

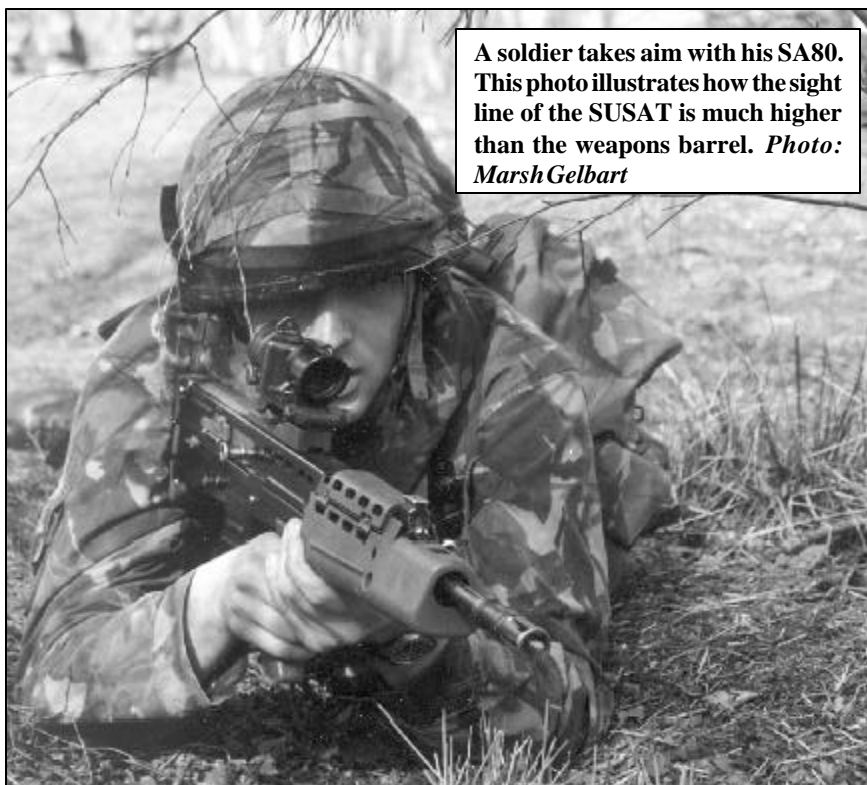


SA80 on the firing range. The SA80 fitted with SUSAT is a consummate marksman's weapon as long as it is not exposed to harsh treatment or severe environmental conditions. *Photo: Marsh Gelbart*

British SA80 Rifles

The L85A1 and L86A1 LSW

Text & Photos by Dan Shea



A soldier takes aim with his SA80. This photo illustrates how the sight line of the SUSAT is much higher than the weapons barrel. *Photo: Marsh Gelbart*

In the early 1950s, the British MOD undertook bullpup projects referred to as the EM1 and EM2 series (See SAR volume 6 number 2). These were never production guns, and they were tried in numerous calibers, most notably in .280. In the 1980s, the British MOD adopted a design that was a relative of these projects- the SA80 rifle, in its type as the L85A1 IW (Individual Weapon) and the bipod supported heavy barrel L86A1 LSW (Light Support Weapon) variant.

Why make a “Bullpup”? The basic idea is that with a much more compact package than a standard rifle, you can keep the full barrel length, vastly improving the ballistics over a shorter barreled rifle. The first instinct in making a shorter rifle would be shortening the barrel length but that leads to several problems. The first and major one is the lost energy and changes to the stability in the projectile. Reports are currently coming back from the fighting in Afghanistan, of US soldiers with M4 carbines shooting “Bad guys” center of mass, and they don’t drop. They are not incapacitated. This is counter to the mission, which is to kill or incapacitate the enemy. This can get our guys compromised, which means “Killed”. This is unacceptable. The M4 carbine uses a barrel that is 14.5” long, which changes the internal ballistics, the external ballistics, and what is becoming more apparent, changes the wound and terminal ballistics of the 5.56x45mm (NATO) cartridge. The M4 Carbine is the direct offspring of the M16A2 series of full size rifles. It is now under fire in the desert fighting. So is the SA80 series, once again. More on other problems later in this article.

During Operation Desert Storm, and in the Sierra Leone battles, the British troops armed with the SA80A1 system were very vocal about the problems they were having with rifles that were unreliable, or flat out didn’t work in the desert environment. Many comments were made about them grabbing Kalashnikovs or M4 carbines if they could, and abandoning the SA80A1 because they didn’t trust it. Soldiers tend to vote with their actions- if something doesn’t work right, it causes them grief or puts them in harm’s way, so they improvise, overcome and adapt. Historically, if that means tossing your Reising Model 50 into the river and grabbing a Garand from a fallen brother, then so be it. Students of military history are well familiar with stories like these, and most veterans can identify with this. This principle is universal to soldiers, whether it be fighting, digging ditches, or doing KP. If it doesn’t do its job, it gets DX’d.

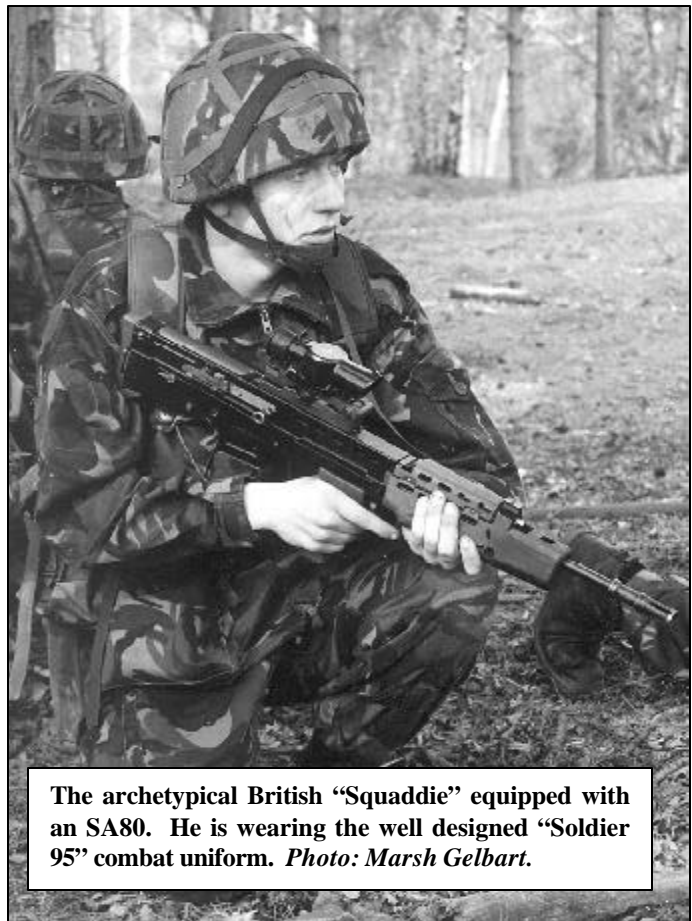
In 1996 the firm of HK Oberndorf undertook an analysis of the system and finally landed a contract for well over \$100 million to perform an upgrade and modification program on 200,000 of the SA80A1 series of rifles intended to become the SA80A2. These included modi-

fications to thirteen parts of the rifles: Breech Block, Breech Bolt, Cartridge Extractor, Cartridge Ejector, Recoil Spring, E x t r a c t o r Spring, Firing Pin, Cocking Handle, Magazine, Gas plug and Cylinder, Hammer, Barrel Extension, and the Barrel on the L86A1 LSW, not the barrel on the L85A1. It is not the purpose of this article to review the HK SA80A2 upgrades, we do not have one available for testing.

The media has been buzzing about problems with the SA80A2 in Afghanistan, and we have not been able to pin down any specific problems from the general comments made. Reports on the failure of the M4 Carbine to perform are abundant as well, and there is at least one comment shared with your faithful correspondent from someone who was there for comparison testing, that the M4 Carbine failed miserably, while the SA80A2 had virtually no problems. All of this will come out in the wash of course.

What we do have available to us, is one each of the L85A1 IW, and the L86A1 LSW. I have spent a number of years gathering accessories and taking pictures of variants, as well as speaking with operators and engineers. Basically, keep these guns cleaned and well lubricated. I recommend liberal treatment with TW-25 on the lower internals, and on the bolt carrier rails as well as the bolt group’s moving components. In other than desert theatres, they seem to perform well.

A bit about the rifles. These are obviously bullpups, which is a plus as well as a minus- you keep the full barrel length in a shorter package, but you move the ejection



The archetypical British “Squaddie” equipped with an SA80. He is wearing the well designed “Soldier 95” combat uniform. Photo: Marsh Gelbart.

process close to your face and left handed shooters have a major problem with this location. I found the balance point to be somewhat awkward, it is behind the pistol grip. This means that you have one hand out front on the forend, the other on the pistol grip, and the majority of the weight is rocking the rifle out of balance to the rear and down. A good firm support against the shoulder is required to counter this pressure. Without that control, the rifle will rise much more severely on automatic fire.

The receiver is bent up sheet metal. While treated and properly manufactured, it is still sheet metal, and subject to denting inwards. In some locations on the receiver, this can either misalign a part, or, more likely, interfere with the travel of the bolt carrier. Many interior components are sheet metal as well.

Most of the parts appeared fairly robust, with some questions about the internals in the trigger area- many appeared to be formed sheet metal, which this writer never considers a good idea in a high wear area.

The SUSAT (Sight Universal Small

Arms Trilux) sight is very quick for target acquisition. In fact, it is one of the best general issue optical sights that this writer has ever used. The SUSAT is widely acknowledged to be fast and accurate, keeping its zero fairly close on dismount and remount, and it works well in darker scenarios, due to its Tritium capsule. There are no batteries, and the Tritium capsule is expected to last about ten years then be replaced. The SUSAT is issued in combat zones, but generally the carry handle / Iron Sight combination is issued otherwise.

Altogether, the SA80A1 system gets a thumbs down as a modern military issue weapon from SAR. This is mainly because of the reported troubles in the field, and the fact that a modern army may be fighting in virtually any conceivable environment, not just a local, known one. There are many other systems available today. Without reviewing the SA80A2 upgrades, it is hard to make any comments on that,

other than to acknowledge the excellence of HK's reputation on engineering.

I tried to analyze the system in the photo captions, and give my hints for weapon care in the disassembly sequences. With only a few thousand rounds through the gun, most in the summer environment here in Maine, it is difficult for me to simulate the other environments encountered.

The use that this writer envisions for these A1 rifles is more in a standard Law Enforcement environment. The bullpup configuration of the SA80 series is an excellent method of maintaining the full power of the projectile when facing modern body armor on criminals while keeping a small overall package. If your LE environment is not in the desert, the SA80A1 is certainly worth testing out. Production of the SA80 series was 323,920 Individual Weapons, and the production line was shut down in 1996. (*Jane's Infantry Weapons*). This would leave approximately 130,000 SA80A1s unaltered,

and these will probably be sold out to UK friendly governments, or more likely upgraded to SA80A2 configuration, depending on the current situation. There is a source that has approximately 100 of the L85A1 IW and a small quantity of the L86A1 LSWs available for Law Enforcement purchase, or to qualified museums, reference collections, and collectors around the world. US collectors cannot obtain them, only Class 3 dealers who have an agency who require a test of the system. For more information, contact:

Law Enforcement International Ltd.

PO Box 328
St. Albans Herts
AL4 OWA England
Tel: 01727-826607
(Allow for Int numbers)
Fax: 01727-826615
Email: lei@lei.co.uk

“Mini” SA80 Tank Model, made in a very small quantity in Great Britain. Serial number A000259. Probably only a handful made. This one has a different, very early SUSAT sight on it.



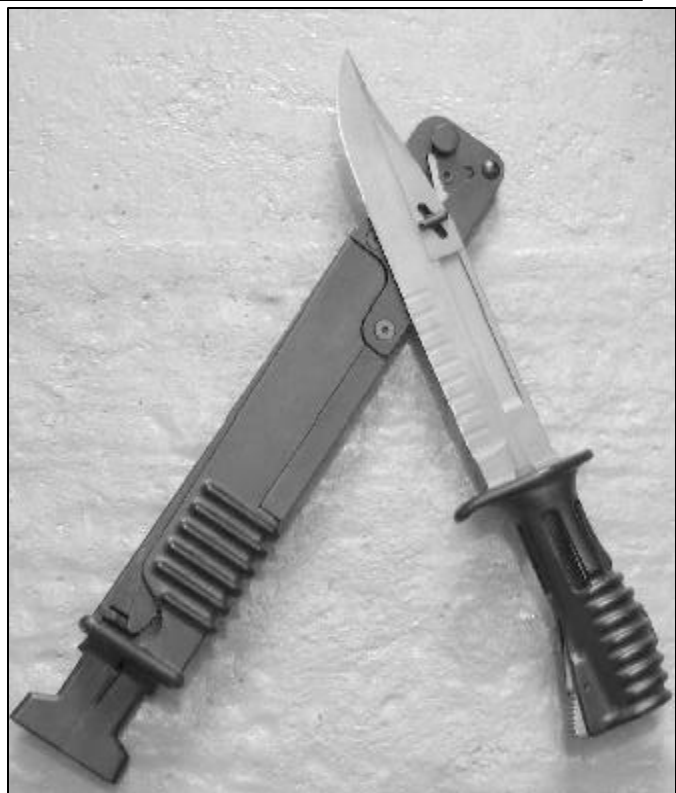
Very early SUSAT scope mount on the “Mini” SA80. This scope has the aiming post coming down from the top.



SA80 Carbine for Thailand or other South East Asian contract- no one seems to know for sure. Serial number UN93A368007. This “Carbine” model never received an “L” model designation to go into service. The forend is marked L86A1 like the Light Support Weapon. An estimated 20-40 units were made. Barrel length is reduced to 17.4 inches.

SAR’s Technical Specifications for the SA80A1 Rifle

	L85A1 IW	L86A1 LSW
Caliber:	(Both) 5.56x45 mm (NATO)	
Overall Length:	780 mm 30.73 in	900 mm 35.46 in
Barrel Length:	518 mm 20.41 in	628 mm 24.75 in
Weight, with full mag		
And SUSAT sight:	5.08 kg 11.2 lbs	6.88 kg 14.99 lbs
Weight, Empty:	3.80 kg 8.38 lbs	5.60 kg 12.35 lbs
Weight of full mag:	0.48 kg 1.06 lbs	(same)
Weight of empty mag:	0.12 kg 0.26 lbs	(same)
Number of Barrel grooves:	6	6
Twist of Rifling:	Right Hand	Right Hand
Pitch of Rifling:	1/175 mm 1/7 in	1/175 mm 1/7 in
Muzzle Velocity:	940 m/s 3083 fps	970m/s 3182 fps
Firing Modes:	(Both) Semi and Full automatic	
Rate of Fire:	650 RPM	680 RPM
Method of operation:	(Both) Gas, short stroke piston, spring return	
Lock up method:	(Both) 7 lug rotary bolt, forward locking	
Sighting Systems		
Optical Sight:	SUSAT (Sight Universal Small Arms Trilux)	
Magnification:	X 4	
Field of view (mils):	177 Mils	
Eye Relief :	24 mm 0.95 in	
Range settings:	300 to 800 meters	
Reticle type:	Clear post with Trilux lamp	
Iron Sights:		
Front Sight:	Post protected by two buckhorns	
Rear Sight:	Twin aperture	
Sight radius:	290 to 320 mm 11.43 to 12.61 in Depending on rear sight placement	
Range of use:	Up to 300 Meters	



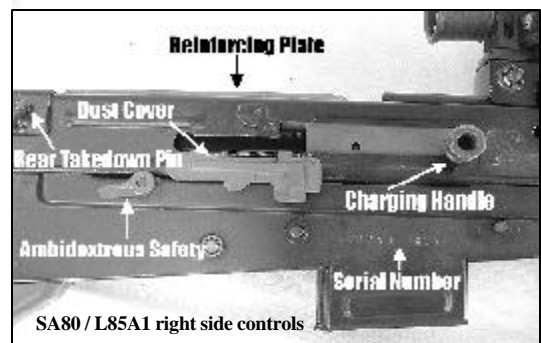
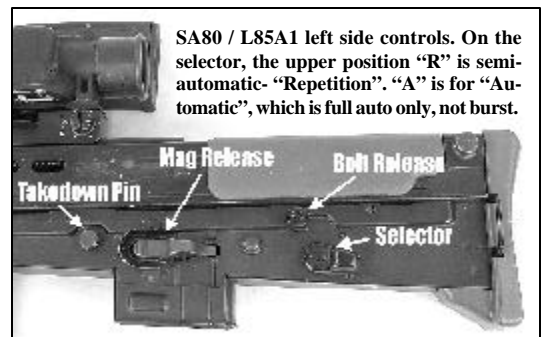
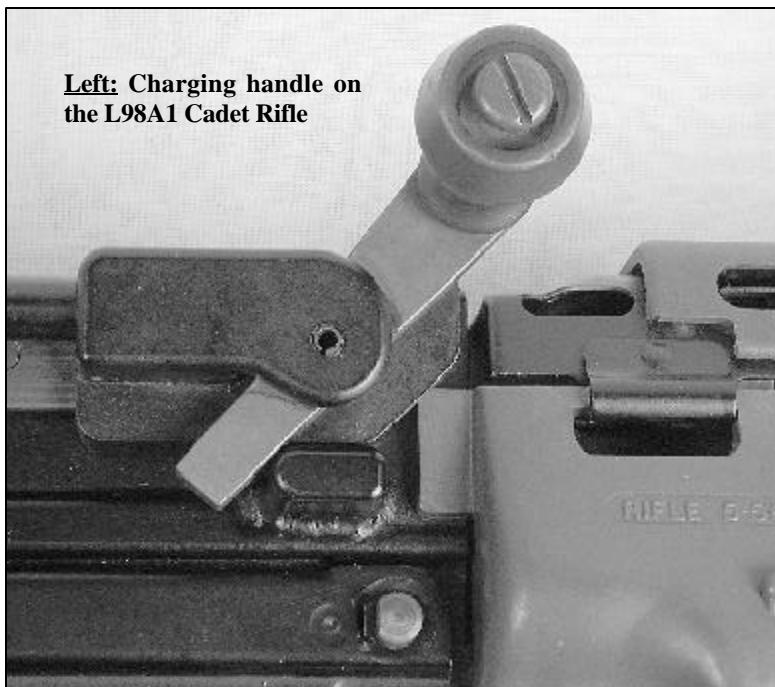
SA80 bayonet in the wire cutting mode.

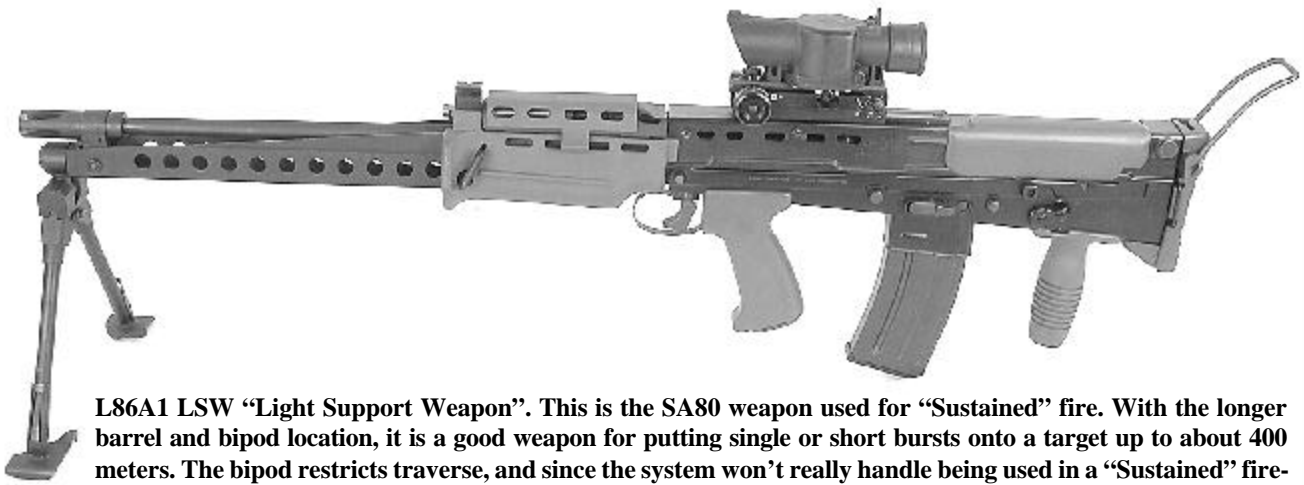


British SA80 with List manufactured suppressor.



L98A1 Cadet rifle, single shot version of the SA80 for Cadet training. There is no gas system, this is entirely manually operated. There is a 22LR Subcaliber unit available for this unit.



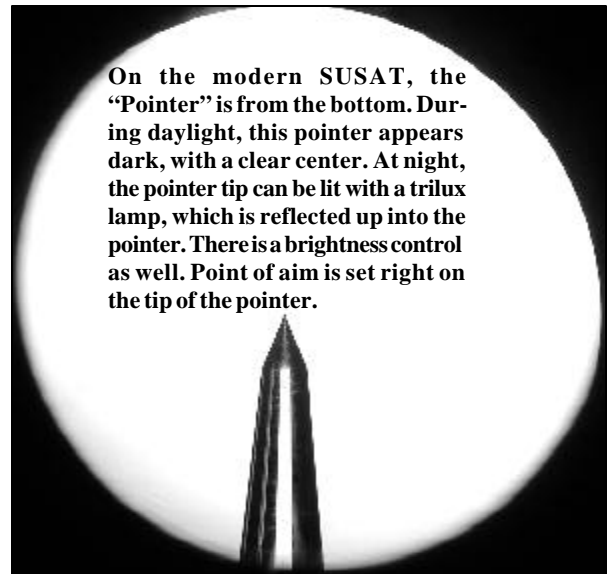
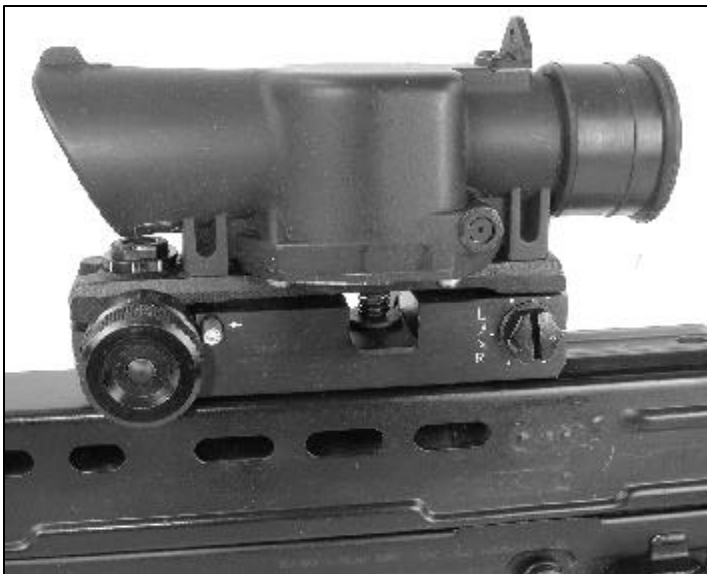


L86A1 LSW “Light Support Weapon”. This is the SA80 weapon used for “Sustained” fire. With the longer barrel and bipod location, it is a good weapon for putting single or short bursts onto a target up to about 400 meters. The bipod restricts traverse, and since the system won’t really handle being used in a “Sustained” fire-squad automatic mode- this is a problem. The UK MOD is considering the Minimi or the HK MKG43 as a replacement for this role.

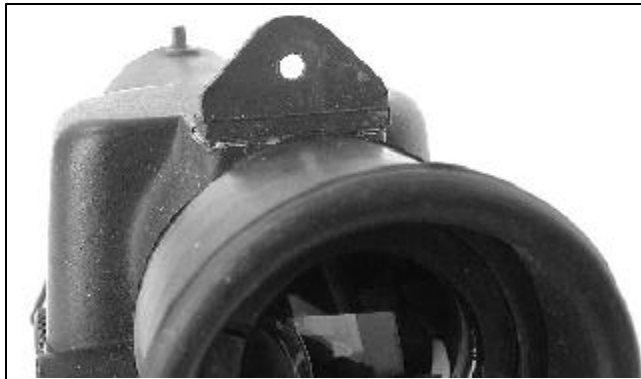


L85A1, the “Individual Weapon”, or the “SA80 Rifle”. This model has the modern SUSAT sight on it.

Below Left: Standard issue SUSAT sight (Mid production model- later SUSATs have differing control locations). This is a 4x scope with a 177 mils field of view. The SA80 has a dovetail rail on top with several mounting positions, and the sight is positioned with a spring retained lever, then locked into place with special levers. Zeroing is recommended at 100 meters, but at 25 meters, if you are 25mm below the point of aim, you will be dead nuts at 300 meters and about 100mms high at 100 meters.



On the modern SUSAT, the “Pointer” is from the bottom. During daylight, this pointer appears dark, with a clear center. At night, the pointer tip can be lit with a trilux lamp, which is reflected up into the pointer. There is a brightness control as well. Point of aim is set right on the tip of the pointer.



Note the EBS (Emergency Battle Sight) on top- a peep type sight and blade front.



The gas piston system is exposed when the handguard upper is opened to the right. Note the post base for a fixed style front sight (A).



The Balance point is several inches behind the pistol grip. This leads to a tendency for the rifle to rotate downward when held in a standard style- balance is important to fully automatic firearms, not having a secure platform for the buttstock will lead to erratic shot placement. It is important to fire this weapon with a good, solid two hand hold, secured against the shoulder.



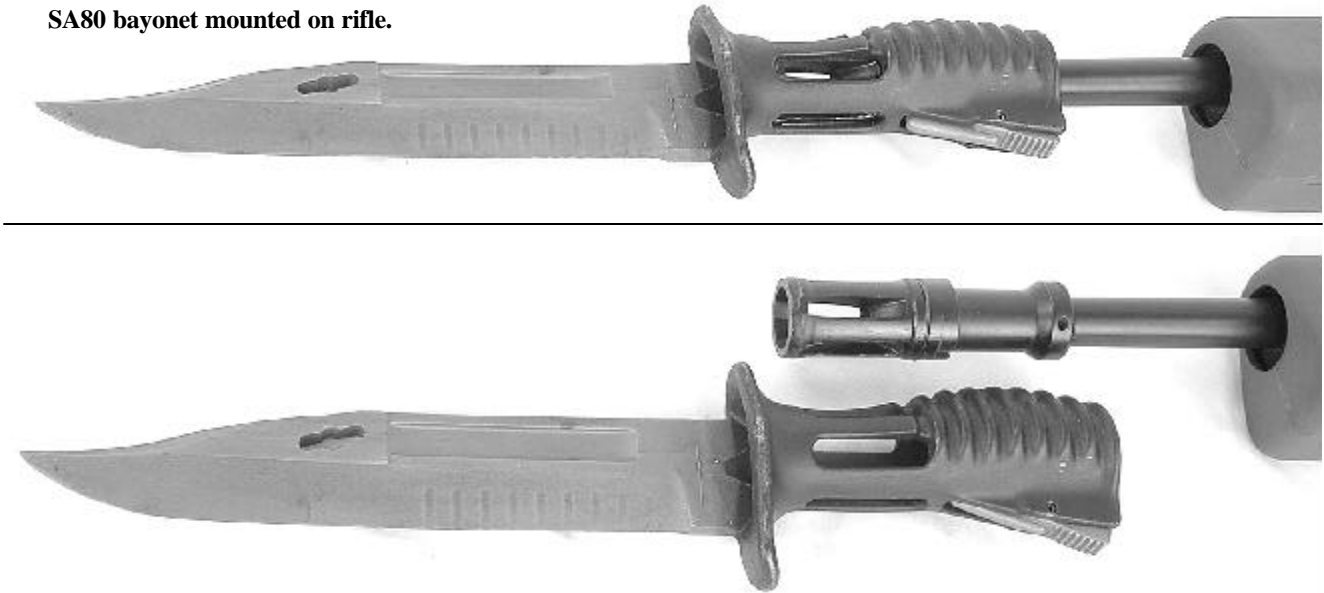
The magazine catch is protected from accidental pressure, which is a good thing, however, the thin sheet metal walls of the magazine well are prone to damage, and more importantly, the "Bell" of the well, where magazines enter, is prone to damage as well- making magazine insertion difficult or impossible.

Below: Original 30 round SA80 magazines. Lightweight aluminum body. The M16 magazine interchanges with this. HK has made new magazines, considering the magazine as a part of the problems. The SA80 magazine, however, is a good, solid, lightweight design. It is readily disassembled and cleaned. "RG" stands for "Radway Green", the manufacturer.



SA80 basic accessories first row: plastic muzzle cover, tactical sling. Second row: Blank Firing Adapter, Blade front sight with mount, rear carry handle W/ "Iron Sight" (fits all SA80 models), Cadet "Peep" sight, nylon SUSAT cover. Third row: new style accessory pouch, old style accessory pouch with patches, Combination tool, chamber brush, bore brush, plastic oil bottle, green scrubbing pad, and sectional cleaning rod.

SA80 bayonet mounted on rifle.

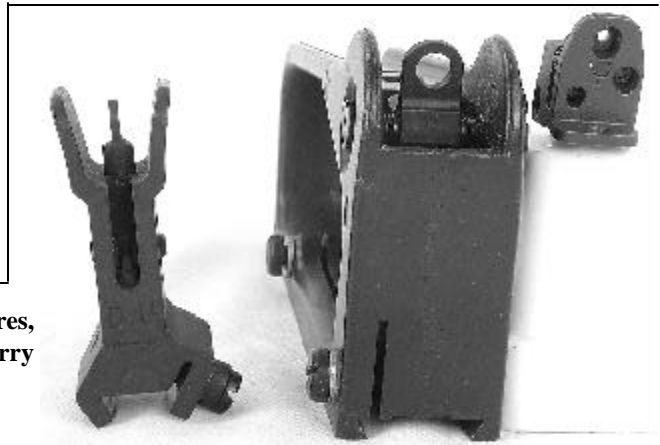
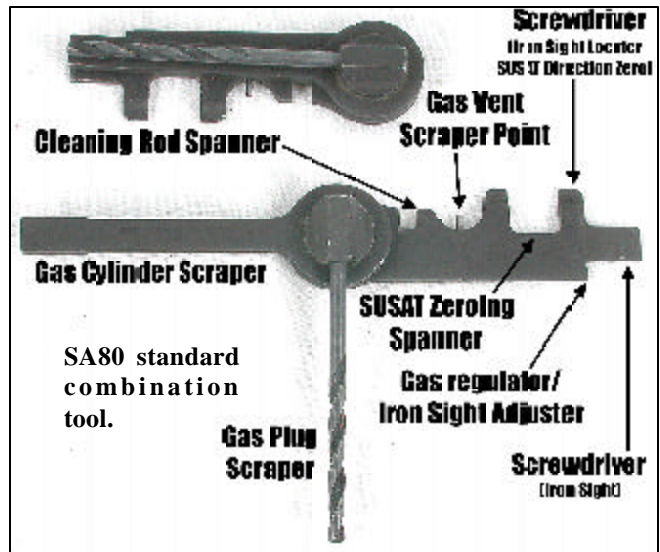


Bayonet problem- the handle of the bayonet mounts around the flash suppressor, and actually has corresponding holes to vent the gases. Hot gases. Unfortunately for the user, this makes the handle of the bayonet close to the temperature the flash hider gets to while firing. This is a major design flaw in just about everyone's opinion. If you are shooting the weapon, forget about taking the bayonet off for a while. While the instances of bayonet use are few and far between, the system should be more user friendly. Just in case we Yanks get a hold of these.

L-R: British SA80 Bayonet, Combat Sheath, Green nylon Frog, Black patent leather sheath for Regiment Parade, L3A1 white buff leather parade sheath. Combat sheath is missing the sharpening stone and saw blade. Bayonet tips are somewhat brittle and many examples will have the very tip broken off.

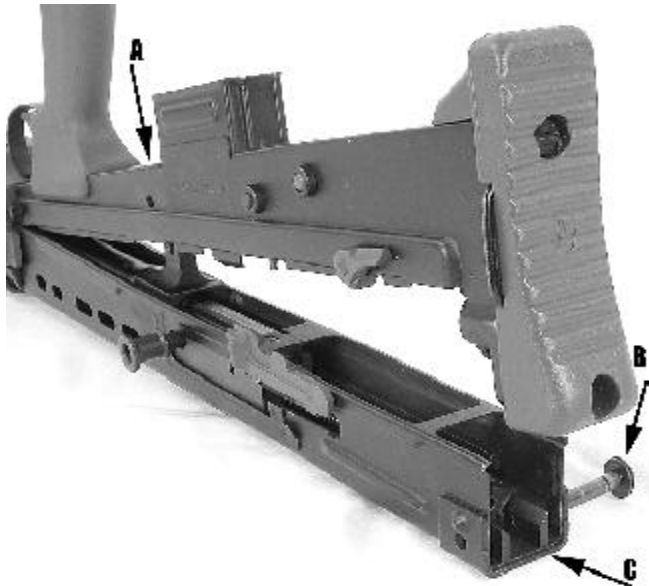


L-R: front Iron Sight, rear Iron Sight with two apertures, "Cadet" "target" rear sight that can be installed in the carry handle.

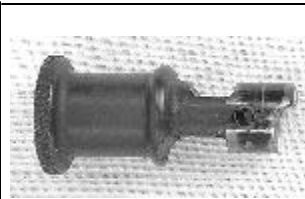


SAR's Field Strip for cleaning:

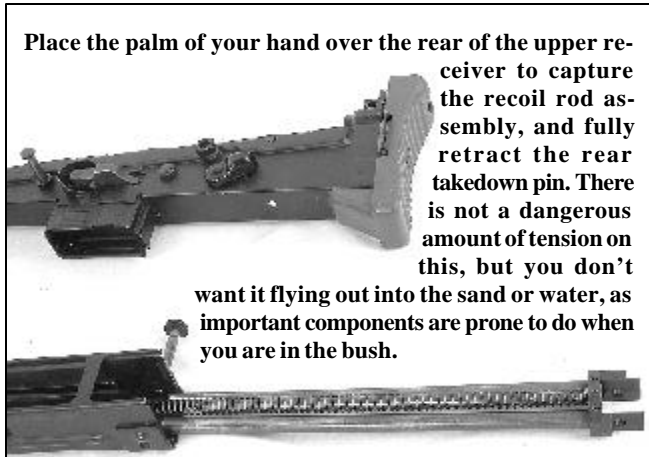
First, point the weapon in a safe direction and remove magazine. Place the safety on "Safe"- it is a crossbolt type, a small button directly above the trigger- it is a physical block of the trigger when pushed all the way to the right (Buttstock to shoulder, looking down the sights). Next, pull the charging handle all the way to the rear, and inspect the chamber to ensure it is empty. Allow the bolt to the forward position. Remove the SUSAT by opening the upper handguard, operating the releases, and sliding forward. Clean the SUSAT separately. Do not operate the trigger, leave the hammer cocked and the weapon on safe. Now, physically inspect the exterior of the receiver and mag well for dents or damage.



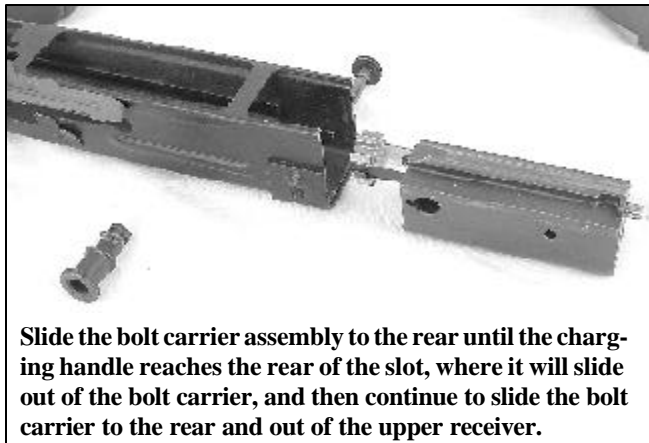
Ensure that the bolt is forward, then invert the weapon as shown-horizontal. Lay it on a table, or the hood of the vehicle, or in your lap. Push the rear takedown pin (B) all the way through as shown, then push it in a short distance until you get a distinct "Click". This is designed to hold the recoil rod assembly inside the upper receiver when you disassemble it (C). If you don't connect, the assembly will jump out under pressure when you open the upper / lower. Once you are sure that the rear pin is properly holding the recoil assembly, push the forward takedown pin (A) to the left (it is captive), and lift the lower receiver up, then to the rear and separate the upper and lower receivers. There is a pivot point at the front by the trigger.



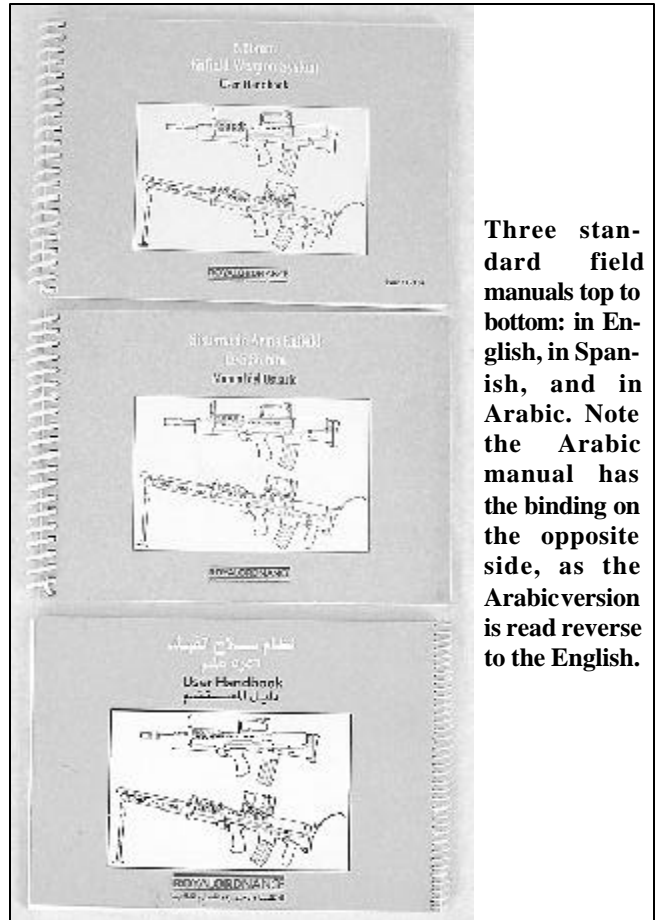
The charging handle travels with the bolt carrier. It is a weak link in the system, and has been operationally replaced with a stronger handle.



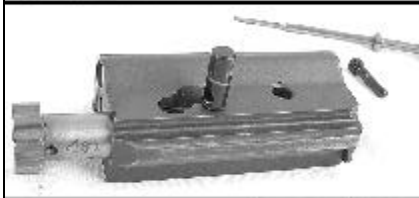
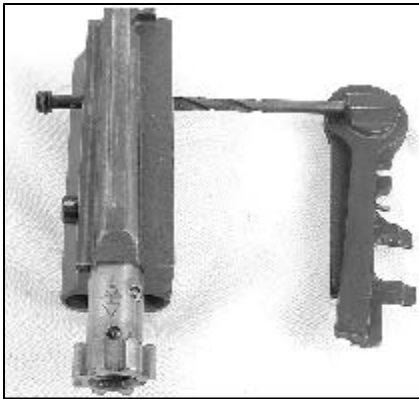
Place the palm of your hand over the rear of the upper receiver to capture the recoil rod assembly, and fully retract the rear takedown pin. There is not a dangerous amount of tension on this, but you don't want it flying out into the sand or water, as important components are prone to do when you are in the bush.



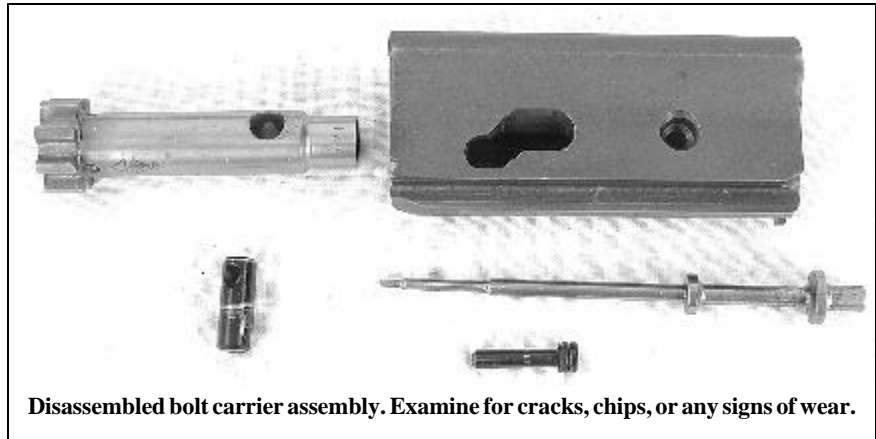
Slide the bolt carrier assembly to the rear until the charging handle reaches the rear of the slot, where it will slide out of the bolt carrier, and then continue to slide the bolt carrier to the rear and out of the upper receiver.



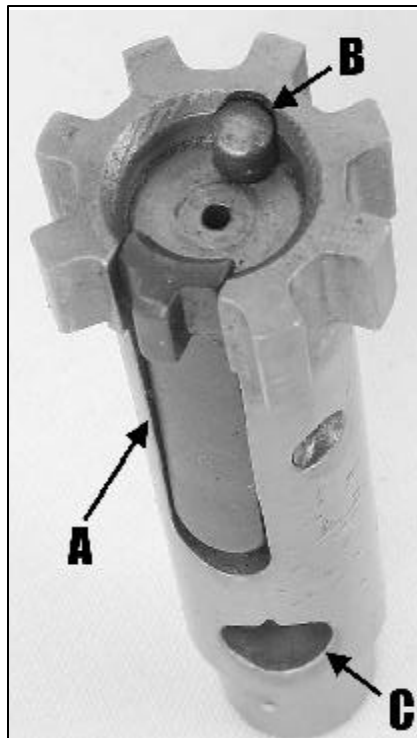
Three standard field manuals top to bottom: in English, in Spanish, and in Arabic. Note the Arabic manual has the binding on the opposite side, as the Arabic version is read reverse to the English.



Using the carbon drill on the combination tool, or other similar sized punch, push the firing pin retaining pin out. The firing pin drops out to the rear. Do this in a controlled area, on a poncho or on something similar, these are not captured. Pull the bolt all the way to its forward position, and the cam stud should come out, releasing the bolt itself.

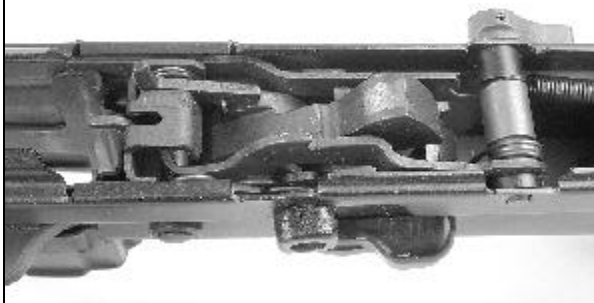


Disassembled bolt carrier assembly. Examine for cracks, chips, or any signs of wear.

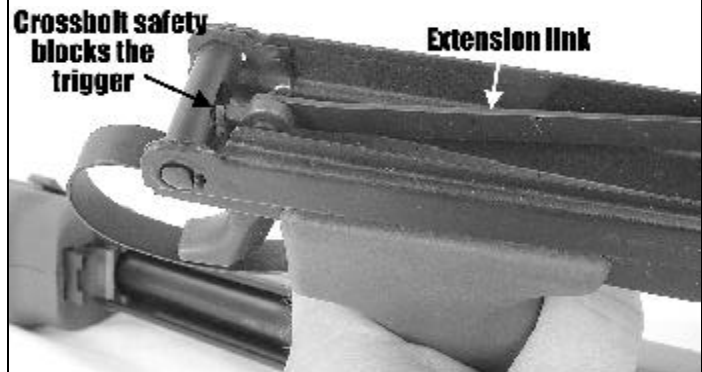


The bolt is an 8 lug position M16 style rotating bolt head. There is one position missing to make room for the extractor (A). This is normal with the Stoner style head- very similar to the M16 series. When disassembled, check the spring tension on the extractor (A) and ejector (B), and check all of the lugs for any signs of cracking. The lugs on the SA80 bolt are robust without sharp angles where they are milled out of the bolt body, and this is a good thing. The gentle radius of the bolt lug protrusions will add much strength and longevity to the lugs. Further disassembly of the bolt should not be needed for general cleaning unless there is a problem with spring travel or strength on the extractor or ejector. Note the slight chamfer around the cam pin hole (C)- this is done to prevent stress cracking, and was started in the very early AR15s.

Do a quick visual scan on the internals of the trigger group. It is recommended against disassembling this in the field. Brush it out, blow it out, remove dust and dirt. Inspect the springs for breaking and tension. Look for wear on the parts, or anything out of symmetry. Many of these are stamped steel parts, look for wear on the trip (A) where it hits the bolt carrier.

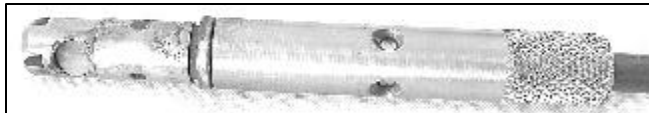


The cross bolt safety physically blocks the trigger from moving. There is a transfer bar or "Link" that goes from the trigger to the firing mechanism, transferring the trigger movement to the hammer trip.





This is essentially a short stroke piston system, with return spring. The system is very similar to the AR18 system with some changes. The piston has no “Cup” to capture gases, it is contained at the front end inside the gas cylinder. Essentially the gases pressurize from the gas port into the gas plug, driving the piston to the rear and venting when they reach the vent ports in the gas cylinder. The momentum imparted to the piston rod and bolt carrier assembly continues rearward through the cycle, but the piston has its own return spring. To remove and clean, open the upper handguard, push the piston to the rear and once it is free from the gas cylinder, pull it out of plane, then forward. The piston and return spring will come out together.



When the piston is at rest, it is all of the way forward.



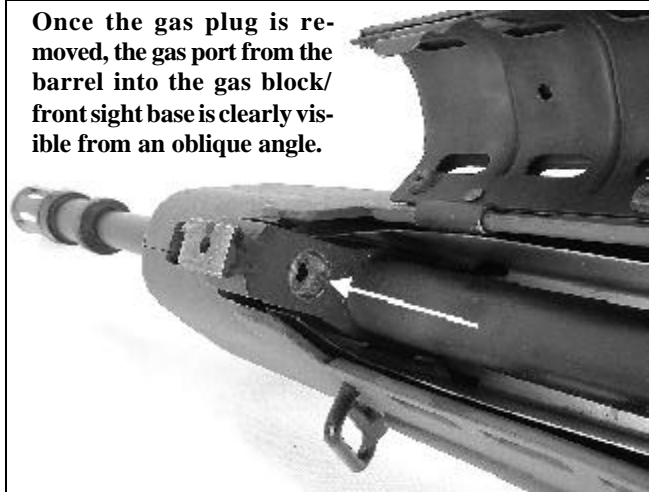
When the system is pressurized, the piston travels to the rear until it passes the gas vents in the gas cylinder, as shown. From this point on, the piston/ bolt carrier mass has the momentum to cycle the system, and the excess gases are vented forward inside the handguard.



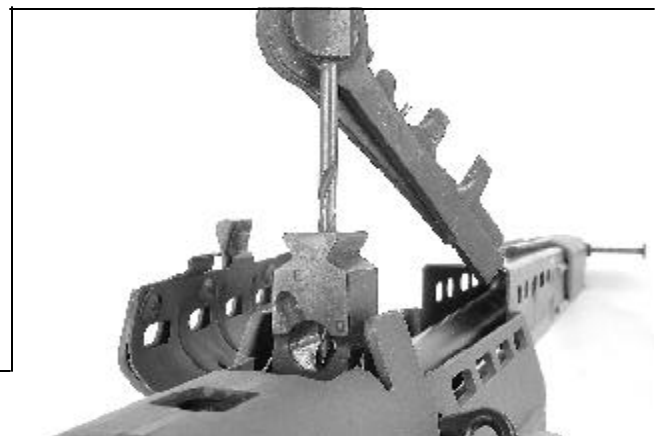
The Gas Piston Return Spring is attached to the piston with one very tight end slipped over the piston, and the spring should not normally be removed from the rod for cleaning, but inspect it.



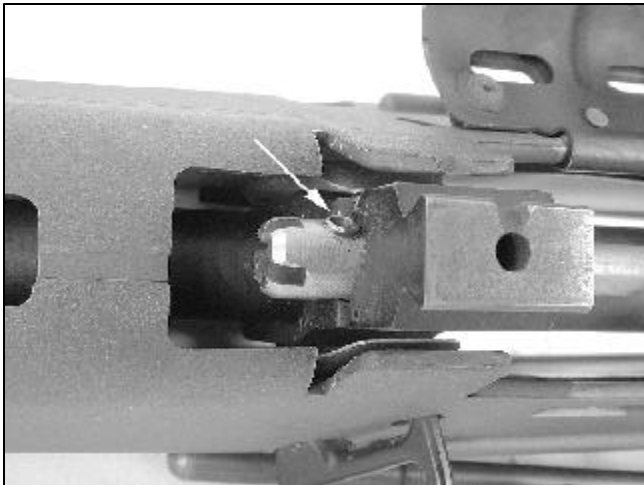
The gas cylinder will come out to the rear. Note that the vents on the cylinder are chamfered (Aimed) towards the front of the weapon, directing excess gases forward away from the operator. The gas cylinder can not be installed backwards, it is soldier proofed. Just in case you need to know, the knurling goes to the rear. The Gas plug itself comes out to the rear after you depress the plunger. Get that green pad out, bronze brushes, and cleaning oil... scrub the piston, gas cylinder and gas plug until clean, this is a high carbon area. It also needs very little in the way of lubrication, so keep this clean.



Once the gas plug is removed, the gas port from the barrel into the gas block/ front sight base is clearly visible from an oblique angle.



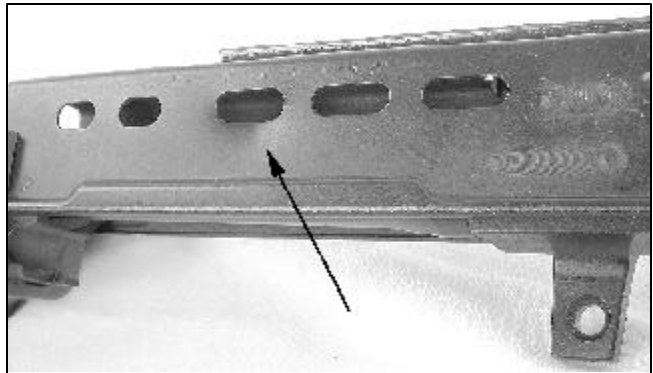
The carbon tool on the combination tool is basically a drill bit. This is used to ream the gas port in the gas plug. If your weapon is new, you should strip it and drop the tool into the block to get an idea of the proper depth. Electrician’s tape or the handyman’s secret weapon, duct tape, wrapped at the proper depth on the tool will help until you get the general feel for what the procedure is- once the carbon starts in here, it can be hard to judge depth. Clean, clean, clean.



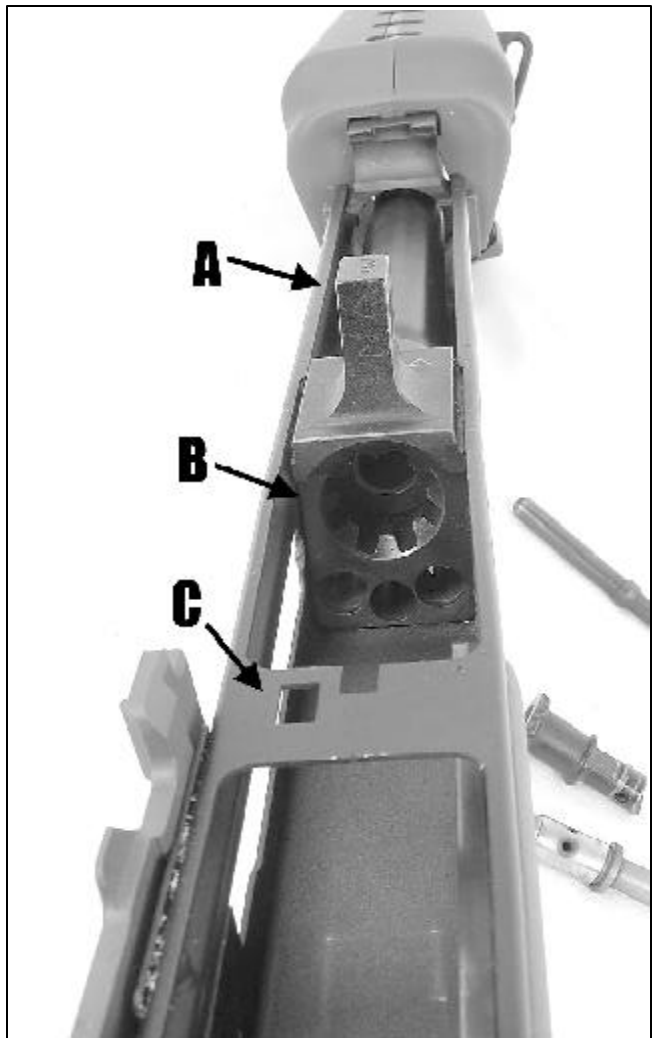
There are two basic gas positions; “N” for Normal, and “E” for Excess. Like many modern assault rifles, the designers have taken into account a fact of combat- you can’t always take time to clean the weapon, you may be in a fight. What the two position gas plug does is offer two different aperture sizes for the gas to come out of the barrel port, and go into the gas cylinder. “Normal” allows the standard amount of gas to enter the system and energize the piston/ bolt carrier mass. In combat, heavy use, the carbon can slow the system, or dirt, grease, mud, ice, bad lubing, can slow or stop the system. The plunger, which is on “N” in this picture, is used as the indicator. In trouble? Clear the weapon, place on safe, use a tool or bayonet to turn the plug so the indicator is on “E”, reload, and fire. If this doesn’t get the juices going, then you have other deeper problems, get another weapon off of someone else who “Isn’t using it anymore”. Remember, this is NOT a cyclic rate adjuster, even though the rate will go up in normal use when changed to “E”. This is a quick fix for a sluggish or dirty gun while in a fight. Keep this clean, it makes a difference.



Barrel thread size is 1/2" x 28 UNEF, the same as the M16. Don’t forget to remove the roll pin BEFORE trying to unscrew the flash hider. This is not necessary for disassembly. The flash hider system is designed to fire the standard NATO rifle grenades from the L85A1 Individual Weapon only, the carbine and L86A1 Light Support Weapon are not designed for this use. If you are apt to run into rifle grenade use either because you are issued, or might “Happen” on them on the battle field, first, make darn sure you know what you might be using - whether it is blank activated, bullet through, or bullet trap- then make sure the flash hider and forward barrel area are always carbon free and clean. Carbon build up will interfere with mounting the grenade.



On inspection of our test gun, we noted that the receiver was dented in. At the position of the dent, there are no moving parts that interact with it. Had this dent occurred further back in the sheet metal receiver, the bolt carrier may not have been able to move past it. This would be a “Negative” thing.



“A” The front takedown pin slides into this trunion extension. “B” Note the 8 position locking lugs on the barrel extension. “C” the sheet metal receiver has a slot for the trip lever to contact the bolt carrier.

