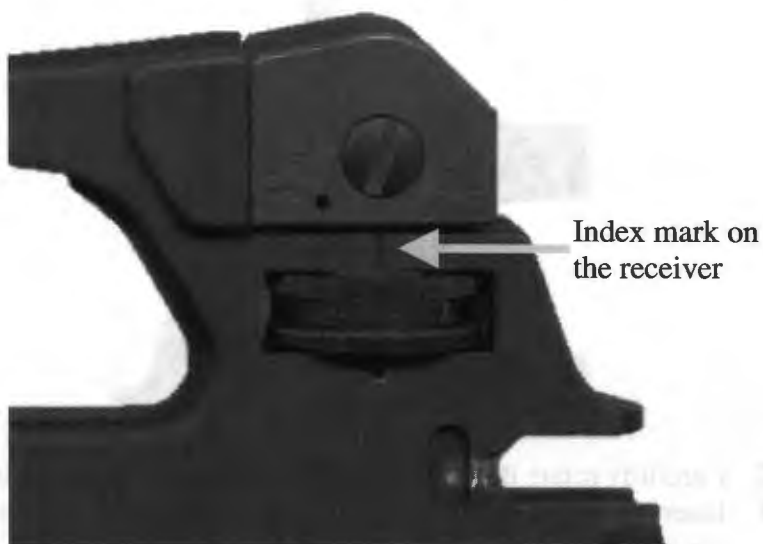


2. Carefully rotate the elevation index knob into its cutout in the receiver
3. Insert the threaded portion of the rear sight base into receiver and rotate the elevation index knob until threads engage
4. As the base is lowered, insert the spring and detent into the front-left of the base
5. Rotate the elevation index knob until base is all the way down and then rotate the knob 22 clicks up
6. Start the spring pin under the elevation index knob
7. Rotate the receiver so sight is down, insert elevation knob spring into threaded portion of the rear sight base and hold in place with a screwdriver
8. Drive in the spring pin with the pin passing OVER the spring, not through its coils



9. Turn the receiver over and rotate the elevation index knob all the way down
10. Install the flat spring and rear sight aperture with the large peep hole towards the rear
11. Use a screwdriver and install the windage screw from the left

12. Place the spring and detent into the windage knob and push the knob onto the shaft of the windage screw
13. Carefully ensure the hole in the windage screw aligns with the hole in the windage knob and drive in the windage knob spring pin



Note: At this point, the mechanical zero on the rear sight elevation needs to be checked. To do this, screw the elevation index knob all the way down until the base is in its last click. If you need to rotate the knob back slightly to engage the last full click, do so. Rotate the elevation knob three clicks clockwise. The 300 meter mark should align with the index mark on the receiver.

If the 300 meter mark is not aligned with the index mark, then the knob needs to be re-indexed.

1. Rotate knob until the 300m mark aligns with the index mark
2. Insert a 1/16" allen wrench through the access hole in the top of the elevation base and loosen the screw three turns
3. Leave the allen wrench in the screw
4. Rotate the **lower** portion of the elevation index knob counterclockwise until it stops on the last detent notch – do not allow the upper portion of the knob to move
5. Rotate the lower portion of the knob clockwise three clicks
6. Tighten the screw and remove the allen wrench
7. Verify by rotating the elevation index knob counterclockwise to the last click, then rotate clockwise three clicks
8. The 300m mark on the knob should align with the index mark on the receiver

14. Insert forward assist pawl spring into plunger assembly and insert the pawl detent over the spring



15. Insert the pawl over the spring and detent; compress the spring to align the hole in the pawl with the hole in the plunger assembly



16. Install the spring pin and drive pin flush or slightly below flush
17. Place the forward assist spring over the forward assist assembly



18. Place the forward assist assembly and spring into the receiver
19. Depress the forward assist assembly to align holes and install spring pin
20. From the front, insert the dust cover pin with the retaining ring on the pin to the front, into the hole in the receiver

21. Place the dust cover in position and push the dust cover pin halfway through the dust cover
22. Position the dustcover spring with the long leg towards the front and slide the pin partway through the spring



23. Grasp the spring's rear-half and rotate spring to correctly lay with its short end on receiver



Rotate spring in this direction

24. Push the dust cover pin through the spring, dust cover and hole in the receiver



25. Install the barrel assembly as covered in Section X-B

XI. Disassembly and Assembly of the Lower Receiver and Buttstock



1. Lower Receiver	17. Pistol Grip	33. Receiver Extension
2. Pivot Screw	18. Takedown Pin	34. Recoil Spring
3. Pivot Pin	19. Takedown Pin Plunger	35. Buffer
4. Bolt Catch/Bolt Release	20. Takedown Pin Plunger Spring	36. Buffer Retainer Plunger
5. Bolt Catch Plunger	21. Butt Plate	37. Buffer Retainer Spring
6. Bolt Catch Plunger Spring	22. Door	38. Selector
7. Bolt Catch Pin	23. Door Plunger	39. Disconnecter
8. Release Button	24. Door Plunger Spring	40. Disconnecter Spring
9. Release Button Spring	25. Door Plunger Pin	41. Trigger Spring
10. Magazine Catch	26. Hinge	42. Trigger
11. Trigger Guard Pin	27. Hinge Pin	43. Trigger Pin
12. Trigger Guard	28. Sling Swivel Screw	44. Hammer Pin
13. Selector Detent	29. Sling Swivel	45. Hammer
14. Selector Detent Spring	30. Butt Stock	46. Hammer Spring
15. Pistol Grip Lock Washer	31. Butt Stock Screw	
16. Pistol Grip Screw	32. Spacer	

A. Disassembly of the Lower Receiver

WARNING: BEFORE WORKING ON OR CLEANING YOUR WEAPON, ENSURE IT IS UNLOADED!

1. Remove the pistol grip
2. Remove the selector lever spring and detent from the right side of the pistol grip and receiver
3. Remove the upper buttstock screw
4. Pull the buttstock and insert rearward to remove
5. Remove the takedown pin spring and detent from receiver
6. Remove the takedown pin
7. Use a modified 1/16" allen wrench to depress the pivot pin detent, then rotate the allen wrench and the pivot pin 1/4 turn

Note: The detent pin and spring are compressed; cup your hand over them and catch them as the pivot pin is removed so you don't lose them.

8. Remove the pivot pin, detent and spring
9. Push the spring pin retaining the bolt catch towards the rear of the receiver and remove



10. Remove the bolt catch, plunger, and spring
11. Use a punch and push the magazine release button to the left
12. Rotate the magazine catch bar counterclockwise and remove
13. Relax tension on the magazine release button, then remove the button and spring

14. Ease the hammer down to the fired position

Caution: *A free-falling hammer may damage the receiver, the hammer, or the bolt catch/bolt release assembly. As you are performing this step, keep your free hand or thumb over the hammer to keep it from snapping forward into the receiver.*

15. Push out the hammer pivot pin in either direction
16. Lift the hammer and hammer spring up to remove
17. Remove the selector lever to the left
18. Push out the trigger pivot pin in either direction
19. Lift the disconnecter, disconnecter spring, trigger, and trigger spring up to remove
20. Depress the buffer assembly slightly and depress the buffer retainer plunger enough to remove the buffer and buffer spring
21. Either place the receiver in an action block and place in a vice (or insert the pistol grip into a padded vice)
22. Using an AR combination wrench, unscrew the receiver extension (buffer tube) from the receiver

Note: The buffer plunger and spring are compressed; cup your hand over them and catch them as the receiver extension is removed so you don't lose them.

23. Remove the buffer plunger and spring
24. Drive out the trigger guard spring pin and remove the trigger guard

B. Assembly of the Lower Receiver

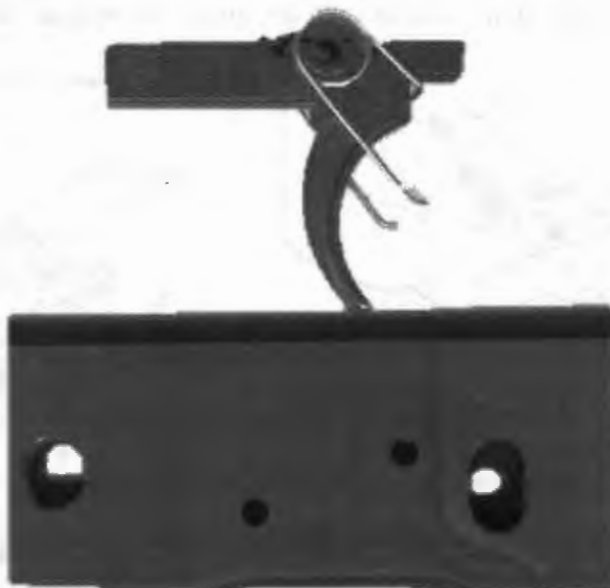
1. Install trigger guard, align hole in trigger guard with hole in receiver, then drive in the spring pin

Note: Before installing the receiver extension, apply "No Seize" lube to the threads.

2. Start the receiver extension into the lower receiver a couple of turns
3. Place the buffer retainer spring and buffer retainer into the receiver and depress far enough so the receiver extension partially clears the buffer retainer and holds it in place
4. Secure the receiver in an action block and vice, then torque the receiver extension to 35 ft./lbs.

Caution: *Go slowly so as not to twist the receiver out of the vice. Ensure the tube is not cutting into the buffer retainer – it should just be on the 'shoulder' of the retainer, not on the post.*

5. Install the buffer and spring, spring first, into the receiver extension. Push the buffer assembly in far enough to where the buffer retainer pops up, capturing the buffer, and holds it in place
6. Drop the trigger, trigger spring, and disconnecter spring into the receiver



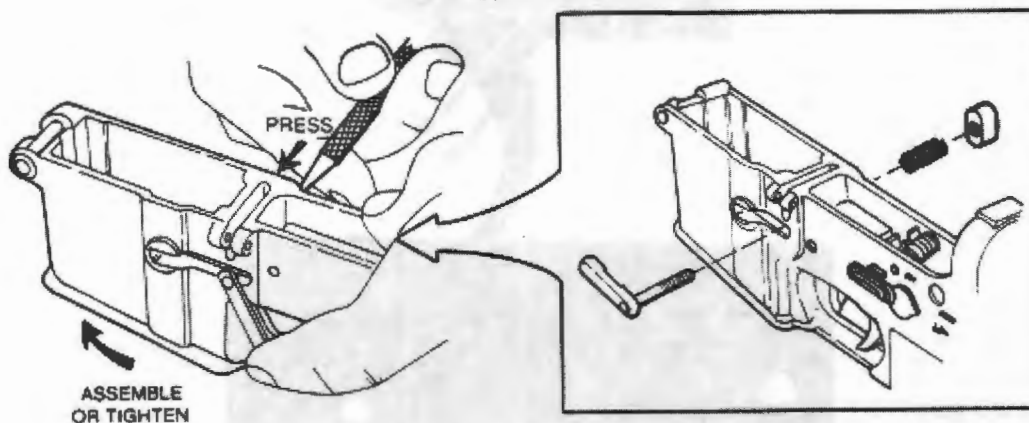
7. Start the trigger pin through the receiver and just enough of the trigger to hold trigger in place

Note: Both the trigger and hammer pins are interchangeable and go in either direction.

8. Drop disconnecter onto trigger
9. Align hole in disconnecter with trigger pin and push pin flush with receiver sides
10. Slide selector lever from left into receiver
11. Drop hammer and spring into receiver from the top – the hammer spring legs must go **on top** of the trigger pin



12. With hammer in fired position push down to align hammer pin hole
13. Install hammer pin
14. From the right install the magazine catch spring and magazine release button and compress button with punch
15. From the left screw in the magazine catch to the magazine release button until the threaded shaft is flush with the magazine release button



16. Install the bolt catch/bolt release spring and plunger into the hole on the left side of the receiver
17. Align the bolt catch with the holes in the receiver and install the bolt catch spring pin
18. Using a special tool, install the pivot spring, detent and pin – take care to not lose the detent
19. Install the selector lever detent and spring into the hole under the pistol grip with the pointed end of the detent going towards the selector lever



20. Slide the pistol grip onto the receiver, apply No Seize lube to the screw and start screw into the receiver
21. Ensure the selector lever detent spring is lined up before pushing the pistol grip all the way onto the receiver and tightening the screw
22. Install the takedown pin from the right
23. From the rear, install the takedown pin detent and spring



24. Place the spacer over the receiver extension (buffer tube) and slide the buttstock over the tube carefully, ensuring that the takedown detent spring is lined up in the receiver and with the buttstock so as not to damage the spring
25. Install and tighten the upper buttstock screw

C. Disassembly of the Buttstock

1. Use a screwdriver and remove the lower buttstock screw
2. Pull sling swivel down and out
3. Pull butt plate group rearward
4. Lay butt plate group on a table and open door assembly by depressing plunger
5. Lift out door assembly
6. Push out hinge pin and separate hinge from door

D. Assembly of the Buttstock

1. Position hinge and door assembly and install pin



2. Install door assembly into butt plate and lock plunger
3. Install butt plate onto buttstock
4. Install sling swivel
5. Install screw through buttstock and tighten

Notes: _____

XII. Disassembly and Assembly of the Magazine

A. Disassembly of the Magazine

1. Use a punch and insert it into the floorplate
2. Using mild force, spring the floorplate up just enough to clear the locking notch from the magazine body



3. Slide the floorplate rearward and off of the magazine body
4. Gently guide the magazine spring and follower out of the bottom of the magazine body



B. Assembly of Magazine

1. Correctly orient the magazine follower and magazine spring, then insert, follower first, into magazine body



2. Use your fingers to hold the spring inside the magazine body as you slide the floorplate on
3. Slide the floorplate until it seats and snaps into place

Notes: _____

XIII. Troubleshooting

A. General

In a properly maintained firearm, malfunctions rarely occur. However, when they do, malfunction diagnosis can be a problem for the armorer. The following is a guide for the armorer in malfunction diagnosis. In some cases the correction may include more than one cause or correction.

B. Stoppages, Possible Causes, and Remedy

Stoppage	Possible Cause	Remedy
Failure to fire	Broken or damaged firing pin	Replace and re-gauge firing pin protrusion
	Bolt carbon fouled	Clean bolt
	Broken or damaged firing pin retaining pin	Replace firing pin retaining pin
	Broken hammer or hammer spring	Replace hammer and/or spring
	Walking hammer or trigger pins	Inspect and correct
	Disconnecter releasing hammer too soon	Time disconnecter so as disconnecter releases hammer, the trigger is fully forward
Short Recoil	Weak or broken action spring	Replace
	Misaligned, broken or missing gas rings	Verify or replace; discard any gas rings that have a gap less than .045"
	Damaged gas tube	Inspect or replace
	Bent gas tube	Disassemble bolt carrier group and insert the carrier only into the receiver and verify there is no binding between carrier key and end of gas tube. Check key for damage
	Broken carrier key screws	Un-stake and replace both screws then re-stake

B. Stoppages, Possible Causes, and Remedy (Continued)

Stoppage	Possible Cause	Remedy
Failure to feed	Bad magazine	Verify loaded magazine can push rounds up both front and rear when pushed down with finger. If not, adjust as follows: disassemble magazine and stretch the rear coils of the magazine spring (not the front), then using smooth parallel jaw pliers very slightly open the front of the magazine lips; reassemble magazine and test again. Discard any magazines that won't work
	Magazine catch	Verify magazine catch holds magazine high enough for a minimum of 1/16" interference between bolt face and round in magazine
	No jump	Ensure there is a minimum of 1" to 1½" jump. If not, remove barrel, re-cut and polish the barrel extension feed ramp
	Short recoil	Verify the malfunction is not short recoil by loading one round into the chamber and closing the bolt; insert an empty magazine and fire. If the bolt locks back, it's not short recoil
Failure to extract	Extractor worn	Verify extractor is positive – has at least .020" cam out and rubber insert is not damaged. Replace any worn parts.
	Rough Chamber	Observe unfired and fired cases. Lots of marks on casings either replace barrel or polish chamber using no coarser than 360 grit cloth backed sandpaper on a tight fitting mandrel.
	Over gassed	Verify gas orifice is of correct diameter Colt 20" barrel .086" Colt CAR .054" Colt M - 4 .074" Bushmaster (all) .092" If gas hole is oversized you need to replace the barrel with one of correct gas hole diameter.

B. Stoppages, Possible Causes, and Remedy (Continued)

Stoppage	Possible Cause	Remedy
Failure to eject	Ejector stuck	Verify ejector moves freely in and out
	Weak ejector spring	Replace spring
	Broken ejector	Replace ejector
Failure to close	Bolt cam pin missing	Replace
	Loose or damaged carrier gas key	Replace or repair carrier gas key
	Extractor	Verify extractor is assembled correctly. Extractor spring has a flared end that secures the spring to the bottom of spring hole cut in extractor. Properly seat spring in extractor.
	Bent gas tube	Adjust by bending in area of hand guard or replace tube
	Recoil spring weak	Recoil spring minimum free length is 11 3/4"

Notes: _____

XIV. Tools Required for Armorers

A. Tools Required for Complete Disassembly and Assembly

1. Set of pin punches
2. Set of spring (roll pin) punches
3. Screwdriver
4. 2 ounce ballpeen hammer
5. Set of allen wrenches
6. AR-15 combination wrench
7. Barrel and receiver action blocks

B. Tools Required for Armorer Work

1. 8-10" Mill smooth hand file with handle
2. Dummy ammunition
3. 4" parallel smooth jaw pliers
4. Dial calipers
5. Cold blue
6. Q-tips
7. Headspace gauges
8. Cleaning equipment
9. No seize lubricant e.g. Moly Grease, Dry Lube, etc.
10. Degreaser e.g. Isopropyl Alcohol
11. 1 1/2" snap ring pliers
12. Torque wrench in inch/pounds with 1/8" allen head set screw adapter
13. Torque wrench in foot/pounds

Notes: _____

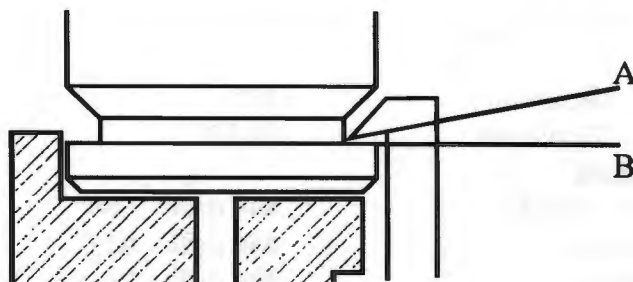
XV. Miscellaneous

A. Specification Sheet

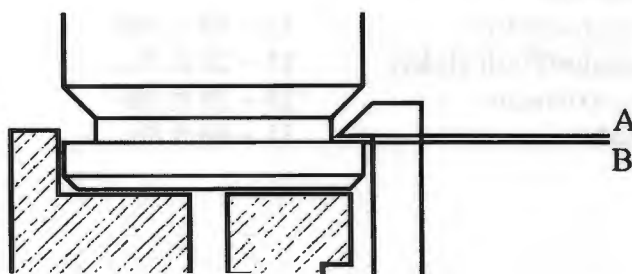
1. Firing pin protrusion: .028" ~ .036"
2. Trigger pull: 4 ~ 8.5 lbs.
3. Recoil spring free length
 - a. 20" barrel
 - i. Minimum: 11 3/4"
 - ii. Maximum: 13 1/2"
 - b. CAR
 - i. Minimum: 10"
 - ii. Maximum: 10 7/8"
4. Gas hole diameter
 - a. Colt 20" barrel: #44 drill - .086"
 - b. Colt CAR: #54 drill - .054"
 - c. Colt M-4: #49 drill - .074"
 - d. Bushmaster (all): #52 drill - .064" to #33 drill - .113"
5. Torque specifications
 - a. Carrier key screws: 35 ~ 40 in./lbs.
 - b. Compensator/Flash Hider: 15 ~ 20 ft./lbs.
 - c. Receiver extension: 35 ~ 39 ft./lbs.
 - d. Barrel nut: 31 ~ 80 ft./lbs.

B. Positive Extractor Hook Angle

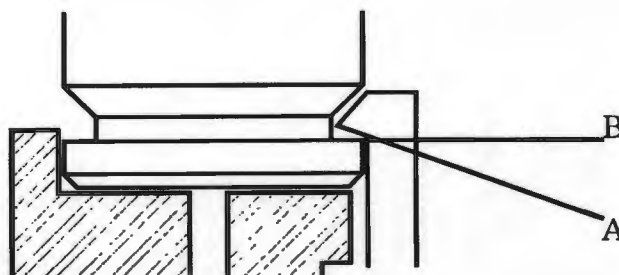
1. All extractors have a positive hook angle with the extractor in the “**working position**” (the extractor is pushing against the case and holding it against the bolt face)
2. Line A = a line parallel to the extractor hook angle
3. Line B = a line parallel to the rim of the case
4. **Positive** extractor hook angle: line A angles away from line B



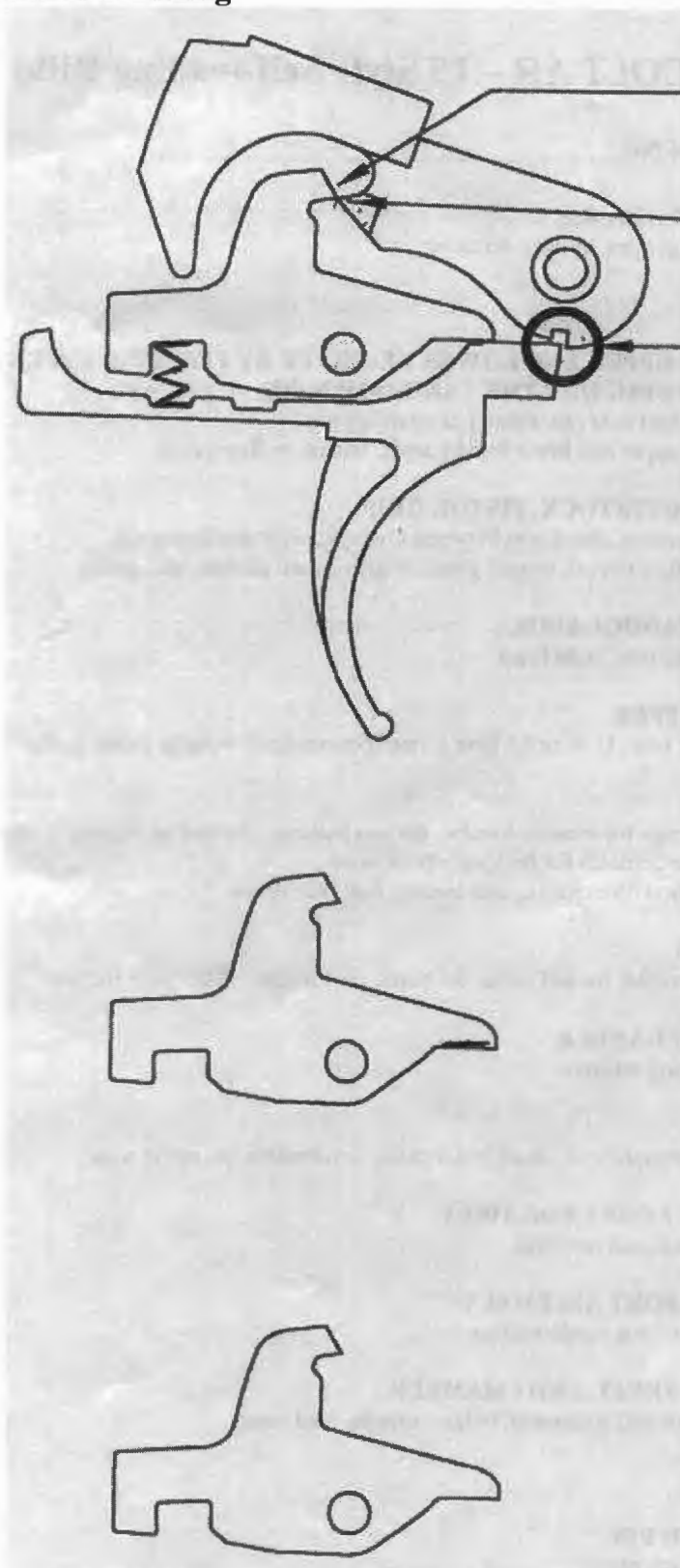
5. **Neutral** extractor hook angle: line A parallels line B



6. **Negative** extractor hook angle: line A angles towards and crosses line B



C. Disconnecter Timing



D. Inspection Checklist

COLT AR – 15 Style Self-loading Rifle

Weapon Serial No. _____

OVERALL APPEARANCE

Clean, no cracks, gouges, or deep scratches

FIELD STRIP

1. SEPARATE UPPER AND LOWER RECEIVER BY PIVOTING UPPER RECEIVER DOWNWARD AFTER PUSHING OUT THE TAKE-DOWN PIN

Bolt carrier, bolt, bolt cam pin, firing pin retaining pin
Charging handle, upper and lower hand guards, buffer, buffer spring

2. INSPECT BUTTSTOCK, PISTOL GRIP

For cracks or looseness, check gap between lower receiver and buttstock,
Buttplate hinge, sling swivel, trigger guard, trigger guard plunger and spring

3. INSPECT HANDGUARDS

For cracks, missing tabs, tight liner

4. CHECK BUFFER

For cracks, spring rust (11 ¾ to 13 ½ in.), free movement of weights inside buffer

5. BOLT

Check three gas rings for wear or breaks: carbon buildup, cracked or missing locking lugs
Check extractor underneath for buildup, check hook
Check spring tension on extractor and ejector, bolt face down

6. FIRING PIN

Carbon buildup, cracks, tip and collar for burrs, protrusion - .028 - .035 inches

7. CHARGING HANDLE

Straightness – spring tension

8. GAS TUBE

Carbon buildup, straightness, check pin, cracks, deformities, eccentric wear

9. FORWARD ASSIST ASSEMBLY

Operates freely and does not bind

10. EJECTION PORT ASSEMBLY

Cover spring, cover pin, retaining ring

11. INSPECT BARREL AND CHAMBER

Loose compensator and alignment, bulges, cracks, feed ramp

REASSEMBLE

1. TAKEDOWN PIN

Should lock into place

2. **CHECK SAFETY**
Operates freely and does not bind
3. **DISCONNECTOR/TRIGGER/HAMMER FUNCTION**
Smooth recovery
4. **BOLT LOCK**
Holds bolt open with and without empty magazine
5. **MAGAZINE CATCH**
Operates freely, holds magazine in, allows magazine to drop freely with bolt open and closed, proper magazine release button height
6. **HEADSPACE**
Go and No-Go
7. **FRONT SIGHT ASSEMBLY**
Taper pins, front swivel, front sight post, detent and spring
Check front sight for function – bent ears
8. **REAR SIGHT ELEVATION AND WINDAGE**
Flip-type peep sight will lock in position, correct and full movement
9. **FUNCTION TEST**
Function test with and without dummy rounds
10. **TRIGGER PULL**
4 to 8 ½ lbs.
11. **MAGAZINE INSPECTION**
Dry, clean, follower not worn, base plate broken/cracked, spring clean, dry, no rust, follower works freely. Check lips for wear or cracks.
12. **OVERALL FUNCTION**
13. **TEST FIRE ONE FULL MAGAZINE**
14. **TARGET GROUP SIZE:**

COMMENTS:

INSPECTED BY: _____ **DATE:** _____